Maryland Historical Trust

Maryland Inventory of Historic Properties number: HO-675.

Name: MD 32 over Cattail Rd., Patapsco River Bridge

The bridge referenced herein was inventoried by the Maryland State Highway Administration as part of the Historic Bridge Inventory, and SHA provided the Trust with eligibility determinations in February 2001. The Trust accepted the Historic Bridge Inventory on April 3, 2001. The bridge received the following determination of eligibility.

MARYLAND HISTORICAL TRUST

Eligibility Recommended _____ Eligibility Not Recommended __X____

Criteria: ___A ___B ___C ___D Considerations: ___A ___B ___C ___D ___E ___F ___G __None

Comments: THIS IS THE ALUMINUM BRIDGE. IF IT MAKES IT TO 2012, IT MAY BE ELIGIBLE.

Reviewer, OPS: Anne E. Bruder Date: 3 April 2001

Reviewer, NR Program: Peter E. Kurtze Date: 3 April 2001

MARYLAND INVENTORY OF HISTORIC BRIDGES **MHT No.** HO-673
HISTORIC BRIDGE INVENTORY
MARYLAND STATE HIGHWAY ADMINISTRATION/
MARYLAND HISTORICAL TRUST

SHA Bridge No. 13046 **Bridge name** MD 32 over River Road, Patapsco River and B & O Railroad

LOCATION:
Street/Road name and number [facility carried] Maryland Route 32

City/town Sykesville **Vicinity** X

County Howard

This bridge projects over: Road X **Railway** X **Water** X **Land** _____

Ownership: State X **County** _____ **Municipal** _____ **Other** _____

HISTORIC STATUS:
Is the bridge located within a designated historic district? Yes _____ **No** X
National Register-listed district _____ **National Register-determined-eligible district** _____
Locally-designated district _____ **Other** _____

Name of district _____

BRIDGE TYPE:
Timber Bridge _____:
Beam Bridge _____ **Truss -Covered** _____ **Trestle** _____ **Timber-And-Concrete** _____

Stone Arch Bridge _____

Metal Truss Bridge _____

Movable Bridge _____:
Swing _____ **Bascule Single Leaf** _____ **Bascule Multiple Leaf** _____
Vertical Lift _____ **Retractile** _____ **Pontoon** _____

Metal Girder X _____:
Rolled Girder X **Rolled Girder Concrete Encased** _____
Plate Girder _____ **Plate Girder Concrete Encased** _____

Metal Suspension _____

Metal Arch _____

Metal Cantilever _____

Concrete _____:
Concrete Arch _____ **Concrete Slab** _____ **Concrete Beam** _____ **Rigid Frame** _____
Other _____ **Type Name** _____

DESCRIPTION:
Setting: Urban _____ **Small town** _____ **Rural** ____X____

Describe Setting:

Bridge No. 13046 carries Maryland Route 32 over the Patapsco River, River Road, and the B & O Railroad in Howard County, Maryland. MD 32 runs in a generally north-south direction; the Patapsco River and the B & O Railroad run generally east-west at this crossing. The bridge is situated in a rural wooded area with no structures visible from the bridge.

Describe Superstructure and Substructure:

The superstructure of Bridge # 13046 is a three span semi-monocoque composite aluminum beam bridge. The total bridge length is 269.5 feet, with two spans measuring 92.75 feet and the third measuring 105.1 feet. The superstructure is supported by rigid-frame reinforced concrete piers on spread footings and reinforced concrete abutments on piles. Bridge # 13046 includes riveted triangular box stiffened sheet girders supporting a lightweight concrete slab with a bituminous wearing surface (Alison 1984).

The 1996 inspection report lists the bridge in fair to poor condition. There is deterioration on the girders, including random pitting, and section loss at the bearings due to galvanization. The report also notes that these problems have been in existence since at least 1986, have not been repaired, and consequently continue to worsen. Repairs to the aluminum girder are recommended immediately. The 1989 inspection report lists the abutments in fair condition with exposed steel piles, due to undermining. The abutment breast walls and back walls also have cracked and spalled areas. The piers are listed in poor condition, with spalls and cracks, and unsound concrete components.

