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	Water Resources Policies and Authorities NAVIGATION POLICY: COST APPORTIONMENT OF BRIDGE ALTERATIONS	
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DEPARTMENT OF THE ARMY
Office of the Chief of Engineers
Washington, D. C. 20314

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Regulation
No. 1165-2-25

30 May 1979

Water Resources Policies and Authorities
NAVIGATION POLICY: COST APPORTIONMENT OF BRIDGE ALTERATIONS

1. Purpose. This regulation provides policies and guidelines for the apportionment of bridge alteration costs required in connection with navigation improvements recommended in reports transmitted to the Chief of Engineers for approval or submitted to Congress for authorization.

2. Applicability. This regulation is applicable to all OCE elements and all field operating agencies having Civil Works responsibilities.

3. References.

a. Section 6, Public Law 647, 67th Congress 21 June 1940, as amended (33 U.S.C. 516). (Appendix A)

b. Section 6, Public Law 89-670, Department of Transportation Act, 15 October 1966 (49 U.S.C. 1655).

c. Coast Guard reference: G-ECV-1, Truman-Hobbs Act.

d. ER 1105-2-50

e. EP 1165-2-2

4. Definitions. The following definitions are applicable to this regulation:

a. "Bridge". The term bridge means a lawful bridge over navigable waters of the United States, including approaches, fenders, and appurtenances thereto, which is used and operated for the purpose of carrying railroad traffic, or both railroad and highway traffic, or if a State, county, municipality, or other political subdivision is the owner or joint owner thereof, which is used and operated for the purpose of carrying highway traffic.

b. "Bridge owner". Bridge owner means any State, county, municipality, or other political subdivision, or any corporation, association, partnership, or individual owning, or jointly owning, any bridge, and, when any bridge shall be in the possession or under the control of any trustee, receiver, trustee in bankruptcy, or lessee, such term shall include both the owner of the legal title and the person or the entity in possession or control of such bridge.

c. "Navigable waters". Navigable waters of the United States means those waterbodies, except the territorial seas, which are subject to the ebb and flow of the tide, or are presently, or have been in the past, or may be in the future susceptible for use for purposes of interstate or foreign commerce.

d. "Alteration". The term alteration includes changes of any kind, reconstruction, or removal in whole or in part.

5. General. Public Law 647 as amended, (33 U.S.C. 511-523) commonly referred to as the "Truman-Hobbs Act" provides for the alteration of railroad and highway bridges when found unreasonably obstructive to navigation. Section 6 of that Act establishes policies for the apportionment of such bridge alteration costs. Public Law 89-670, transferred to the Secretary of Transportation from the Secretary of the Army the responsibility for administration of the Act. Pursuant to this responsibility, the Secretary of Transportation has established implementing procedures based on those previously adopted and utilized by the Chief of Engineers prior to 15 October 1966. This regulation adapts these cost apportionment procedures, found in reference paragraph 3c, to Corps of Engineers planning.

6. Basic Policies.

a. The cost apportionment principles of 33 U.S.C. 516, are applicable to the costs of bridge alterations recommended by reporting officers in the interest of navigation during preauthorization planning, including studies conducted under the Continuing Authorities Program (ER 1105-2-50).

b. The bridge owner shall bear such part of the cost as is attributable to the direct and special benefits which will accrue to the bridge owner as a result of the alteration, including the expectable savings in repair or maintenance costs. That part of the cost attributable to the requirements of railroad or highway traffic shall also be borne by the bridge owner, to include any expenditure for increased carrying capacity of the bridge, and such proportion of the actual capital cost of the old bridge as the used service life bears to the total estimated service life.

c. In general, the Federal government's participation in the cost of a bridge alteration shall be limited to providing a functional facility equal in every respect, as near as possible, to the existing facility, while also providing navigational clearances required to meet the anticipated and reasonable needs of navigation.

d. If the bridge owner or other local interests desire improvements or modifications in the new bridge design for reasons other than that required by the navigation improvement project, the reporting officer may recommend such improvements if such local interests provide necessary assurances to pay the costs apportioned to them.

e. In the case of small boat harbors and channels, the costs of bridge alterations, strictly for recreation navigation shall be apportioned in accordance with the procedures provided in this regulation. Bridge alteration costs associated with small boat harbors and channels and not apportioned to the bridge owner by the procedures in this regulation, shall be cost shared on the basis of 50 percent Federal and 50 percent non-Federal, the same as the costs of other general navigation facilities.

f. Reporting officers shall obtain letters of intent from local interests for non-Federal costs apportioned under the provisions of this regulation, in accordance with established procedures for preauthorization feasibility studies. If such letters cannot be obtained from the bridge owner, the reporting officers shall then include in their report a statement that the cost of such alterations shall be borne by the bridge owner or, in the alternative, be apportioned between the bridge owner and the Government as provided under the principles of Section 6 of the Truman-Hobbs Act (33 USC 516).

