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REPLACEMENT OF THE PEQUONNOCK RIVER RAILROAD BRIDGE (PECK) AND BRIDGEPORT VIADUCT IN BRIDGEPORT, CONNECTICUT

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INTRODUCTION

The Pequonnock River Railroad Bridge and Bridgeport Viaduct, both commonly referred to as PECK Bridge, are located in Bridgeport, Connecitcut about fifty miles northeast of New York City. They are an integral part of the Northeast Corridor, a vital rail transportation link extending from Washington, DC through Philadelphia and New York City to Boston. More than 100 trains pass through the Bridgeport area on an average weekday including those of the New Haven Line Commuter Service (73 revenue trains), Amtrak's Northeast Corridor Service (27 revenue trains) an Conrail's freight service.

The half-mile long steel structure has experienced extensive corrosion and fatigue over the past 87 years. Also, excessive movement of the substructure has made the movable span of the bridge inoperable, placing restrictions on both rail and marine traffic. Since loss of this structure would severely impact the New Haven Line Commuter Service as well as all other major rail service between New York City and New England, CDOT has decided to replace PECK Bridge.

HISTORY OF THE NEW HAVEN LINE

Suburban railroad commuter service to New York City was initiated on the New Haven Line in 1848 by the New York and New Haven Railroad. In 1868, after several mergers and bankruptcies, the railroad sold its assets to the Penn Central Transportation Company. Two years later Penn Central went bankrupt. During those troubled times, the states of Connecticut and New York intervened to assure the continued operation of this important commuter service. Also, in recognition of the potential hardship that this and other railroad bankruptcies would have on both the region and the nation, Congress enacted legislation which required the newly created Conrail to operate the New Haven Line Commuter Service beginning in April 1976. Conrail ran the service until relieved of the duty in December 1982 by enactment of further federal legislation. At that time, the Metro-North Commuter Railroad Company was created to operate the New York portion of the commuter service for the Metropolitan Transportation Authority (MTA). CDOT contracted with MTA and Metro-North to provide continued commuter service on the New Haven Line in Connecticut. In 1985 CDOT purchased the Connecticut portion of the New Haven Line (including PECK Bridge) from Penn Central, exercising an option offered under an earlier agreement.

DESCRIPTION

PECK Bridge spans the Pequonnock River at the upper reach of Bridgeport Harbor. The 88-foot movable spans consist of two side-by-side rolling lift spans each carry two tracks. The east and west approaches to the drawbridge are collectively known as the Bridgeport Viaduct and have a total length of 2500 feet. Several local streets pass under the steel structure which was constructed in 1903 by the New York, New Haven & Hartford Railroad as part of its modernization program to electrify and eliminate grade crossings.

THE PROBLEM

Over the past 87 years PECK Bridge has experienced substantial steel corrosion and fatigue. Of greater concern is the lateral movement of the pit pier, a massive concrete substructure which supports the movable span and keeps the rear portion of the span dry when it is open. The pier's gradual downstream movement, first detected in the 1920's, has made the drawbridge inoperable since 1985. To prevent any additional impact on rail or marine operations, CDOT authorized a $700,000 pier stabilization project which was completed in May of this year. The stopgap measure should provide an added factor of safety until the drawbridge can be replaced. Due to the severity of the above noted steel and foundation problems, a 10 mph speed restriction is currently in effect for trains passing over the bridge.

THE PROJECT

The Northeast Corridor High Speed Rail Passenger Service Improvement Project (NECIP) was initiated by the Federal Railroad Administration (FRA) in the 1970's to improve the busy rail corridor between Washington and Boston. At that time FRA's designer recommended the replacement of PECK Bridge due to excessive steel deterioration and fatigue. However, funding limitations forced CDOT to pursue the rehabilitation, not replacement, of this and four other movable bridges on the New Haven Line. Early into the rehabilitation design movement of the PECK pit pier accelerated. This movement, coupled with the steel problems, prompted CDOT to remove PECK Bridge from the rehabilitation contract and to direct the preparation of an engineering feasibility and economic analysis to address various replacement alternatives. The study was completed in December 1988. Numerous Federal, State and Local agencies were afforded an opportunity to review the document, and a public hearing was held in April 1989. As a result, CDOT is pursuing a bridge replacement project as follows:

1. The Pequonnock River Railroad Bridge and Bridgeport Viaduct will be replaced along the existing alignment to minimize the impact on adjacent property and facilities.

2. A bascule (trunnion) bridge will replace the existing rolling lift structure. (A higher fixed span replacement over the channel was considered, however, its impact on adjacent

facilities and a possible lengthy permit process ruled out this alternative.)

3. The present four track configuration will be maintained over the structure. While present service can be adequately handled on the three tracks, future operational maintenance considerations dictate the construction of a four-track structure.

4. A ballasted deck will replace the existing open deck structure along most of the west approach to the drawbridge. This will reduce noise levels and facilitate future track maintenance. An open deck will be utilized elsewhere to reduce the weight of the movable structure and to achieve the maximum possible vertical clearances over local streets.

5. A horizontal alignment incorporating spiral transitions into the track curves and eliminating the "broken back" curve over the drawbridge will allow for higher operational speeds than are possible with the present alignment.

6. An additional eight feet of vertical clearance will be provided under the drawbridge for marine traffic. Also, because of restrictive channel geometry, the Coast Guard has directed that the horizontal clearance be increased from 70 to 105 feet. These increased clearances should accommodate larger vessels,

thereby reducing the number of required bridge openings. Local streets impacted by the project will be reconstructed with the added benefit of increased vertical clearance for highway vehicles and improved intersection geometry.