Discuss Major Alterations:

There is no evidence that major alterations have been made to the bridge.

HISTORY:

WHEN was the bridge built: ___1963___
This date is: Actual _____X_____ **Estimated** _____
Source of date: Plaque _____ **Design plans** _____ **County bridge files/inspection form** __X__
Other (specify): _____

WHY was the bridge built?

The bridge was constructed in response to the need for more efficient transportation network and increased load capacity.

WHO was the designer?

Harry Kahn of the Kinetics Division of Fairchild Engine and Airplane Corporation, Hagerstown, Maryland (predecessor of International Aluminum Structures, Inc)

WHO was the builder?

State Roads Commission and International Aluminum Structures, Inc. (successor of the Kinetics Division of Fairchild Engine and Airplane Corporation)

WHY was the bridge altered?

N/A

Was this bridge built as part of an organized bridge-building campaign?

Unknown

SURVEYOR/HISTORIAN ANALYSIS:

This bridge may have National Register significance for its association with:

A - Events _____ B- Person _____

C- Engineering/architectural character _X_____

The bridge is eligible for the National Register of Historic Places under Criterion C, as a significant and unique example of aluminum beam bridge construction in Maryland. The structure has a high degree of integrity and retains such character-defining elements of the type as riveted triangular box stiffened sheet girders constructed from aluminum. Though the bridge is not yet 50 years old, it meets National Register Criteria Consideration G for structures that have achieved significance within the past fifty years; this structure is of exceptional engineering importance as the only aluminum bridge in Maryland and one of seven constructed in the United States and Canada.

Was the bridge constructed in response to significant events in Maryland or local history?

After the World War II hiatus on non-defense-related bridge construction ended in 1945, economical highway girder bridges such as those described by Brown and Conner were readily built by county and municipal officials across the United States.

Technological advances in use of non-traditional metals, such as aluminum, also characterized some metal girder bridge design and construction after World War II. Although ALCOA in 1933 had designed a lightweight aluminum deck for the 1882 Smithfield Street Bridge in Pittsburgh, the earliest aluminum bridge in the United States was a 100-foot-long railroad plate girder span designed by ALCOA and built in 1946 to replace an existing bridge over the Grasse River, near Massena, New York (Trinidad 1984:1). Prior to this bridge, only a bascule bridge at Sunderland, England and a footbridge in Scotland had been made of aluminum (Alison 1984).

The Massena, New York bridge and a 1950 long-span aluminum highway bridge at Arvida, Quebec served to demonstrate the capabilities of aluminum as a structural material. Maryland's only known aluminum bridge is a girder bridge (Bridge # 13046) designed and built in 1963 by the State Highway Administration and International Aluminum Structures, Inc., to carry State Route 32 over the South Branch of the Patapsco River near Sykesville (Alison 1984; Suffness 1992a).

A postwar trend in design of metal girder bridges, reflected in the 1963 construction of a significant Maryland example, was the development of aluminum girder bridges. Based on research alone, it appears that the 1963 Bridge # 13046, a three-span structure built by the State Roads Commission and International Aluminum Structures, Inc., is the only example of an aluminum bridge in Maryland and one of seven built in North America (Canada and United States) between 1948 and 1963. Bridge # 13046 includes riveted triangular box stiffened sheet girders supporting a lightweight concrete slab with a bituminous wearing surface (Alison 1984).

When the bridge was built and/or given a major alteration, did it have a significant impact on the growth and development of the area?

There is no evidence that the construction of this bridge had a significant impact on the growth and development of this area.

Is the bridge located in an area which may be eligible for historic designation and would the bridge add to or detract from the historic/visual character of the potential district?

The bridge is located in an area which does not appear to be eligible for historic designation.

Is the bridge a significant example of its type?

This bridge is significant as the only example of an aluminum girder bridge constructed in Maryland and one of seven constructed in the United States and Canada.

Does the bridge retain integrity of important elements described in Context Addendum?

The bridge retains the character-defining elements of its type, as defined by the Statewide Historic Bridge Context, including riveted triangular box stiffened sheet girders supporting a light-weight concrete slab with a bituminous wearing surface.