7. Coordination With the U.S. Coast Guard. In accordance with an agreement signed by the Chief of Engineers on 18 April 1973, (EP 1165-2-2 for a copy of the agreement), reporting officers shall consult with the Coast Guard on contemplated and recommended navigation improvements which involve the consideration of bridge alterations. Determination of navigational requirements for horizontal and vertical clearances of bridges across navigable waters is a responsibility of the Coast Guard. The Chief of Engineers shall coordinate preauthorization feasibility reports, which include recommended bridge alterations, with the Commandant, U.S. Coast Guard.

8. Procedures for Apportionment of Costs. This paragraph provides the procedures for apportionment of costs of bridge alterations, as established by the U.S. Coast Guard (reference para 3c) and adapted for use in Corps planning and construction programs. A sample apportionment of the cost of a hypothetical bridge alteration is provided in Appendix B.

a. Calculate the Total Estimated Cost of Bridge Alteration. The total estimated cost, to be apportioned by these procedures, includes the cost of all necessary appurtenances required to complete the alteration for use by both highway and railway traffic, including engineering, design and inspection.

b. Determine the Salvage Value of Bridge to be Altered. The salvage value represents the worth of the materials in the old bridge which may be used for scrap or for other purposes. The value will vary depending on the intended use of the materials.

c. Determine Direct and Special Benefits.

(1) Removing old bridge. The bridge owner shall pay a share of the removal cost computed as that part of the removal cost that the used service life bears to the total estimated service life. The share of the bridge owner, thus computed, represents an obligation incurred by the owner now by reason of the needs of navigation which otherwise would not have to be met until the bridge had reached the end of its useful life. Accordingly, the present worth of the amount is computed deferred over the unexpired life. The discount rate to be used in the present worth computation is that established by the Water Resources Council, current at the time of the study.

(2) Fixed charges. A fixed charge such as engineering, design, and inspection costs, realtor and counsel fees, and the bridge owner's administrative expenses is an undistributed cost, shared in the ratio that each party shares in the cost of construction less fixed charges. In computing the bridge owner's share of the fixed charges, all other financial liabilities assigned to the bridge owner shall be included in the computation.

(3) Contribution. If a third party should be involved in a bridge alteration project, such as a party which might benefit from some reasonable modification beyond the needs of navigation and the needs and desires of the bridge owner, that party would be responsible for the incremental costs of such further modification, and such costs would not enter into the apportionment between the bridge owner and the Federal Government.

(4) Betterments. Items desired by the bridge owner, but which have no counterpart in the old bridge or are of higher quality than similar items in the old bridge, will be included under this heading. Items considered to fall within this category are listed below. It is intended this list serve as a guide to indicate the types of items that may be considered betterments. The cost of such items will be borne by the bridge owner.

(a) Access roads.

(b) Concrete or stone finish of embankment slopes instead of seeding.

(c) Water proofing and skid-resistant epoxy finish of masonry surfaces.

(d) Steel or concrete spans instead of timber trestle.

(e) Ballasted deck instead of open deck.

(f) Trainman's walkways and sidewalks.

(g) Elevators costing more than stairways.

(h) Materials of greater thickness or heavier weight than supported by design requirements.

(i) Exotic materials for machinery and operator's house, including tinted and insulated windows.

(j) Heaters and insulation in the machinery house.

(k) Operator's house furnishings, air-conditioners, water coolers, and medicine cabinets.

(l) Hydraulic jacks for counterweight support.

(m) Fourth coat of paint, and exotic paint systems.

(n) Brass pipe and high alloy steel conduits.

(o) Floodlights and metallic vapor arc lights.

(p) Spare parts.

(q) Lubricants and lubrication equipment, and tools in excess of minimum requirements.

d. Determine Expectable Savings in Repair or Maintenance Costs.

