TOLTZ, KING, DUVALL, ANDERSON AND ASSOCIATES, INCORPORATED,
ENGINEERS AND ARCHITECTS
ST. PAUL, MINNESOTA

FEASIBILITY STUDY OF PROPOSED TUNNELS CAPITOL COMPLEX

STATE OF MINNESOTA
ST. PAUL, MINNESOTA

FOR

DEPARTMENT OF ADMINISTRATION
STATE ADMINISTRATION BUILDING
50 SHERBURNE AVENUE
ST. PAUL, MINNESOTA

NORMAN R. OSTERBY
DIRECTOR
OFFICE OF STATE BUILDING CONSTRUCTION

JANUARY, 1980
COMMISSION 7236

TKDA TOLTZ, KING, DUVALL, ANDERSON AND ASSOCIATES INCORPORATED
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January 28, 1980

Mr. Norman R. Osterby, Director
Office of State Building Construction
Room G-10, Administration Building
St. Paul, Minnesota 55155

Re: Tunnel Feasibility Study
State Capitol Complex
Commission No. 7236

Dear Mr. Osterby:

As per our agreement with the State of Minnesota, we have conducted a feasibility study of the proposed pedestrian/utility tunnel to the Veterans Service Building; and the tunnel extension to the Ford Building. The study and attached report, containing findings and conclusions, were performed to provide the State with suitable guidelines in ascertaining the alignment and construction of these proposed tunnels.

A brief summary of our study findings are as follows:

1. VETERANS SERVICE BUILDING TUNNEL

It is recommended that this tunnel segment extend from the east end of the Veterans Service Building, due north to the medium island in Central Avenue and then northeast to connect to the existing pedestrian/utility tunnel between the Centennial Building and Historical Society Building. Estimated 1980 construction cost for this segment is $1,245,000.

An alternate tunnel alignment, for your consideration, would be extending from the east end of the Veterans Service Building directly across to below the main Cedar Street enterance of the Centennial Building. The estimated 1980 construction cost for this alignment is $1,100,000.

2. FORD BUILDING TUNNEL

It is recommended that this tunnel segment connect to the existing tunnel at the west property line of Park Street extend north, on the west side of Park Street to University Avenue and then diagonally northwest to the southeast corner of the Ford Building. Estimated 1980 construction cost for this segment is $670,000.

A more detailed writeup on our study, conclusions and recommendations is included in the attached report.

We are hopeful that the information and recommendations submitted herein and in our attached report will be helpful in the State's decision regarding these tunnels. We would be available to meet with you to further discuss our study and report, if you so wish.

Very truly yours,

TOLTZ, KING, DUVALL, ANDERSON
AND ASSOCIATES, INCORPORATED

Owen J. Beatty

Owen J. Beatty, P.E.
Minnesota Registration No. 6593

OJB/lw
Enclosure

TOLTZ, KING, DUVALL, ANDERSON AND ASSOCIATES, INCORPORATED

ENGINEERS AND ARCHITECTS

ST. PAUL, MINNESOTA

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CAPITOL COMPLEX
STATE OF MINNESOTA
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I hereby certify that this report was prepared by me or under my direct supervision and that I am a Registered Professional Engineer in the State of Minnesota.

Owen J. Beatty

Owen J. Beatty, P.E.
Minnesota Registration No. 6593

7236

I. PROPOSED TUNNEL ALIGNMENT AND USES

The two tunnel segments evaluated in this study are as follows:

1. Tunnel connecting Centennial Building to Veterans Service Building. (See attached Drawings S-1, S-2 and S-4 Alt.).

2. Tunnel extensions from existing tunnel, between Capitol and State Office Building, to Ford Building at 117 University Avenue. (See attached Drawings S-1 and S-3).

The intended use of these proposed tunnel segments is to provide all-weather pedestrian access between the major Capitol Complex Buildings and to enclose the various utility lines serving these State buildings.

The proposed tunnel segment between the Centennial Building and Veterans Service Building will complete the existing tunnel "loop" which presently extends north from the Centennial Building connecting the Historical Building, State Capitol, State Office Building, Transportation Building and Veterans Service Building.

The proposed tunnel extension to the Ford Building will provide pedestrian access and utility service to the remodeled Ford Building and possible future State Buildings to be constructed in that block. We understand that the existing heating plant in the Ford Building may be abandoned in a few years, therefore necessitating a utility connection to the Central Steam Plant.