Is the bridge a significant example of the work of a manufacturer, designer, and/or engineer?

This bridge is a significant example of the work of the State Roads Commission and International Aluminum Structures, Inc. in the 1960s.

Should the bridge be given further study before an evaluation of its significance is made?

No further study of this bridge is required to evaluate its significance.

BIBLIOGRAPHY:

County inspection/bridge files _____ **SHA inspection/bridge files** _____
Other (list):

Alison, Gordon A.
1984 Evaluation of Seven Aluminum Highway Bridges After Two to Three Decades of Services. Paper presented April 30, 1984, to Aluminum Association of America.

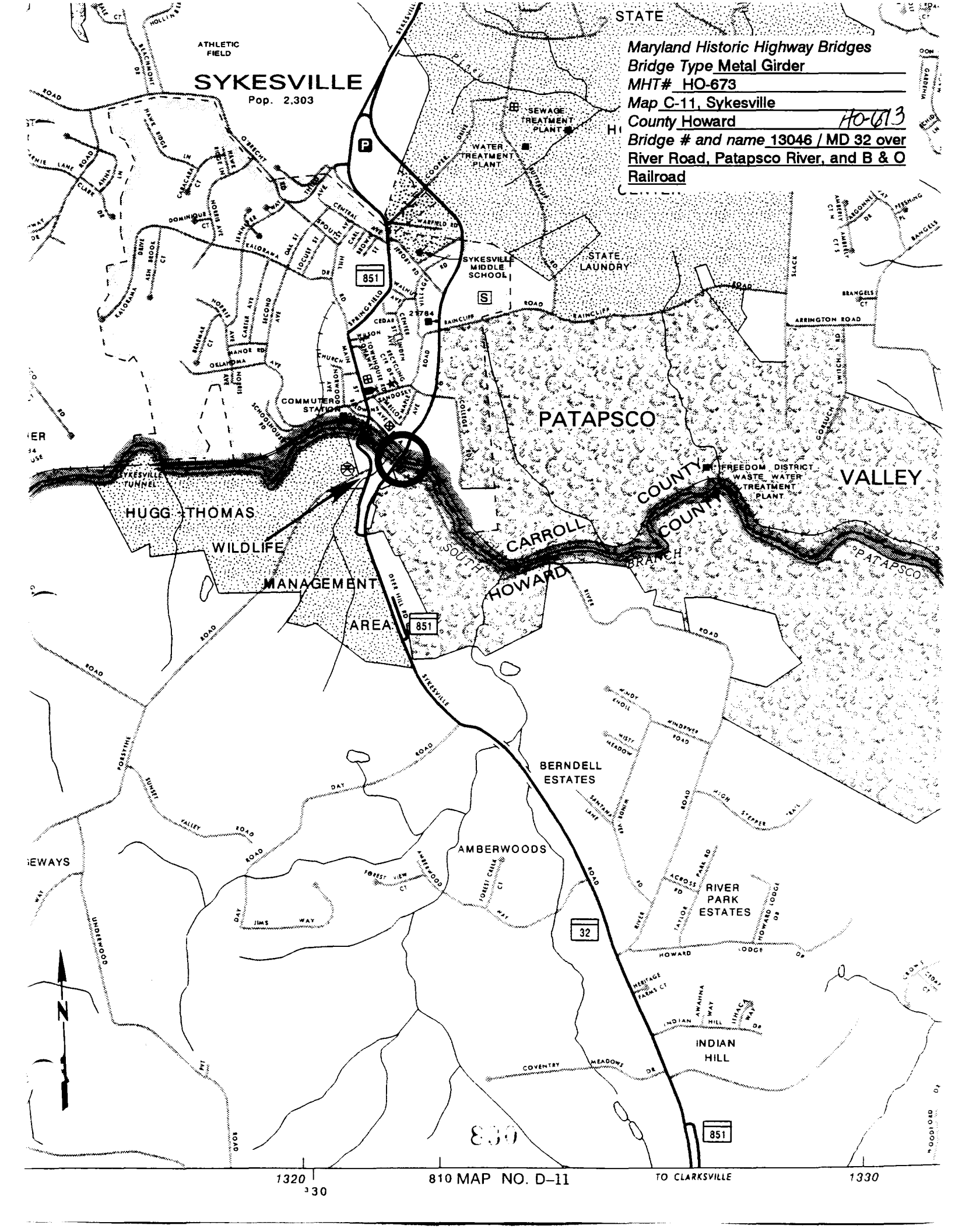
P.A.C. Spero & Company and Louis Berger & Associates
1995 Historic Highway Bridges in Maryland: 1631-1960: Historic Context Report. Maryland State Highway Administration, Maryland State Department of Transportation, Baltimore, Maryland.