(1) The provisions of any features that would reduce annual maintenance costs of the altered bridge, such as a wider navigation span eliminating the requirement for protection works, reducing the overall length of the bridge by fill in lieu of a trestle, or replacing two bridges with one bridge, will be included under this heading. The bridge owner should bear the increased annual maintenance cost that will accrue as a result of providing any increased loading and width desired by the bridge owner or attributable to the requirements of railway or highway traffic. Since 33 U.S.C. 516 does not mention bridge operating costs, any increase or decrease in such costs shall not be included in the cost

of alteration to be apportioned. The bridge owner's obligation is computed by capitalizing the estimated annual savings at the same rate of interest used in paragraph 8c(1) above.

(2) Expectable savings in repair costs is that amount which the bridge owner will not have to pay to restore his bridge, which may be in a damaged condition or may be dilapidated, since the bridge is being altered or removed as a part of the contemplated navigation improvement.

e. Estimate Costs Attributable to Requirements of Railway and Highway Traffic. Items desired by the bridge owner to meet the requirements of railway and highway traffic, but which have no counterpart in the old bridge, will be included under this heading. Items considered to fall within this category are listed below. This list does not contain all such items, but it is intended to serve as a guide in determining which items might fall within this category.

(1) Increased navigational clearances for the benefit of land traffic.

(2) Wider roadbed.

(3) Additional traffic lanes or track.

(4) Medians and wider traffic lanes.

(5) Increased train clearances and spacing of tracks.

(6) Larger cross and bridge ties.

(7) New and heavier rail and expansion joint devices.

(8) Additional signaling and communications systems.

(9) Additional right-of-way.

f. Estimate Expenditure for Increased Carrying Capacity. The bridge owner is required to pay the difference in cost between a bridge meeting the navigation clearance requirements with the same live loading capacity as the old bridge and new or altered bridge having any increased live loading capacity desired. The cost of increased live loading capacity will be based on the estimated cost of the new or altered bridge with unit prices applied to the quantity of materials estimated for a hypothetical bridge with the same live loading as the old bridge, but with the increased clearances required by the navigation improvement. The live loading of the new or altered bridge should be compared with the live loading of the old bridge, based on normal working stresses without overstress, overload, or reduction of safety factor.

g. Determine Value of Expired Service Life of Old Bridge.

(1) Section 6 of the Act provides, among other things, that the bridge owner shall bear such proportion of the actual capital cost of the old bridge or such part of the old bridge as may be altered or rebuilt, as the used service life of the whole or a part bears to the total estimated service life of the whole or such part. Guide service life figures have been obtained from retirement curves based on mortality statistics, which represent an attempt to consider economic causes of retirement in addition to physical causes.

(2) For railroad bridges service life, figures of 100 years for substructure, 70 years for superstructure, 37 years for treated timber, 35 years for automatic signals, 20 years for main rail, 30 years for siding rail, and 20 years for crossties and bridge ties are considered to be reasonable and will be used in computing the bridge owner's liability. The service life of the operator's house and machinery house, including machinery, is considered to expire with the removal of the superstructure. For timber structures which have been in existence for more than 50 percent of their estimated service life, the expired service life is held usually at 50 percent providing the structure has been adequately maintained and is in a good state of repair.

(3) The service life of highway bridges, except for certain long span bridges, is usually limited by obsolescence as well as structural deficiency and deterioration. Obsolescence may be due to insufficient capacity for heavier loads and greater volume of traffic than the bridge was originally designed for, safety requirements, and location. Superstructures and pile bents are considered to have a service life of 50 years. Masonry substructure which could be reused in the renovation of a bridge is considered to have a service life of 100 years.

(4) The foregoing service life figures are not to be used arbitrarily, but as a basis for a fair judgment of the service life considering all other factors that pertain in any particular case.

FOR THE CHIEF OF ENGINEERS:



THORWALD R. PETERSON
Colonel, Corps of Engineers
Executive Director, Engineer Staff

2 Appendixes
APP A - Sec 6, PL 647
as amended (33 USC 516)
APP B - Hypothetical Example
of Cost Apportionment

APPENDIX A

Section 6, Public Law 647, as amended
(33 USC 516)