II. STUDY CONSIDERATIONS

In the course of the feasibility study, the following items were considered in deriving the recommended tunnel alignments:

A. Pedestrian flow

B. Extension and/or connection to existing Capitol Complex utilities

C. Costs

D. Existing underground utilities, such as telephone, sewer, water, gas, etc.

E. Existing surface improvements, such as buildings, streets, parks, proposed construction, etc.

F. Soil conditions

III. TUNNEL CONSTRUCTION

The proposed tunnels would be constructed of cast-in-place reinforced concrete, with waterstopped joints, and a waterproofing membrane coating on the exterior walls and roof. (See attached Drawing S-3 for typical tunnel section).

Proposed tunnels would have a minimum of two (2) feet of earth cover over the top.

Tunnels would be properly lighted and ventilated in accordance with applicable building codes and in addition will be properly designed to comply with State Handicapped Code Requirements.

Interior of tunnels would be divided into two longitudinal sections; one section 7'-0" wide x 7'-5" high would be for pedestrian traffic,

the other section 4'-6" wide x 7'-5" high would be for utility lines, etc. The two sections would be separated by full height block and/or tile partition.

The interior of the tunnel to the Veterans Service Building will be painted concrete and concrete block, while the interior of the pedestrian portion of the Ford Building Tunnel would be glazed tile to match existing adjacent tunnel construction.

IV. CONCLUSIONS AND RECOMMENDATIONS

Based on the intended tunnel use, existing underground utilities, proposed and existing structures, we have the following recommendations relative to the proposed tunnel alignments:

A. Veterans' Service Building Tunnel

It is recommended that this tunnel segment extend from the east end of the Veterans Service Building basement due north to the medium island in Central Avenue and then northeast to connect to the existing pedestrian/utility tunnel between the Centennial Building and the Historical Society Building. (See attached Drawing S-2). This alignment would interfere the least with major underground utilities, provide acceptable grade transitions, would be a relatively direct route between the two buildings and would intersect the main steam distribution lines servicing the Veterans Service Building.

Estimated 1980 construction costs for this segment is . . $1,245,000.

Another alignment which could be utilized, would be extending from the east end of the Veterans Service Building basement directly across to below the Cedar Street enterance of the Centennial Building.

This route would be shorter, 750 feet, as compared to the 990 feet required for the route described in IV A, hereinbefore, with a 1980 estimated cost of $1,100,000.

However, the State should consider the following aspects of this alignment which may be undesirable:

1. Remodeling in sub-basement of Centennial Building to accommodate tunnel traffic.
2. Routing of large utility lines from existing tunnel at north of building, thru Centennial Building, to new tunnel.
3. Pedestrian traffic would have to use elevators or stairs to continue from new tunnel to existing tunnel, due to two level difference in elevation (see S-4).

The following alternate alignments for this tunnel segment were considered and rejected for the reasons listed:

1. Alternate Alignments - Veterans Service Building Tunnel

   a. East End of Veterans Service Building to South End of Centennial Building

      The basement of the Centennial Building is at approximately street level (Columbus Avenue) and therefore a stairwell and/or elevator would have to be extended down to the tunnel elevation. The high cost of constructing such an elevator along with underpining the Centennial Building columns would be prohibitive. Additionally all of the tunnel utilities would have to be routed through the basement of the Centennial Building, to the existing tunnel to the north.

   b. East End of Veterans Service Building up Cedar Street to Existing Tunnel North of Centennial Building

      This alignment would necessitate objectionable "dips" in the tunnel to clear major underground utilities and would still require relocation of 30" sewer line.

B. Ford Building Tunnel

It is recommended that this tunnel segment connect to the existing pedestrian/utility tunnel at the west property line of Park

Street and then north along west side of Park Street to University Avenue and then diagonally northwest to the southeast corner of the Ford Building (See attached Drawings S-1 and S-3).

This alignment would interfere the least with existing underground utilities, provide a relatively direct route between the Ford Building and other Capitol Complex buildings, provide acceptable grade transitions and would not disturb new Park Construction.

Estimated 1980 Construction costs for this segment is. $670,000.