Suffness, Rita
1992a Evaluation Form prepared for Bridge # 13046. Prepared for use of Maryland State Highway Administration, Baltimore.

Trinadad, Adolph A., Jr.
1984 Aluminum – A Proven Bridge Material. Paper presented June 4-6, 1984 at the International Bridge Conference, Pittsburgh, Pennsylvania.

SURVEYOR:

Date bridge recorded August 1998
Name of surveyor Stephanie L. Bandy
Organization/Address State Highway Administration, 2323 West Joppa Road, Brooklandville, MD 21002
Phone number(410) 321-22113
Revised by P.A.C. Spero & Company, April 1998


Maryland Historic Highway Bridges
Bridge Type Metal Girder
MHT# HO-673
Map C-11, Sykesville
County Howard
HO-613
Bridge # and name 13046 / MD 32 over River Road, Patapsco River, and B & O Railroad
SYKESVILLE
Pop. 2,303
ATHLETIC FIELD
SEWAGE TREATMENT PLANT
WATER TREATMENT PLANT
SYKESVILLE MIDDLE SCHOOL
STATE LAUNDRY
COMMUTER STATION
SYKESVILLE TUNNEL
PATAPSCO
FREEDOM DISTRICT WASTE WATER TREATMENT PLANT
VALLEY
HUGG-THOMAS WILDLIFE MANAGEMENT AREA
CARROLL COUNTY
HOWARD COUNTY
SOUTH BRANCH PATAPSCO RIVER
BERNDELL ESTATES
AMBERWOODS
RIVER PARK ESTATES
INDIAN HILL
851
32
N
1320
330
810 MAP NO. D-11
TO CLARKSVILLE
1330

HO-673

Br. # 13046
over River Rd / Patapsco
Riv. / B+O RR
Howard Co. 4-3-96
E elevation looking N

1 of 8

Br. # 13046 over
River Rd / Patapsco / B+O R
Howard Co. 4-3-96
E elevation looking N

298

HO-673

Br. 13046 over
River Rd. / Patapsco / B+O RR
Howard Co. 4-3-96
E elevation facing W

