

**PSPE PHILADELPHIA CHAPTER  
OUTSTANDING ENGINEERING ACHIEVEMENT AWARD NOMINATION FORM – 2023**

**Project Information:**

Name of Project: PennDOT I95; Sec. ECA - Emergency Cottman Avenue Bridge Mainline Reopening Project

Location of Project: I-95 at Cottman Avenue, in the City of Philadelphia, PA

Description of Project, Include specific details (use two additional pages if necessary):

This project consisted of the emergency demolition of the I-95 fire damaged mainline bridge over the Cottman Avenue NB off-ramp that was severely damaged by a gasoline tanker truck fire and the reopening of the I-95 mainline to traffic.

Construction Cost: \$ 5 M Completion Date: 6/22/2023 Project or component must be complete in 2023

Primary Engineering Disciplines Represented by the Project (check those that apply):

Mechanical \_\_\_\_\_; Electrical \_\_\_\_\_; Civil X; Structural X; Chemical \_\_\_\_\_

Organizations/Firms That Contributed to the Project and are Responsible for the Achievement (provide additional sheets as required): (SEE ATTACHED PROJECT DESCRIPTION)

Names: Alfred Benesch & Company

Phone: 570-624-4298

Address: 400 One Norwegian Plaza, Pottsville, PA 17901

Email: syekley@benesch.com

Contact Person: Sandi K. Yeakley, PE

Title: Senior Project Manager | Principal Associate

Client/Owner:

Names: Pa Dept. of Transportation

Phone: 610-205-6680

Address: 7000 Geerdes Blvd., King of Prussia Pa. 19406

Email: hwindisch@pa.gov

Contact Person: Harold Windisch, P.E.

Title: Assistant District Executive - Construction

Submitted by:

Firm/Organization: Pennoni Associates, Inc.

Phone: 215-510-2903

Signature: *Harry E. Laspee*

Email: hlaspee@pennoni.com

To be Presented on December 5th by: Harry E. Laspee, P.E.

Email: hlaspee@pennoni.com

Cell Phone: 215-510-2903

A \$50 Entry Fee is required and is to be submitted with the Nomination Form.

The entry fee is to be made payable to PSPE, Philadelphia Chapter.

Nomination is due: November 17, 2023 Presentations: Thursday, December 7, 2023

Send by Email or Fax Nomination to: [oea@pspe-philly.org](mailto:oea@pspe-philly.org) or 215-885-3732

Payment of the Application Fee may be check or by credit card.

To pay by credit card, click to [PAYPAL BUYNOW](#) button on our website <http://www.pspe-philly.org/oea/entryfee.htm>

To pay by check please mail to:

Fredric L. Plotnick, Ph.D., Esq., P.E. Chairman, Outstanding Engineering Achievement Awards  
5000 Boardwalk Apt 1901, Ventnor NJ 08406 Phone: 215-885-3733, Fax: 215-885-3732,  
email: [oea@pspe-philly.org](mailto:oea@pspe-philly.org) or [oea@fplotnick.com](mailto:oea@fplotnick.com) or [fplotnick@fplotnick.com](mailto:fplotnick@fplotnick.com)



## **Pennsylvania Society of Professional Engineers (PSPE) Philadelphia Chapter 2023 Project Submission for Outstanding Engineering Achievement Awards**

### **PennDOT I95; Sec. ECA - Emergency Cottman Avenue Bridge Mainline Reopening Project**

**Project Name:** PennDOT I95; Sec. ECA - Emergency Cottman Avenue Bridge Mainline Reopening Project

**Address of the Project:** I-95 and Cottman Avenue, Philadelphia, PA

**Client:** Pa Dept. of Transportation

**Engineer of Record:** Alfred Benesch & Company

**Other Organizations / Firms that contributed to the Project included:**

Buckley Contractors, C. Abbonizio Contractors, Aero Aggregates Inc. JMT, AD Marble, Jacobs, AECOM, Hill International, American Engineers Group (AEG), Schnabel, Philadelphia Streets Department, Philadelphia Water Department, the FHWA, the First Responders, the Elected Officials, and Pennoni Associates,