At the time the Secretary shall authorize the bridge owner to proceed with the project, as provided in Section 515 of this title, and after an opportunity to the bridge owner to be heard thereon, the Secretary shall determine and issue an order specifying the proportionate shares of the total cost of the project to be borne by the United States and by the bridge owner. (Secretary of Transportation) Such apportionment shall be made on the following basis: The bridge owner shall bear such part of the cost as is attributable to the direct and special benefits which will accrue to the bridge owner as a result of the alteration, including the expectable savings in repair or maintenance costs; and that part of the cost attributable to the requirements of traffic by railroad or highway, or both, including any expenditure for increased carrying capacity of the bridge, and including such proportion of the actual capital cost of the old bridge or of such part of the old bridge as may be altered or changed or rebuilt, as the used service life of the whole or a part, as the case may be, bears to the total estimated service life of the whole or such part. Provided, that in the event the alteration or relocation of any bridge may be desirable for the reason that the bridge unreasonably obstructs navigation, but also for some other reason, the Secretary may require equitable contribution from any interested person, firm, association, corporation, municipality, county, or State desiring such alteration or relocation for such other reason, as a condition precedent to the making of an order for such alteration or relocation. The United States shall bear the balance of the cost, including that part attributable to the necessities of navigation: and provided further, that where the bridge owner proceeds with the alteration on a successive partial bid basis the Secretary is authorized to issue an order of apportionment of cost for the entire alteration based on the accepted bid for the first part of the alteration and an estimate of cost for the remainder of the work. The Secretary is authorized to revise the order of apportionment of cost, to the extent he deems reasonable and proper to meet any changed conditions. (June 21, 1940, ch. 409, Section 6, 54 Stat. 499; July 16, 1952, ch. 889, Section 2, 66 Stat. 733; Aug. 14, 1958, Public Law 85-640, Section 1(c), 72 Stat. 595.)

* Secretary of Transportation

APPENDIX B

HYPOTHETICAL EXAMPLE OF COST APPORTIONMENT

Following is the interpretation of the principles as applied to the alteration of a hypothetical highway-railroad bridge across Blank River between City A and City B.

		REFERENCE <u>TABLE</u>
1. TOTAL ESTIMATED COST OF ALTERATION PROJECT	\$10,917,300	A

The existing double deck swing span will be replaced with a new double deck lift span affording a horizontal navigation opening of 250 feet clear width between piers normal to the navigation channel and a vertical clearance of 125 feet above mean high water in the raised position.

2. SALVAGE	\$ 77,300	
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This value is deducted from the original cost to determine the actual capital cost (TABLE VII). It is also deducted from the Total Estimated Cost of Alteration Project to determine the cost to be apportioned.

3. DIRECT AND SPECIAL BENEFITS:

a. REMOVING OLD BRIDGE (OWNER'S SHARE)	\$ 165,489	I
b. FIXED CHARGES (OWNER'S SHARE)	\$ 284,460	II

A fixed charge such as engineering, design and inspection costs, realtor's and counsel's fees, and bridge owner's administrative expenses is an undistributed cost shared in the ratio that each party shares the cost of construction less fixed charges. In computing the bridge owner's share of the fixed charges, all other financial liabilities assigned to the bridge owner shall be included in the computation. (TABLE II).

c. CONTRIBUTION BY THIRD PARTY	\$ 432,000	
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Section 6 of the Act provides that in the event the alteration or relocation of any bridge may be desirable for the reason that the bridge unreasonably obstructs navigation, but also for some other reason, the Secretary may require equitable contribution from any interested person,

firm, association, corporation, municipality, county, or State desiring such alteration or relocation for such other reason, as a condition precedent to the making of an order for such alteration or relocation. In the instant case, testimony at the hearing developed that the bridge would require alteration because of the navigation project but also City A desires to relieve traffic on a nearby secondary road by providing access to the new bridge. It is considered that as an equitable contribution, City A should contribute an amount equal to one half of the expectable road user benefit accruing over the next 10 years. Other methods for determining the third party's contribution are acceptable depending on the circumstances.

d. BETTERMENTS	\$ 18,360	III
4. EXPECTABLE SAVINGS IN REPAIR OR MAINTENANCE COSTS		IV
REPAIR	\$ 100,000	
MAINTENANCE	\$ 16,288	

The new bridge is designed for increased loading and width greater than that of the old bridge. Therefore, the estimated annual maintenance cost was based on a hypothetical bridge designed, but not constructed, for the same loading and width as the old bridge but with increased clearances as required to meet the needs of waterborne navigation, and not on the estimated annual maintenance cost of the new bridge. The savings in repair costs represents a savings to the bridge owner who will not have to restore the bridge that was recently damaged since it is being altered as a part of a proposed navigation improvement.