The following alternate alignments for this segment were considered and rejected for the reasons listed:

1. Alternate Alignments - Ford Building Tunnel

   a. State Office Building Directly North to Ford Building

      This alignment would intersect the major trunk telephone lines connecting St. Paul to Minneapolis, which due to age of telephone duct lines, would cause extremely difficult construction. Additionally, this alignment would disturb new Park Construction recently completed.

   b. State Capitol Under University Avenue (via Existing Tunnel) and then West to Ford Building

      There is insufficient clearance in front of the

church on northwest corner of University Avenue and Park Street to allow tunnel excavation, without expensive sheeting.

The pedestrian flow on this alignment would be undesirable, as all persons from the State Office Building, Transportation Building and Veterans Service Building would have to go through the State Capitol basement enroute to the Ford Building.

V. COSTS

As per your instructions, the estimated tunnel construction costs listed are based on 1980 construction. Attached herewith are our itemized cost estimates for these tunnel segments. (See attached Sheets 1 thru 6).

Our estimates were derived from 1979 construction costs and adjusted to account for anticipated price increases. Cost estimates include a 10% contingency and 8% engineering design fee.

Additionally for your reference, we have projected these costs to 1984 construction.

VI. CONSTRUCTION DIFFICULTIES

We would not expect any unusual difficulties during the construction of these tunnels. There would be the "normal" scheduling of street closings, etc. when crossing beneath existing streets. Soil data available to us reveals that soils in this area are generally till,

consisting of medium dense sand and gravel. No major groundwater problems are anticipated in the two recommended alignments, however before final design is started on these segments, sufficient number of soil borings must be taken to verify actual soil conditions.

VII. REMARKS

Existing utility locations were compiled from utility records and by observation. All data and actual ground locations should be verified with the utilities prior to construction.

Opinions expressed on subsoil conditions were based on straight line interpolation between existing soil borings available to our office. There is no expressed or implied guarantee as to the accuracy of the data nor of the interpolation thereof.

COST ESTIMATE
VETERANS SERVICE BUILDING TUNNEL - 990 FEET LONG
STATE CAPITOL COMPLEX

Tunnel Construction (1979 Costs Per Lineal Foot)

Forming	35 Sq.Ft.	$ 86.68	
Concrete	1.6 Cu. Yd.	90.20	
Reinforcing	300 Lbs.	118.20	
Painting	23 Sq.Ft.	6.70	
Conc. Block	7.7 Sq.Ft.	19.25	
Waterproofing	32 Sq.Ft.	31.34	
Excavation	14 Cu. Yd.	43.20	
Backfill	9 Cu. Yd.	47.00	
Lighting	L.F.	10.00	
Heating/ Ventilation	L.F.	10.00	
Plumbing	L.F.	8.00	
2-10" Watermains	L.F.	110.00	
		580.57/Lineal Foot	
		x 990 LF =	$574,764

Site Restoratior

Sidewalk	1,100 Sq.Ft.	2,200.
Paving	11,530 Sq.Ft.	12,683.
Curb	620 L.F.	4,340
Sodding	1,900 Sq.Yd.	3,760

Utility Relocation

Lawn Sprinklers	L.S.	3,000
4 - 6" ϕ Water Lines		1,200
1 - 6" Steam		300.
3 - Telephone Ducts		7,800
2 - Gas Lines		500
1 - 18" ϕ Sewer		1,900.
1 - 36" ϕ Sewer		1,500
At Existing Tunnel Intersection	L.S.	7,000
Electrical Service Loop		90,000
	Subtotal	$710,947

	From Sheet 1 of 6	710,947
Demolition		
Veterans Service Building		700
Exist. Pedestrian Tunnel		1,000
		$712,647
Labor Additive (Insurance & Payroll Taxes)		
40% x $712,647 x 26%		74,115
		$786,762
20% Overhead, Ins. Profit		157,352
		$944,114
Contingencies 10%		94,411
1979 Construction Costs		$1,038,525
Escalated Costs to 1980		
(11% per year)		
11% x 1,038,525		114,238
1980 Construction Cost		$1,152,763
8% Engineering Fee		92,221
Total 1980 Construction Costs		$1,244,984
Use	*	$1,245,000
TOTAL 1984 Construction Costs		
1.44 x 1,224,984 =		$1,792,777
Use	*	$1,793,000

* If tunnel has glazed tile walls, add $76,000 to 1980 Costs and $92,000 to 1984 Costs.