**Date of Award of Design Contract:** June 11, 2023

**Construction Completion of Project:** June 23, 2023

#### **A. Project Description:**

“On Sunday, June 11, 2023, about 6:17 a.m. eastern daylight time, a 2017 International truck-tractor in combination with a 2004 Heil Specification Package 406 tank-trailer (combination vehicle), operated by a 53-year-old driver, was exiting Interstate 95 (I-95) northbound on the Cottman Avenue off-ramp in Philadelphia, Pennsylvania. At this location, I-95 was an eight-lane divided highway with four (4) lanes each in the northbound and southbound directions.

The combination vehicle, operated by an affiliate carrier leased to Penn Tank Lines, was transporting about 8,500 gallons of gasoline from Wilmington, Delaware, to a gas station located on Oxford Avenue in Philadelphia. The posted speed limit on I-95 in the vicinity of the crash was 55 mph, and the Cottman Avenue off-ramp was posted with a 25-mph speed limit and truck rollover warning sign.” (NTSB Preliminary Report)

The truck driver was unable to maintain control of the combination vehicle on the off-ramp. The truck rolled over and immediately exploded and caught fire under the northbound lanes of the I-95 overpass. The tanker came to rest adjacent to the northerly abutment of the NB lanes and reportedly within 17 minutes the NB steel girder bridge collapses onto WB Cottman Avenue (SR 0073), Ramp B. The SB I-95 bridge structure was compromised and the bridge abutments and ramp paving were damaged, with the NB northerly bridge abutment being the most severely damaged.

In addition to the NB I-95 bridge collapse onto WB Cottman Avenue (SR 0073), Ramp C, there were numerous explosions within the storm sewer system that blew the manhole frames and covers off about (6) manholes and dislodged manhole frames and cone sections.

As a result of the rollover and subsequent fire, the driver was fatally injured. The fire caused the northbound lanes of I-95 to collapse onto the Cottman Avenue off-ramp. The southbound lanes of I-95 were significantly damaged by the fire.

This Project entailed PennDOT's emergency response to reopen I-95 as quickly as possible.

## **B. Existing Conditions:**

This section of I-95 through the City of Philadelphia carries over 160,000 vehicles per day and as such it a vital transportation and economic asset for the Delaware Valley region.

The highway bridge cross-section at this location consists of four (4) 12-foot lanes in each direction with shoulders on both the left and right sides, with concrete barriers for an out-to-out bridge width of just under 150'. At this location, the mainline is on a 3,000' centerline radius curve and the I-95 mainline roadway is superelevated at 5.3%.

The bridge super-structure consisted of a 103' single span, steel plate girder bridge, with (8) girders NB & SB, 43" deep webs and a 14'-9" under-clearance. The bridge was built in 1/3 widths to maintain I-95 traffic, about ten (10) years ago under PennDOT's I-95; Sec. CP-2 Project. The Bridge was designed by URS Corporation as a sub to AE Bensch and was constructed by Walsh Construction circa 2013.

The bridge substructure consists of H-Pile supported RC footings with slope wall and battered RC abutments with a 2'-8'- stem top width and a 4'-4' stem bottom width.

The I-95, northbound Cottman Avenue off-ramp consists of a 15" depth RC superelevated pavement, with (2) lanes, 29' wide plus a 4' left shoulder, and a 12' to 14' right shoulder.

The underground utilities crossing under I-95 via the Cottman Avenue off-ramp included a circa 1915 / 1964, 6'-9" x 9'-0" RC Box combined sewer with about 5'-0" cover, a PWD 30" diameter concrete encased VCP sanitary sewer with about 18' cover and the existing PennDOT drainage facilities, including a 24" diameter RC SW drainage pipe.

### **C. The Emergency Response:**

By early Sunday morning, June 11, 2023, representatives of PennDOT, the Pennsylvania State Police, the Philadelphia Police and Fire Departments, the Fire Marshall, the City's Office of Emergency Management, representatives of the Alcohol-Tobacco and Firearms (ATF), the PA-

DEP, the US Coast Guard, the Philadelphia Water Department (PWD), the Philadelphia Streets Department (PSD), Buckley Contractors, Inc., C. Abbonizio Contractors the FHWA, the NTSB and elected officials were already on site.