5. COSTS ATTRIBUTABLE TO REQUIREMENTS OF RAILWAY AND HIGHWAY TRAFFIC	\$1,534,000	V
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The old bridge carries a highway deck on the upper level consisting of a roadway 18 feet wide (no sidewalks) and a railway deck on the lower level with 110-lb. rails. The new bridge will carry a highway deck on the upper level consisting of one 28-foot roadway and two 5-foot sidewalks, and the railway deck will have new 130-lb. rails. In addition, the railway deck will be paved to carry highway traffic. Thus, the bridge may be kept in an intermediate raised position when not being used by railway traffic to pass small-boat traffic without delaying highway traffic. City A also desires to provide additional highway approaches and right-of-way to connect a nearby secondary road with the new bridge.

REFERENCE
TABLE

6. EXPENDITURE FOR INCREASED
CARRYING CAPACITY \$2,330,000 VI

The highway deck of the old bridge was designed for a live loading equivalent to AASHO H15-44 and the railway deck for live loading of Cooper E 45. The highway deck of the new bridge will be designed for live loading AASHO HS20-44, and the railway deck will be designed for live loading of Cooper E 60. Accordingly, the bridge owner will pay the additional cost for the increased carrying capacity of the new bridge.

7. EXPIRED SERVICE LIFE OF
OLD BRIDGE \$ 511,300 VII

The structure of the old bridge was completed in 1908 and the superstructure completed in 1909. For this hypothetical example it was assumed the bridge would be replaced in 1970.

8. The following is an explanation of the procedure for determining the Tabulation of Proportionate Shares of Costs To Be Borne By The United States and The Bridge Owner presented in TABLE B.

(1) Cost of alteration to be apportioned is the total estimated cost of the project (excluding contingencies) less salvage value (paragraph 8b) less contribution by third party, if applicable (paragraph 8c(3)).

(2) Share to be borne by the bridge owner is the sum of the direct and special benefits (paragraph 8c) expectable savings in repair or maintenance costs (paragraph 8d), costs attributable to requirements of railway and highway traffic (paragraph 8e), expenditure for increased carrying capacity (paragraph 8f) and expired service life of old bridge (paragraph 8g).

(3) Share to be borne by the United States is the difference between the cost of alteration to be apportioned and the share to be borne by the bridge owner.

(4) The exact amount of costs to be borne by the bridge owner will be determined upon completion of the project.

(5) Contingencies may be included in the total shares to be borne by both the United States and the bridge owner.

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TABLES

- A. SUMMARY OF ESTIMATED PROJECT COSTS
- B. TABULATION OF PROPORTIONATE SHARES OF COST TO BE BORNE BY THE UNITED STATES AND THE BRIDGE OWNER
 - I. BRIDGE OWNER'S SHARE OF REMOVING OLD BRIDGE
 - II. FIXED CHARGES TO BE PAID BY BRIDGE OWNER
 - III. BETTERMENTS
 - IV. EXPECTABLE SAVINGS IN REPAIR OR MAINTENANCE COSTS
 - V. COSTS ATTRIBUTABLE TO REQUIREMENTS OF RAILWAY AND HIGHWAY TRAFFIC
 - VI. EXPENDITURE FOR INCREASED CARRYING CAPACITY
 - VII. VALUE OF EXPIRED SERVICE LIFE OF OLD BRIDGE

TABLE A

SUMMARY OF ESTIMATED PROJECT COSTS

<u>ITEM NO.</u>	<u>ITEM</u>	<u>COST</u>	<u>FIXED CHARGES</u>	<u>TOTAL</u>
1	New bridge	\$8,104,052	\$570,000	\$8,674,052
2	Removal of old bridge	521,908	500	522,408
3	Approaches	50,000	5,000	55,000
4	Additional highway approaches	1,530,000	15,000	1,545,000
5	Railroad force account work	41,800	3,500	45,300
6	Additional signaling	27,000	2,400	29,400
7	Right-of-way	13,240	900	14,140
8	Additional right-of-way	<u>30,900</u>	<u>1,100</u>	<u>32,000</u>
	TOTAL	\$10,318,900	\$598,400	\$10,917,300

Total estimated cost of project:	\$10,917,300
Less salvage	- 77,300
Less contribution by third party	<u>- 432,000</u>
Cost of alteration to be apportioned	\$10,408,000
Less right-of-way (Items 7 and 8)	<u>- 46,140</u>
Cost of construction	\$10,361,860