7. In general, marine and highway traffic will be maintained throughout the anticipated six year construction duration for this project. Some short term marine restrictions will be imposed, as necessary. These will be coordinated with the Coast Guard. Temporary steel detours will be utilized in cooperation with the city.

8. To maintain rail operations, the new viaduct will be constructed two tracks at a time. A temporary runaround at the river crossing will allow for the safe removal of the troublesome pit pier and facilitate the construction of the new movable bridge.

PROJECT STATUS

Final design activities for the replacement of PECK Bridge began in the summer of 1989 and are 40% complete. A value engineering study is scheduled for this fall. Design completion is anticipated by August 1991. An environmental assessment of the proposed replacement has been prepared by CDOT. The document has been reviewed by federal state and local agencies and will be offered to the public later this year. Based on information gathered to date, CDOT will be recommending a Finding of No Significant Impact (FONSI) for the project.

United Illuminating occupies a portion of the rail right-of-way with its power distribution facilities. Since these facilities will have to be relocated before bridge demolition, CDOT is accelerating the utility design schedule. CDOT has also authorized funds for utility items requiring a long long time to purchase.

Preliminary right-of-way activities began in September 1989. Property acquisition will commence this fall. In addition to a significant partial taking of city-owned land, CDOT will be acquiring two developed commercial properties and one undeveloped parcel of land. Numerous temporary construction easements will also be needed. Right-of-way activities will be completed before the start of construction.

DESIGN ALTERNATIVES

The following tables outline the advantages and disadvantages of the various options considered for horizontal alignments, type of river crossings, track systems and girder systems.

EVALUATION OF HORIZONTAL ALIGNMENTS

ALIGNMENT	ADVANTAGES	DISADVANTAGES
NORTH	A four track movable river crossing can be constructed without impact on existing structures Lowest construction cost for fixed bridge profile Less impact on city streets than southerly alignments Design speed of 53 mph Less impact on train operations than any alignment except south alignment Approximately 12% construction is adjacent to operating tracks	Most impact on UI substation of any alignment and largest utility relocation costs Takes more commercial property than any other alignment Larger property acquisition cost than Mid-North Alignment
MID-NORTH	Three track movable or four track fixed river crossing can be constructed without interfering with the use of the existing structure Lower construction cost than South Alignments Lower property cost than any alignment except On-Line	Substantial impact on UI substation Lower design speed than North Alignment (51 mph) Greater length of construction adjacent to operating tracks than any Off-Line Alignment
ON-LINE	*Least property acquisition of any alignment* Lowest construction cost for movable bridge and lowest total cost for both movable and fixed bridge Least disruption to community Maximizes use of portion of existing foundations Only temporary easement and minor relocations required at UI substation	Most construction required adjacent to operating tracks and most impact on train operations Longest construction time, requires construction of a two track detour before demolition of existing PECK Bridge Lowest design speed of any alignment (46 mph) Requires approximately two years operation of detour trackage with maximum speed of 15 mph
MID-SOUTH	A three track fixed bridge or a two track leaf for a movable structure could be built on this alignment without impact on the existing structures No impact on UI substation	Alignment crosses Pequonnock River at bend requiring a larger channel, 125' versus 105' increasing construction cost of river crossing Lowest design speed of any Off-Line Alignment (48 mph) Substantial adjustments to city streets required Requires taking of residential property
SOUTH	A four track movable bridge can be built without impact on existing structures Least construction required adjacent to operating tracks than any alignment Highest design speed of any alignment (56 mph) No impact on UI substation	Highest construction cost and total cost of any alignment Most property acquisitions required of any alignment Most disruptive to the community

TYPE OF RIVER CROSSING

TYPE	ADVANTAGES	DISADVANTAGES
FIXED BRIDGE	Operational personnel not required No machinery or electrical maintenance required Simpler communication, signals and power transmission No interlocking plant and signals required	High profile may be considered visual pollution Obtaining Coast Guard approval may delay start of project Steeper approach grades are required Construction cost for the approach viaducts are higher
MOVABLE BRIDGE	Lower profile allows for a less obtrusive structure Since it would be replacement in-kind, approvals should be easier Less costly approach viaducts required	Electro-mechanical operating devices, mitre rail and catenary interlocks and complex structural components are required Greater service interruptions are possible Bridge operators and more frequent inspection and maintenance are required

TRACK SYSTEMS

TYPE	ADVANTAGES	DISADVANTAGES
OPEN DECK	Lower initial costs than either ballasted deck or direct fixation deck systems	More noise and vibration than other systems Possibility of debris falling through open deck Increased maintenance costs of both track and supporting structure
BALLASTED DECK	Lower initial cost than direct fixation deck system Less noise and vibration than open deck system Simple and inexpensive maintenance program typical of at-grade track maintenance	Greater dead load on supporting structure than either open deck or direct fixation deck
DIRECT FIXATION DECK	Less noise and vibration than other systems Track locations are inflexible, minor realignments and adjustments are not needed	Greater initial construction cost than other systems Lack of previous installations subject to anticipated loadings makes maintenance cost difficult to evaluate Metro-North track department has no previous maintenance experience with this system Inflexible track conditions limit future modifications

TABLE 1-9

GIRDER SYSTEMS

TYPE	ADVANTAGES	DISADVANTAGES
STEEL GIRDER SYSTEM	Good quality control is easily obtained Lighter weight sections to support same loads Easy to inspect and repair damage Adaptable to difficult framing requirements	Ballasted deck section requires a concrete deck or steel pan Needs cleaning and repainting periodically
PRESTRESSED CONCRETE BOX GIRDER	Low initial maintenance Requires minimal deck forming when ballasted deck is used Small deflections under live loads	Difficult to determine deterioration and repair damage Heavier superstructure dead loads requiring more substructure capacity Difficult to provide quality control during construction requiring more inspection