The City's Office of Emergency Management had set up a command center on site to coordinate the emergency response.

The first responders took quick action to close the NB lanes and then the SB lanes of I-95, which undoubtedly saved lives, perhaps many lives.

As the first responders were extinguishing the fire, hosing down the scene and flushing drainage pipes, the US Coast Guard & PA-DEP are working to install booms in the Delaware River at the outfalls to contain any product from the accident.

Sunday morning there was also an active accident investigation going on involving the Pennsylvania State Police, the Philadelphia Police and the ATF investigate the cause of the accident and to ensure that there was no nefarious intent. It fairly quickly became apparent that it was just an accident

### **D. Engineering Challenges and Innovative Solutions / Formulation of a Repair Plan:**

Meanwhile, early Sunday morning, June 11, 2023, PennDOT was formulating their own emergency response to the bridge collapse.

Their initial focus was to keep traffic moving as safely and efficiently as possible. PennDOT with assistance from the City Streets Department and State & City Police quickly implemented traffic detours with police stationed at each intersection.

PennDOT's secondary focus was on reopening I-95 as soon as possible due to the huge economic impact of the collapse. Options included the following:

1. Infilling between the abutments with soil, millings, stone or ultra-light foamed glass aggregate (UL-FGA) produced by Aero Aggregates using a temporary wire wall.
2. Since the status of the un-collapsed SB I-95 bridge structure was unknown at this point and another option is to install temporary cribbing under the SB I-95 bridge structure as temporary supports while the structure would continue in use. Similar cribbing was previous used on other sections of I-95 in the City of Philadelphia.
3. After discussions by the PennDOT team, a course of action was developed as follows:
  - Inspect the eight (8) SB I-95 Bridge girders to see if they could be salvaged.
  - Inspect the underground sewer systems to determine the extent of any damage.
  - Confirm that the additional load from the placement of the UL-FGA Aero Aggregate, pavement and appurtenances over Ramp B would have no adverse effect on the existing underground utility facilities, including a circa 1915 / 1964, 6'-9" x 9'-0" RC Box combined sewer with about 5' cover, a PWD 30" diameter concrete encased VCP sanitary sewer with about 18' cover and the existing PennDOT drainage facilities, including a 24" diameter RC SW drainage pipe.
  - Investigate and confirm the suitability of the abutments for possible re-use via a series of abutment cores.

Part of PennDOT's path forward also included contract decisions.

Since C. Abbonizio Contractors were already mobilized on the immediately adjacent I-95; CP-3 site with suitable demolition equipment, and laydown areas available, PennDOT authorized them to begin demolition and removal of both the collapsed NB I-95 bridge superstructure and the compromised SB I-95 bridge superstructure and to work 24/7 until the work was completed. C. Abbonizio Contractors began the demolition about 6 PM Sunday beginning with the removal of the collapsed NB I-95 bridge superstructure after the emergency responder's release the site to PennDOT. In this case, they had to work in conjunction with representatives of the Bureau of ATF, the State Police, Philadelphia Police and Fire Departments and Medical Examiner's Office to recover any bodies trapped in the debris. This was done on Monday morning about 10:00 as the ME removed what was left of the truck cab to a remote location for recovery.

In addition, PennDOT also authorized Buckley to begin to mobilize to perform the emergency work to reopen I-95 and to reconstruct the bridge, although the design of the repairs was still evolving. This allowed Buckley to work on mobilizing for this effort and to begin sourcing materials while the debris was being cleared and the remaining structure was being demolished by Abbonizio. Ultimately PennDOT decided that the project known as I-95 Sec. ECA would be prosecuted as a Design-Built Project with AE Benesch being the Engineer of Record for Buckley.