TABLE B

TABULATION OF PROPORTIONATE SHARES OF
COSTS TO BE BORNE BY THE UNITED STATES AND THE BRIDGE OWNER

Total estimated cost of project (excluding contingencies)		
(Table A)		\$10,917,300
Less salvage		77,300
Less contribution by third party.		432,000
Cost of alteration to be apportioned		<u>10,408,000</u>
Share to be borne by the bridge owner:		
Direct and special benefits:		
Removing old bridge	\$ 165,489	
Fixed charges	284,460	
Betterments	18,360	
Expectable savings in repair or maintenance costs.		
a. Repair	100,000	
b. Maintenance	16,288	
Costs attributable to requirements of railway and highway traffic	1,534,000	
Expenditure for increased carrying capacity	2,330,000	
Expired service life of old bridge	511,300	\$4,959,897
Share to be borne by the United States		\$5,449,103
Contingencies 15%		817,365
Total		<u>\$6,266,468</u>
Share to be borne by the bridge owner		\$4,959,897
Contingencies 15%		743,985
Total		<u>5,703,882</u>

Note - The exact amount to be borne by the bridge owner will be determined after completion of the project.

TABLE 1

BRIDGE OWNER'S SHARE OF REMOVING OLD BRIDGE

Item to be Removed	Age at Time of Removal (Years)	Owner's Share Percent	Removal Cost	Owner's Share of Removal	Years Remaining	Present Worth Factor	Owner's Present Liability
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Substructure	62	62	\$241,935	\$150,000	38	.1639	\$ 24,585
Protection Works	37	67	60,000	40,200	18	.4245	17,065
Superstructure	61	87	206,896	180,000	9	.6516	117,288
Signaling	61	100	440	440	0	1.0	440
Ties & Timber	20	67	6,000	4,000	10	.6213	2,485
Rail & Accessories							
Rail, 110 lb.	33	100	1,000	1,000	0	1.0	1,000
Rail, 110 lb.	13	65	<u>5,637</u>	<u>3,664</u>			<u>2,626</u>
TOTAL			\$521,908	\$368,104			\$165,489

Present Worth Factor based on 4-7/8%, F.Y. 1970, as established by Water Resources Council. The actual factor to be used shall be that current at the time of alteration.

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TABLE II

FIXED CHARGES TO BE PAID BY BRIDGE OWNER

Cost of construction	\$10,361,860
Less fixed charges	<u>598,400</u>
Total	\$ 9,763,460
Owner's share less fixed charges:	
Removing old bridge	\$ 165,489
Betterments	18,360
Expectable savings in repair or maintenance costs:	
a. Repair	100,000
b. Maintenance	16,288
Costs attributable to requirements of railway and	
highway traffic (less right-of-way)	\$ 1,503,100
Expenditure for increased carrying capacity	2,330,000
Expired service life of old bridge	<u>511,300</u>
TOTAL	\$ 4,644,537
Fixed charges by owner	\$ 284,460

$$\frac{4,644,537}{9,763,460} \times 598,400 = 284,460$$

TABLE III

BETTERMENTS

New furniture and water cooler in control house	\$ 1,050
Increased cost of elevators over stairways	13,360
Increased cost of galvanized steel grating walkways over timber walkways	<u>\$ 3,950</u>
TOTAL	\$18,360

TABLE IV

EXPECTABLE SAVINGS IN REPAIR OR MAINTENANCE COSTS

Repair Cost:

Cost in 1970 to repair damaged bridge	<u>\$100,000</u>
Savings in repair costs	<u>\$100,000</u>

Maintenance Cost:

Average annual maintenance cost for old bridge	\$ 16,875
Estimated annual maintenance cost for new bridge	<u>16,000</u>
Total decrease in annual maintenance costs	\$ 875

Annual savings capitalized (50 years) @ 4-7/8%:
 $875 \div 0.05372 =$ \$ 16,288

Present Worth Factor based on 4-7/8%, F.Y. 1970, as established by Water Resources Council. The actual factor to be used shall be that current at the time of the study.