3 of 8

HO-673

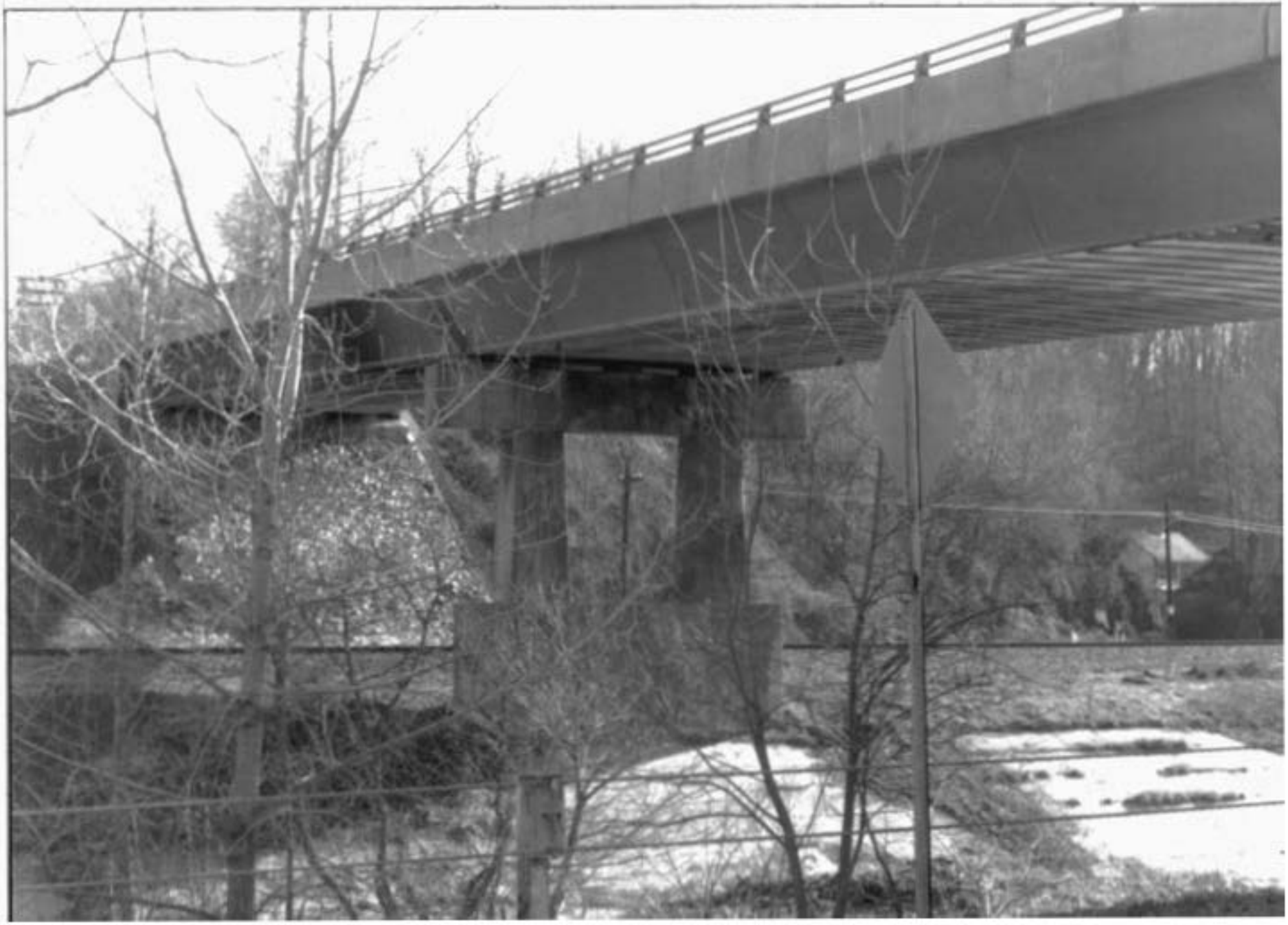
Br. 13046 over River Rd

Patapsco / B+O RR

Howard Co. 4-3-96

piers facing N

4 of 8



Br. 13046 over River Rd /
Patapsco / B-0222
Howard Co. 4-3-96
W elevation facing NE

5 of 8

Br. 13046 over River Rd/
Patapsco / B+O RR
Howard Co. 4-3-96
W elevation facing S

698

HO-673

Br. 13046 over River Rd
Patapsco / B+O RR
Howard Co. 4-3-96
S approach facing N
788


Welcome
to
Howard County

Br. 13046 Diver River Rd/
Patapsco / B+O RR
Howard Co. 4-3-96
N approach facing S

888

MARYLAND INVENTORY OF
HISTORIC PROPERTIES

Survey No. HO-673

Magi No.

DOE __yes __no

Maryland Historical Trust
State Historic Sites Inventory Form

1. Name (indicate preferred name)

historic

and/or common Bridge No. 13046

2. Location

street & number MD 32 over Patapsco River and River Road N/A not for publication

city, town Sykesville x vicinity of congressional district

state MD county Howard

3. Classification

Category	Ownership	Status N/A	Present Use	
___ district	x public	___ occupied	___ agriculture	___ museum
___ building(s)	___ private	___ unoccupied	___ commercial	___ park
x structure	___ both	___ work in progress	___ educational	___ private residence
___ site	**Public Acquisition**	**Accessible**	___ entertainment	___ religious
___ object	___ in process	___ yes: restricted	___ government	___ scientific
	___ being considered	x yes: unrestricted	___ industrial	x transportation
	x not applicable	___ no	___ military	___ other:

4. Owner of Property (give names and mailing addresses of all owners)

name MD State Highway Administration

street & number 707 N. Calvert Street telephone no.:

city, town Baltimore state and zip code MD 21202

5. Location of Legal Description

courthouse, registry of deeds, etc. County Courthouse liber

street & number folio

city, town Ellicott City state MD

6. Representation in Existing Historical Surveys

title N/A

date ___ federal ___ state ___ county ___ local

depository for survey records

city, town state

7. Description

Survey No. HO-673

Condition		Check one	Check one
___ excellent	___ deteriorated	_x_ unaltered	___ original site
_x_ good	___ ruins	___ altered	___ moved date of move _____
___ fair	___ unexposed		

Prepare both a summary paragraph and a general description of the resource and its various elements as it exists today.

See Continuation Sheet 7.1

8. Significance

Survey No. HO-673

Period	Areas of Significance—Check and justify below				
___ prehistoric	___ archeology-prehistoric	___ community planning	___ landscape architecture	___ religion	
___ 1400–1499	___ archeology-historic	___ conservation	___ law	___ science	
___ 1500–1599	___ agriculture	___ economics	___ literature	___ sculpture	
___ 1600–1699	___ architecture	___ education	___ military	___ social/ humanitarian	
___ 1700–1799	___ art	___ engineering	___ music	___ theater	
___ 1800–1899	___ commerce	___ exploration/settlement	___ philosophy	___ transportation	
_x_ 1900–	___ communications	___ industry	___ politics/government	___ other (specify)	
		___ invention			

Specific dates 1963 **Builder/Architect** Designer Fairchild Engine and Airplane Corp., International Aluminum Structures

check: Applicable Criteria: __A __B _x_C __D
and/or
Applicable Exception: __A __B __C __D __E __F _x_G

Level of Significance: _x_national __state __local

Prepare both a summary paragraph of significance and a general statement of history and support.

See Continuation Sheet 8.1

9. Major Bibliographical References

Survey No. HO-673

Files, Bridge Division, MD. SHA

10. Geographical Data

Acreage of nominated property less than 1 acre

Quadrangle name Sykesville **Quadrangle scale** 1:24,000

UTM **References** do NOT complete UTM references

A	Zone	Easting	Northing	B	Zone	Easting	Northing
C				D			
E				F			
G				H			

Verbal boundary description and justification

Structure only

List all states and counties for properties overlapping state or county boundaries

state	code	county	code
state	code	county	code

11. Form Prepared By

name/title Rita M. Suffness, Leader, Cultural Resources Group

organization MD State Highway Administration **date** 1991

street & number 707 N. Calvert Street **telephone** (410) 545-8561

city or town Baltimore **state** MD 21202

The Maryland Historic Sites Inventory was officially created by an Act of the Maryland Legislature to be found in the Annotated Code of Maryland, Article 41, Section 181 KA, 1974 supplement.

The survey and inventory are being prepared for information and record purposes only and do not constitute any infringement of individual property rights.

return to: Maryland Historical Trust
Shaw House
21 State Circle
Annapolis, Maryland 21401
(301) 269-2438

DHCP/DHCD
MARYLAND HISTORICAL TRUST
100 COMMUNITY PLACE
CROWNSVILLE, MD 21032-2023

PS-2746

HO-673, Bridge 13046
Sykesville Vicinity, Howard County

Description
7.1 Continuation Sheet

Description Summary
Bridge 13046 is an aluminum girder bridge which, though designed as a composite beam, incorporate the principles of semi-monocoque construction, utilizing not only a non-traditional material (aluminum) but also a design process that differed considerably from traditional methods. Designed as five beam units comprising nine cells, cell beams were prefabricated and lifted into place on the site. The sheer connectors enable the concrete slab to act in conjunction with the aluminum to resist live and impact loads.

Description
Bridge 13046 carries MD 32 over River Road, the South Branch of the Patapsco River and the B & O Railroad in rural Howard County just south of Sykesille. It was designed by the Kinetics Division of Fairchild Engine and Airplane Corporation of Hagerstown, Maryland under the supervision of Harry Kahn and fabricated in 1963 by the Bridge Division of Maryland State Highway Administration and International Aluminum Structures, Inc. (successor of the Kinetics Division of Fairchild Engine and Airplane Corporation).