### **E. Damage & Condition Assessment:**

In the afternoon of June 11, a bridge inspection team from AECOM arrived to inspect the eight (8) SB I-95 Bridge girders to see if they could be salvaged. It was determined that the easterly most girder, closest to the fire was warped, with the web being out of plumb by up to 2-3/4". The remaining

(7) girders were progressively warped by lesser amounts the further they were away from the fire, but it was determined that they all were compromised to a point that they had to be removed.

It was decided to core the abutments / foundations to determine the extent of the fire and heat damage and then to evaluate the abutments / foundations for potential re-use. However, this could not proceed until the debris from the collapsed bridge structure was cleared. Early thinking was that at least the abutments would need to be reconstructed, atop the existing pile supported foundations.

The underground utilities needed to be inspected via CCTV Inspection to determine the extent of damage. But again, this could not begin until the debris from the collapsed bridge structure was cleared. PWD forces videoed their RC Box Sewer, and 30" VCP sanitary sewer facilities and Abbonizio / Buckley contractors had a subcontractor video the PennDOT SW Drainage facilities. These efforts were complete by Wednesday June 14. It was discovered that the PWD RC Box Sewer, was relatively unaffected, with just some soot visible in limited areas. The PWD 30" VCP Sanitary Sewer was unaffected. However, the PennDOT drainage system sustained some severe damage since gasoline from the accident flowed directly into this system. One concrete Water Quality Manhole structure was damaged beyond repair and portions of the SW drainage system that consisted of plastic drainage pipe in the vicinity of the accident was severely damaged.

The ramp & I-95 pavement assessment could not begin until debris was removed. Surface spalling of the ramp was observed.

This damage and condition assessment effort as well as the formulation of a repair plan was well underway by the early afternoon of June 11, 2023.

### **F. The Demolition:**

Shortly after the first on-site Press Conference with the Governor, Mayor and other Elected Officials, starting Sunday evening June 11, at about 6 PM Abbonizio began demolition to remove the debris from the collapsed NB superstructure and the damaged SB superstructure. Ultimately, they were authorized to remove the slope walls and barrier thru-out the ramp area adjacent to the abutments, but not any of the abutments themselves.

Abbonizio began with the removal of the debris from the collapsed NB superstructure to allow for the recovery effort by the ME's Office.

One of the engineering related issues that arose during the demolition effort was the crane placement for the SB beams picks. The PWD was uncomfortable with placing the crane in the ramp area due to the 6'-9" x 9'-0" RC Box combined sewer with about 5' cover, the PWD 30" diameter concrete encased VCP sanitary sewer and a circa 1931 -93" riveted steel water main crossing Cottman Avenue in Wissinoming Street. Ultimately, after the sewers were video inspected and a crane pick plan was submitted, it was decided to place a Thackray rental crane in Cottman Avenue such that the outriggers would avoid the various utilities. Other options included positioning the crane atop I-95, however this was deemed to be an undesirable location for the crane placement.

Beam segments from the damaged SB plate girders were sent to Lehigh & Drexel Universities for forensic analysis.

By Friday morning June 16, 2023, about 10 AM the demolition and debris removal were completed and Abbonizio turned the area over to Buckley for the next stage of construction. (88 Hrs. – 3.67 Days to complete the demolition, working around the clock).

### **G. Finalization of the Repair Plan:**

While Abbonizio performed the demolition, PennDOT finalized the repair plan to reopen I-95.

It was decided to fill the area between the two abutments with the Aero UL-FGA at 20# /CF, which is less than 20% the weight of soil embankment or stone to minimize the deadload on the underground utilities. Another benefit of the Aero UL-FGA is that it can be placed in inclement weather. The Aero Aggregates would be contained via 18" tall Wire Wall Cages at a width that would allow for three (3) 11' lanes in each direction without any shoulders. This width would allow for the permanent reconstruction of the outside lanes such that the (3) lanes NB & (3) SB traffic lanes could be switched to the outside permanent structures while the inside permanent structure would then be constructed.

On Thursday, June 15, 2023, at 9:00 AM, the PWD Accepts -PennDOT / AEB Design calculations for UL-FGA Installation over the PWD sewer facilities.