TABLE V

COSTS ATTRIBUTABLE TO REQUIREMENTS OF

RAILWAY AND HIGHWAY TRAFFIC

Heavier running rail (130 lb in lieu of 110 lb)	\$ 11,200
Paving, lower deck	34,900
Additional signaling	27,000
Additional highway approaches	<u>1,430,000</u>
SUBTOTAL	\$1,503,100
Additional right-of-way	<u>30,900</u>
TOTAL	\$1,534,000

TABLE VI

EXPENDITURE FOR INCREASED CARRYING CAPACITY

Cost of new bridge designed for Cooper E 60 and AASHO HS20-44 loading (a)	\$8,609,592
Cost of replacement-in-kind (hypothetical) bridge designed for Cooper E 45 and AASHO H15-44 loading (a)	\$6,279,592
TOTAL	\$2,330,000

(a) Excludes all items in TABLE III and first two items in TABLE V

TABLE VII

VALUE OF EXPIRED SERVICE LIFE OF OLD BRIDGE
Replacement year - 1970

Item to be Removed	Year Built	Original Cost	Salvage Value	Actual Capital Cost (2) - (3)	Estimated Service Life	Expired Service Life		Value of Expired Service Life (4) X (7)
						Years 1970-(1)	% of Total (6) ÷ (5)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Substructure								
Pivot Pier	1908	\$ 34,500	\$ 0	\$ 34,500	100	62	62	\$ 21,390
Right End Pier	1908	18,580	0	18,580	100	62	62	11,520
Left End Pier	1908	21,410	0	21,410	100	62	62	13,274
Right Abutment	1908	8,600	0	8,600	100	62	62	5,332
Left Abutment	1908	11,410	0	11,410	100	62	62	7,074
Protection Works								
Pivot Pier	1909	\$ 5,800	\$ 0	\$ 5,800	37	61	50 (a)	\$ 2,900
Right End Pier	1942	3,200	0	3,200	37	28	50 (a)	1,600
Superstructure								
Swing Span	1909	\$168,920	\$19,400	\$149,520	70	61	87	\$130,082
Electrification	1957	5,000	500	4,500	22	13	59	2,655
Left Approach Spans	1909	142,017	16,300	125,717	70	61	87	109,374
Right Approach Spans	1909	156,692	19,300	137,392	70	61	87	119,531
Signaling	1909	\$ 15,000	\$ 1,000	\$ 14,000	35	61	100	\$ 14,000

(a) Held at 50% if maintained in good condition.

TABLE VII (cont'd)
VALUE OF EXPIRED SERVICE LIFE OF OLD BRIDGE
Replacement year - 1970

Item to be Removed	Year Built	Original Cost	Salvage Value	Actual Capital Cost (2) - (3)	Estimated Service Life	Expired Service Life		Value of Expired Service Life (4) X (7)
						Years 1970-(1)	% of Total (6) ÷ (5)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ties & Timber	1909	\$ 8,120	\$ 0	\$ 8,120	20	61	50 (a)	\$ 4,060
Rail & Accessories								
Rail, 110 Lb.	1937	\$ 6,600	\$ 2,200	\$ 4,400	20	33	100	\$ 4,400
Rail, 110 Lb.	1957	43,679	18,600	25,079	20	13	65	16,301
Roadway Approaches (b)								
Pavement	1908	\$17,841	\$ 0	\$ 17,841	20	62	50 (a)	\$ 8,921
New Lane	1961	43,609	0	43,609	20	9	45	19,624
SUBTOTAL			\$77,300	\$633,678				\$492,038
Engineering		\$ 24,695	\$ 0	\$ 24,695			78 (c)	\$ 19,262
TOTAL			\$77,300					\$511,300

(a) Held at 50% if maintained in good condition.

(b) Roadway approaches to be abandoned.

(c) Weighted average $100 \times \frac{492,038}{633,678} = 78\%$

EXPLANATION OF COLUMNS FOR TABLE VII

Column (1): Year Built is the original date that an item to be removed became a part of the bridge or the last known date that it was replaced. The items to be removed should be broken down to show as much detail as possible, particularly where there is a variation in the year built and/or the estimated service life.

Column (2): Original cost shall be supported by records furnished by bridge owner. Engineering cost should be estimated if unknown.

Column (3): Salvage - refer to paragraph 8b.

Column (4): Actual capital cost is the original cost of the item to be removed minus the salvage value.

Column (5): Estimated Service Life - refer to paragraph 8g.

Column (6) & (7): Expired Service Life - refer to paragraph 8g.

Column (8): Value of expired service life is the actual capital cost of the item to be removed multiplied by the percent of expired service life.