It is an aluminum girder bridge which is 294 feet long and 30 feet wide, with two piers and two abutments. It is composed of two 93 foot spans and one 105 foot span. These spans incorporate the principles of semi-monocoque construction, designed as five beam units comprising nine cells with a structural depth of 67 inches. In contrast to a true monocoque structure, which is a shell, the skin of which is stressed, a semi-monocoque structure has a skin which is braced with stiffeners or diaphragms for additional strength. The five cell beams are 7 feet wide and 93 feet long the south and middle spans. They were prefabricated and lifted into place on the site. These hollow, triangular beams, consisting of rolled aluminum sheets, were riveted to long, specially extruded alloy angles, then bolted together at the corners, base up, with a bottom cover or plate of aluminum attached. The bottom sheets are not protective coverings, but actual tension areas of the cross section. As the spans are composed of beams connected side by side, the cross section resembles a Warren truss or the wing of a giant airline.

The bridge was designed as a composite beam. Sheer connectors enable the concrete slab to act in conjunction with the aluminum to resist live and impact loads. The concrete slab was poured in place without formwork on top of the corrugated sheet running longitudinally on top of the beams. The corrugated sections act as stiffeners until the concrete hardens and the bridge spans become composite structures. Specifications called for an anti-corrosive coating of zinc chromate on any aluminum that was in contact with the concrete.

History
The potential of aluminum as a structural material had been amply demonstrated in its use in airframes starting in the 1930's. In 1933, ALCOA worked with the city of Pittsburgh to redeck the Smithfield Street Bridge, built in 1882, with a lightweight aluminum deck composed of plates and girders with an asphalt wearing surface to increase its liveload capacity to H20 while reducing the deadload to the foundation. The aluminum permitted the existing structure to sustain higher traffic loadings.

HO-673, Bridge 13046
Sykesville Vicinity, Howard County

Description
7.2 Continuation Sheet

In 1946 the possibilities for aluminum in railroad bridges were investigated by the Aluminum Company of America on a line serving an aluminum smelting company at Messena, New York. A 100 foot riveted plate girder bridge was constructed to span the Grassi River at the plant site. This was the first totally aluminum bridge structure built in North America.

Following this, the Aluminum Company of Canada erected a 504 foot riveted bridge, composed of a 290 foot arch span with multiple 20 foot approach spans, over Saguenay River, Canada in 1950. It was designed by C.J. Pimenoff, consulting engineer, to carry 20 ton trucks or comparable loads. The arch shape was chosen for aesthetic reasons although it was realized that a truss structure would be lighter and more economical. Since only three aluminum bridges had been erected prior to 1950 (the ALCOA bridge at Massena, a bascule bridge at Sunderland, England, and a footbridge in Scotland), the behavior of the bridge was recorded for a period of time after it was erected to compare its actual performance with assumed design values in such areas as stress levels, temperature effects and corrosion behavior. It demonstrated the practicability of aluminum for constructing highway bridges. It is located near a generating station which supplies power to Alcan's Arvida Works, the largest aluminum smelter in the world.

During the period 1958 to 1963 there was considerable interest in aluminum as a bridge material for shorter spans; seven bridge spans were completed in that time. Steel prices were increasing during the construction of the interstate system and maintenance costs were becoming a concern. Although the cost of aluminum was greater than steel it was felt that this could be partially offset by the lighter weight, making fabrication, transportation and erection easier and resulting in a bridge having lower maintenance costs.

The first aluminum highway bridge built in this period was erected over I-80 in Des Moines, Iowa in 1958. This was a four span continuous welded plate girder bridge with a composite concrete deck designed by Ned L. Ashton, Consulting Engineer, for the Iowa State Highway Commission. At that time, stronger, more weldable, corrosion resistant aluminum alloys had become available.