COST ESTIMATE
VETERANS SERVICE BUILDING TUNNEL - 750 FEET LONG
ALTERNATE ROUTE THRU CENTENNIAL BLDG.
STATE CAPITOL COMPLEX

Tunnel Construction (1979 Costs Per Lineal Foot)		
Forming	35 Sq. Ft.	$ 86.68
Concrete	1.6 Cu. Yd.	90.20
Reinforcing	300 Lbs.	118.20
Painting	23 Sq. Ft.	6.70
Conc. Block	7.7 Sq. Ft.	19.25
Waterproofing	32 Sq. Ft.	31.34
Excavation	14 Cu. Yd.	43.20
Backfill	6 Cu. Yd.	47.00
Lighting	L. F.	10.00
Heating/ Ventilation	L. F.	10.00
Plumbing	L. F.	8.00
2-10" Watermains	L. F.	110.00
		580.57/Lineal Foot
		x 750 LF = $ 435,428

Site Restoration		
Sidewalk	1,100 Sq. Ft.	2,200
Paving	7,820 Sq. Ft.	8,600
Curb	295 L. F.	2,100
Sodding	1,900 Sq. Yd.	3,760

Utility Relocation		
Lawn Sprinklers	L. S.	3,000
4 - 6" Ø Water Lines		1,200
1 - 6" Steam		300
3 - Telephone Ducts		7,800
2 - Gas Lines		500
1 - 18" Ø Sewer		1,900
1 - 36" Ø Sewer		4,500
At Centennial Bldg. (extend 2-10" watermains)		38,500
Electric Service - Loop		90,000
	Subtotal	$599,788

	From Sheet 5 of 6	$ 599,793
Demolition & Remodeling		
Veterans Service Building		700
Centennial Bldg.		25,000
		$ 625,488
Labor Additive (Insurance and Payroll taxes)		
40% x $625,488 x 26%		65,050
		$ 690,538
20% Overhead, Ins. Profit		138,108
		$ 828,643
Contingencies 10%		82,864
	1979 Construction Costs	$ 911,507
Escalated Costs to 1980		
(11% per year)		
11% x $911,507		$ 100,266
	1980 Construction Cost	$1,011,773
	8% Engineering Fee	80,942
	Total 1980 Construction Costs	$1,092,715
	Use	$1,100,000
TOTAL 1984 Construction Costs		
1.44 x $1,092,715		$1,573,510
	Use	* $1,575,000

* If tunnel has glazed tile walls, add $76,000 to 1980 Costs and $92,000 to 1984 Costs.

COST ESTIMATE
FORD BUILDING TUNNEL - 510 FEET LONG
STATE CAPITOL COMPLEX

Tunnel Construction (1979 Costs Per Lineal Foot)			
Forming	35 Sq. Ft.	$ 86.68	
Concrete	1.6 Cu. Yd.	90.20	
Reinforcing	300 Lbs.	118.20	
Tile	15 Sq. Ft.	99.71	
Waterproofing	32 Sq. Ft.	31.34	
Excavation	12 Cu. Yd.	36.00	
Backfill	7 Cu. Yd.	35.00	
Paint (Clg.)	7 Sq. Ft.	2.10	
Lighting	L. F.	10.00	
Heating/ Ventilation	L. F.	10.00	
Plumbing	L. F.	8.00	
2-10" Watermains	L. F.	110.00	
		$637.23/Lineal Foot	
		x 510 LF	= $324,987

Site Restoration			
Sidewalk	3,520 Sq. Ft.		$ 7,040
Paving	4,165 Sq. Ft.		4,582
Curb	128 L. F.		896
Sodding	906 Sq. Yd.		1,812

Utility Relocation			
Lawn Sprinklers	L. S.		$ 3,000
9" ø Sewer			1,500
16" ø Water Line			900
Gas Line			250
At Existing Tunnel Intersection	L. S.		36,000
		Subtotal	$380,967

From Sheet 5 of 6	$380,967
Demolition	
Ford Building	700
Exist. Pedestrian Tunnel	1,000
	$382,667
Labor Additive (Insurance & Payroll taxes)	
40% x $382,667 x 26%	39,797
	$422,464
20% Overhead, Ins., Profit	84,493
	$506,957
Contingencies 10%	50,696
1979 Construction Costs	$557,653
Escalated Costs to 1980 (11% per year)	
11% x $557,653 =	61,342
1980 Construction Cost	$618,995
8% Engineering Fee	49,520
Total 1980 Construction Costs	$668,515
Use	$670,000
TOTAL 1984 Construction Costs	
1.44 x $668,515 =	$962,662
Use	$965,000