The PWD requested that settlement plates be placed in the fill area and that a bypass casing pipe be placed thru the fill in the event any bypass pumping of the sanitary sewer became necessary, since it would eliminate the need to extend a bypass pipe across the NB on-ramp to I-95.

PennDOT and Buckley were able to source Gravix precast concrete barrier with an integral moment slab from another PennDOT Project that were already manufactured, so there was very little lead time for any of the materials required for the reopening of I-95.

A decision was also made to pave I-95 with asphalt paving for the temporary repair in lieu of concrete. Preparations were also made for signage, pavement markings, barrier repair and filling in rubble strips for the reopening of traffic.

Benesch worked with PennDOT and Buckley to perform the engineering necessary to the temporary reopening of the highway.

#### **H. The Temporary Rebuild:**

Late Friday AM June 16, Buckley Contractors began preparing to the placement of the light weight foamed glass Aero Aggregates and began installing geotextile fabric and geogrid and setting the wire wall cages to conform to the superelevation contours of the ramp. Buckley also placed the bypass casing pipe, which consisted of 24" steel struts that were repurposed from Abbonizio's deep SOE for the adjacent PWD RC Box Sewer Interceptor that they were constructing. Setting the first few cages to get everything level was the most time consuming.

Buckley also needed to carefully control the width of the fill to leave adequate room for the permanent reconstruction.

Buckley used conveyors with elephant trunks to place the light weight fill foamed glass Aero Aggregate throughout the fill area. This worked well because it minimized the amount of spreading necessary. The staging area for the fill was on I-95 south of the bridge collapse area.

The lightweight foamed glass Aero Aggregate compacts easily with two or three passes of a tracked bobcat. Workers used about 2,000 tons or 8,000 CY of lightweight glass aggregate to fill the underpass and bring it up to the I-95 pavement surface subgrade.

It was clearly evident that the NB northly abutment that was closest to the tanker was most heavily damaged. While the lightweight fill was being installed, a series of abutment cores were being taken to evaluate the replacement or reconstruction needs of the abutments. Upon evaluation, it was determined that the abutments could be rehabilitated by hydro-blasting the damaged concrete off the face of the abutments and re-facing the abutments with new concrete and a new mat of rebar.

It was also decided to Live Stream this rebuilding effort.

Once the lightweight fill reached the top of the abutment, the girder stubs and damaged backwall needed to be removed and a small amount of concrete need to be poured in preparation for setting the Precast Gravix Barrier with Moment Slab. The outside face of the barrier was set 12" inside the outside face of the wire wall.



The final preparations for reopening the roadway included, setting median barrier, pavement markings and approach signage, filling in rumble strips and finally the asphalt pavement placement.

With rain threatening to delay the reopening, a truck-mounted jet dryer normally used to keep moisture off the track at Pocono Raceway was brought in to keep the fresh asphalt dry enough for lines to be painted.

### **I. Reopening I-95:**

Interstate 95 reopened to traffic Friday June 23, less than two weeks after the deadly fiery crash in Northeast Philadelphia shut down a heavily traveled stretch of the East Coast's main north-south highway.

Workers put the finishing touches on an interim six-lane roadway -- three lanes in each direction -- that will serve motorists during construction of a permanent bridge. Crews worked around the clock and were finished ahead of schedule.

The reopening happened first with the southbound lanes about 12:30 in the afternoon of June 23, 2023. The northbound lanes appeared open about an hour later -- just around 1:35 p.m.

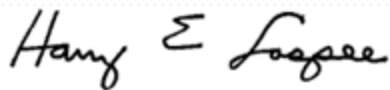
At a Friday morning news conference Pennsylvania Gov. Josh Shapiro said "We demolished a roadway, we rebuilt I-95 in just 12 days," "Through that process we showed the nation what Philadelphia and Pennsylvania are all about."

The PennDOT team continues to work to reconstruct the permanent bridge structure at this location.

We trust that this information is helpful. Please accept this nomination on behalf of Pennoni Associates.

Sincerely,

**PENNONI ASSOCIATES INC.**



Harry E. Laspee, PE  
Associate Vice President

cc: Linda Douthwaite, PE, CEng, MICE  
Pennoni Associates, Inc.