This was succeeded in 1960 with the construction of two wide 77 foot spans bridges with a 31 degree skew, using aluminum alloy riveted plate girders acting compositely with the concrete deck. The bridges carried the Long Island Expressway over Jericho Turnpike in Jericho on Long Island, New York. These were designed by Andrews and Clark, Consulting Engineers, with girders having flange angles with legs of unequal width and thickness specially extruded for the 35 built-up girders of the two bridges.

During the period from 1961 to 1963, in an attempt to reduce the amount of aluminum, four bridges were fabricated of riveted, stiffened aluminum alloy sheets forming triangular girders joined together by longitudinal extrusions to form a trapezoidal cross section. The concept for three of the bridges, making use of aircraft structure techniques, was developed by the Kinetics Division of Fairchild Engine and Airplane Corporation. Comprehensive tests were made at Lehigh University in Bethlehem, Pennsylvania. Two almost identical four span bridges, designed by Kaiser Aluminum and Chemical Corporation, were erected over Sunrise Highway near Amityville, Long

Island, New York. The third, a three span bridge, is Bridge 13046, built near Sykesville, Maryland by International Aluminum Structures, Inc., the successor firm of the design company (Kinetics Division of Fairchild Engine and Airplane Corporation of Hagerstown, Maryland).

A fourth bridge of 97 foot span was erected over the Appomattox River in Petersburg, Virginia. The concept for this bridge design was developed by the Reynolds Metals Company. It is similar to the other three except that the top and bottom flanges consist of special extrusions at the apices of the triangles instead of a continuous stiffened sheet.

HO-673, Bridge 13046
Sykesville Vicinity, Howard County

Statement of Significance
8.1Continuation Sheet

Significance Summary
Bridge 13046 is highly significant as the only aluminum bridge constructed in Maryland and one of seven constructed in the United States and Canada. It is an aluminum girder bridge which, though designed as a composite beam, incorporate the principles of semi-monocoque construction, utilizing not only a non-traditional material (aluminum) but also a design process that differed considerably from traditional methods. Designed as five beam units comprising nine cells, cell beams were prefabricated and lifted into place on the site. The sheer connectors enable the concrete slab to act in conjunction with the aluminum to resist live and impact loads.

Statement of Significance
Bridge 13046 is highly significant as the only aluminum bridge constructed in Maryland and one of seven constructed in the United States and Canada. These were built as a result of intense interest on the part of the aluminum industry in applying the principles of the material to highway bridges. The advantages had been amply demonstrated in airframes in the 1930's, bridge decking in 1933, and in railroad structures in 1946. The Interstate Highway Program was a major impetus, evidently, in that it identified the need to replace numerous functionally obsolete or structurally deficient structures, and to expand the road system, recognizing the prohibitive cost of the standard technology widely utilized at the time. Aluminum was identified as a material which did not require the expensive maintenance typical of steel structures. In addition, aluminum was touted as a lightweight but strong material with substantial weight-to-strength-ratio advantages over concrete and steel. Thus, the dead load weight of the deck could be reduced when constructed with aluminum, allowing for higher live-loads on the structure. Pre-fabricated aluminum panels were thought to save tax-payer dollars, as there is less down-time because work crews could lay aluminum panels in place easily. And, because the material is extruded, engineers could order bridge sections to be made with more material in critical places, providing an engineer with greater flexibility. Although it was widely recognized that aluminum was more costly, proponents said savings from faster assembly and lower maintenance, as it did not require painting, plus higher value of the salvaged material, could offset that drawback.

HO-673, Bridge 13046
Sykesville Vicinity, Howard County

HISTORIC CONTEXT:

MARYLAND COMPREHENSIVE HISTORIC PRESERVATION PLAN DATA

Geographic Organization:	Piedmont
Chronological/Developmental Period (s):	Modern:1930-Present.
Prehistoric/Historic Period Theme:	Transportation

Resource Type:

Category:	Structure
Historic Environment:	Rural
Historic Function and Use:	Transportation/Structure/Bridge
Known Design Source:	Kinetics Division of Fairchild Engine and Airplane Corporation Hagerstown, MD

HO-673, Bridge 13046
Sykesville Vicinity, Howard County
Location Map: Sykesville Quadrangle

5562 I NE
(WINFIELD)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY