

The development of state aid construction standards, rules and regulations

A historical account
of how Minnesota's state aid
standards evolved

Minnesota Department of Transportation
Transportation Building
St. Paul, Minnesota 55155



The development of state aid construction standards, rules and regulations

This report answers the questions:

"Where did they come from?"
"When were they developed?" and
"By whom?"

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On many occasions the question is asked, "How did the Department of Transportation get State Aid Standards."

At this point one looks around for someone else to respond to the question and, hopefully, it is someone who knows what he is talking about. This paper was developed to answer this question.

Question of funding state transportation systems

Following the end of World War II, the question of funding transportation systems within the State was brought to the attention of the Legislature. Counties needed funds over and above the share they were getting from the collection of gasoline tax revenues and from motor vehicle registration fees. Cities were in need of funding, also. At this point they were not receiving any of the State collected user funds (gasoline tax and motor vehicle fees).

In 1948, 1950 and again in 1952, referendums to reappropriation the Hiway Users Tax Distribution Fund were submitted to the voters but failed as a result of misunderstanding and lack of knowledge.

Study commission created

The Legislature, in 1953, created a Highway Study Commission to investigate all factors and make a complete report. The following were appointed commission members:

Senator A. O. Sletvold, Chairman
Representative John A. Hartle, Vice-Chairman
C. C. Ludwig, Secretary

Senate Members

A. O. Sletvold
Homer J. Covert
Joseph J. Daun
Norman J. Larson
Archie H. Miller
C. C. Mitchell
B. G. Novak

House Members

John A. Hartle
Roy H. Cummings
Aubrey Dirlam
Lawrence Haeg
Charles Halsted
Reuben Tweten
Roy Voxland

Commission citizens' committee named

Appointed by Senate

C. C. Ludwig - Executive Secretary, League of Minnesota Municipalities
E. Ray Cory - President, Minnesota State Automobile Association
J. B. McDonald - Chairman, Minnesota Petroleum Industries
Robert B. Morris - Secretary, Duluth Chamber of Commerce
James Morton - President, Minnesota Farm Bureau Federation
E. L. Murphy, Jr. - Vice President, Minnesota Transport Association
Hjalmer Petersen - Publisher, Askov American

Appointed by House

Edwin H. Christianson - President, Minnesota Farmers Union
Gordon Conklin - Chairman, A. F. L. Teamsters Joint Council
Chester Graupmann - County Commissioner, McLeod County
Wendell P. Huber - County Highway Engineer, Otter Tail County
O. Z. Remsberg - President, Minnesota Highway Users Council
William P. Steven - Executive Editor, Minneapolis Star and Tribune
George Shepard - City Engineer, St. Paul, Minnesota

Lloyd F. Wilkes, Executive Secretary

The Study Commission requested the assistance of the following principals in making the study:

Minnesota Department of Highways

O. L. Kipp, Chief Engineer

Staff Loaned by Department of Highways

F. L. Campbell
Johan Nygaard
Alvin Nordling
Vince Bovitz
Elmer Erkkila

Traffic and Planning Division

J. E. P. Darrell, Director
P. R. Staffeld
Clint H. Burnes
E. A. Ahern
Vergil Asklund
W. G. Ebert
N. J. Harren
W. J. Hayne
R. J. McDonald
W. J. Petrowski
K. S. Rivard
W. B. Sorum
H. E. Swanson
A. P. Whim

State Engineer Advisory Committee

P. R. Staffeld, Chairman
A. E. LaBonte
C. C. Colwell
Walter Schultz
M. L. Jones
C. K. Preus
J. E. P. Darrell
T. S. Thompson

County Engineer Advisory Committee

H. E. Palmer, Chairman
R. C. Deegan
George W. Deibler
J. H. Dupont
M. M. Nygaard
Bert J. Pinsonneault
Frank Turnacliff
E. S. Ward

City Engineer Advisory Committee

H. G. Erickson, Chairman
George A. Claydon
J. F. Enz
R. W. Hussey
C. O. Markson
Phil W. Smith
R. W. Teague
Arthur Tews

Twin City Plan Advisory Committee

H. S. Bronson
H. G. Erickson
O. L. Kipp
George M. Shepard
L. P. Zimmerman

University of Minnesota
Department of Geography

John R. Borchert

U. S. Department of Commerce
Bureau of Public Roads

O. K. Normann R. S. Lewis
C. N. Graham

Constitutional amendment becomes law

Following this study and report, the Legislature submitted Constitutional Amendment No. 2 to the voters in November of 1956.

The Amendment passed, resulting in Chapter 943, Laws of 1957, being enacted. These laws provided for the establishment of Rules and

Regulations as follows:

Counties:

The rules and regulations shall be made and promulgated by the Commissioner acting with the advice of a committee which shall be selected by the several county boards, acting through the officers of the state-wide association of county commissioners. The committee shall be composed of nine members so selected that each member shall be from a different state highway construction district. Not more than five of the nine members of the committee shall be county commissioners. The remaining members shall be county highway engineers. In the event that agreement cannot be reached on any rule or regulation, the Commissioner's determination shall be final. The rules and regulations shall be printed and copies thereof shall be forwarded to the county auditors and the county engineers of the several counties.

Rules and regulations to have force and effect of law. The rules and regulations shall have the force and effect of law upon compliance with the provisions of section 15.0412.

Municipalities:

The rules and regulations shall be made and promulgated by the Commissioner acting with the advice of a committee which shall be selected by the governing bodies of such cities, acting through the officers of the statewide association of municipal officials. The committee shall be composed of 12 members, so selected that there shall be one member from each state highway construction district and in addition one member from each city of the first class. Not more than six members of the committee shall be elected officials of the cities. The remaining members of the committee shall be city engineers. In the event that agreement cannot be reached on any rule or regulation the Commissioner's determination shall be final. The rules and regulations shall be printed and copies thereof shall be forwarded to the clerks and engineers of the cities.

Rules and regulations to have force and effect of law. The rules and regulations shall have the force and effect of law upon compliance with the provisions of section 15.0412.

Rules and regulations written and approved

As a result of the provisions for rule making, the State Association of County Commissioners (association name has since been changed to Association of Minnesota Counties) appointed members to the County-State Aid Rules and Regulations Committee.

The County rules committee first met at the Minnesota Highway Department Building at 1246 University Avenue in St. Paul on June 19, 1957.

The Municipal rules committee first met at the Minnesota Highway Department Building on June 26, 1957.

The proposed rules and regulations were written in proper order including standards for construction, reviewed by legal staff of the Attorney General's office and sent to the local units of government, including a notice of public hearing to be held. In addition, copies of the rules and regulations, with notice of public hearing, were forwarded to those parties registered with the Secretary of State.

Following proper notice of hearing, in compliance with 1953 Minnesota Statutes, Section 15.042, a public hearing was held in the State Office Building Auditorium, St. Paul, Minnesota, at 10:00 A.M. on August 7, 1957.

The Rules and Regulations were promulgated by Commissioner of Highways L. P. Zimmerman for the operation of State Aid on the 15th day of August, 1957, and approved by Deputy Attorney General Robert W. Mattson on the same date.

The following served on the Rules and Regulations Committees:

In behalf of the Counties:

Mr. George W. Deibler, County Engineer (St. Louis County)
Mr. Irven Anderson, County Commissioner
Mr. Norman Schmidt, County Engineer (Todd County)
Mr. W. P. Huber, County Engineer (Otter Tail County)
Mr. Edgar L. Baratt, County Commissioner
Mr. Lew Larson, County Commissioner (Fillmore County)
Mr. Roger J. Wolfe, County Commissioner (LeSueur County)
Mr. George Timm, County Commissioner (Yellow Medicine Co.)
Mr. L. P. Pederson, County Engineer (Hennepin County)

In behalf of the Municipalities:

Honorable Eugene Lambert, Mayor
Mr. Waino Somero, City Engineer (City of Ely)

Honorable Harold Thomforde, Mayor (City of Crookston)
Mr. C. O. Markson, City Engineer (City of Brainerd)
Mr. E. F. Hensch, City Engineer (City of Duluth)
Mr. William Ridge, City Engineer (City of Anoka)
Mr. J. F. Enz, City Engineer (City of Red Wing)
Mr. Charles Dahlgren, City Engineer (City of St. Peter)
Honorable M. E. Dirlam, Mayor (City of Redwood Falls)
Mr. George Martens, Alderman (City of Minneapolis)
Mr. Hugh Erickson, City Engineer (City of Minneapolis)
Mr. Frank Marzitelli, Commissioner of Public Works
(City of St. Paul)

These people, with the guidance of J. M. Evans, then State Aid Engineer, and Ward Gronfield, Attorney General's Staff, produced the first Rules and Regulations for State Aid Operations, including the establishment of construction standards which were as follows:

MINIMUM GEOMETRIC DESIGN STANDARDS

The following standards for the County State Aid and Municipal State Aid Systems herein described, adopted August 15, 1957 and referred to in Section 1.6 of the Rules and Regulations shall be established as the minimum for the geometric design on construction or reconstruction of the state aid roads and streets and for the computation of needs on these systems. Any deviation from these minimum standards, or as subsequently amended, because of topographic or economic considerations must be adequately justified to the satisfaction of the Commissioner.

(1) County State Aid Highways

A. Rural Design

Rural Design as hereafter described shall be used on all roads in undeveloped areas including undeveloped areas within corporate limits.

(a) Roadway Widths and Surface (in feet)

Estimated 1975 Average Daily Traffic Volume	Base Design	Surface Type	Subgrade	Width	
				Finished Roadway	Surface
Under 100		Aggregate	24	24	22
100 — 399	5 Ton	Road Mix	30	26	22
400 — 999	7 Ton	Plant Mix	32—34	28—30	24
1000 and over	7 Ult. 9 ton	Plant Mix	36—38	30—32	24

When the estimated 1975 traffic volume of a road exceeds 2,000 vehicles per day, the design may include Portland Cement concrete pavement where economically justified.

(b) Design Speed (in miles per hour)

Estimated 1975 Average Daily Traffic Volume	Terrain		
	Flat	Rolling	Mountainous
Under 100	45	40	30
100 — 399	50	50	40
400 — 999	60	50	45
1000 and over	60	50	45

(c) Maximum Degree of Curve (in degrees)

Estimated 1975 Average Daily Traffic Volume	Terrain		
	Flat	Rolling	Mountainous
Under 100	10	12	22
100 — 399	8	10	14
400 — 999	5	8	10
1000 and over	4	5	8

(d) Maximum Gradient (in percent)

Estimated 1975 Average Daily Traffic Volume	Terrain		
	Flat	Rolling	Mountainous
Under 100	5	7	10
100 — 399	4	5	8
400 — 999	3	5	7
1000 and over	3	4	6

(e) Non-Passing Sight Distance (in feet)

Estimated 1975 Average Daily Traffic Volume	Terrain		
	Flat	Rolling	Mountainous
Under 100	320	300	275
100 — 399	350	350	300
400 — 999	475	350	320
1000 and over	475	350	320

(f) Bridge Standards

Estimated 1975 Average Daily Traffic Volume	New Bridges	
	Clear Width	Design Load (AASHO)
Under 100	24 feet	H — 20
100 — 399	* 24	H — 20
400 — 999	30	H — 20

*Minimum of 24 feet but not less than 2 feet wider than surfaced widths on structures of 80 feet or less in length.

General Note: Consideration should be given to constructing all short span structures to full shoulder width.

(g) Bridges to Remain

Estimated 1975 Average Daily Traffic Volume	Clear Width	Safe Load (Posting Basis in Tons)
Under 100	18 feet	10 ton
100 — 399	24	15
400 — 999	24	15

B. Municipal Design

Any incorporated or unincorporated area which, in the opinion of the county engineer and the Commissioner of Highways, is sufficiently developed, shall warrant the use of the design geometrics approved for the municipal-state aid streets and shall be designed on that basis.

(2) Municipal State Aid Streets

A. Rural Design

When, in the opinion of the municipal engineer and the Commissioner of Highways, the area served by the road is not presently, nor will it be in the foreseeable future, sufficiently developed to warrant the use of municipal design, then the rural design of the county state aid highways shall prevail and the road shall be designed on that basis.

B. Municipal Design

The design geometrics for the construction or reconstruction of the municipal state aid streets shall be determined by the type and volume of traffic and specific project considerations conforming to the minimum requirements within the limits of the roadway widths and other design data as described hereafter.

(a) Minimum Roadway Widths

Through Lanes	Lane width, feet	Total width in feet: Out to out of pavement (3) or face to face of outer curbs					
		Undivided; no parking lanes	With median; no parking lanes		Undivided; with parking lanes		With 4' median and two parking lanes
Number of lanes			4' med.	14' med.	One side	Both Sides	
2**	A*10	—	—	—	—	40	—
	B 11	22	—	—	—	42	—
	C 12	24	—	—	—	44	—
4	A 10	40	44	54	50	60	64
	B 11	44	48	58	54	64	68
	C 12	48	52	62	58	68	72
6	A 10	60	64	74	70	80	84
	B 11	66	70	80	76	86	90
	C 12	72	76	86	82	92	96
8	A 10	80	84	94	—	—	—
	B 11	88	92	102	—	—	—
	C 12	96	100	110	—	—	—

* — Minimums

A — Absolute minimum — to be used only under extreme conditions

B — Acceptable minimum — where conditions warrant

C — Desirable minimum — wherever feasible

** — Should not be considered except where continuous shoulder or parking lane is provided on each side. In general, traffic should exceed 4,000 vehicles per day, 1975 traffic estimate, to qualify for two additional lanes.

(b) Base Design

All base requirements for municipal design shall be computed on the basis of a 7 ton, 7 ultimate 9 ton, or 9 ton design, depending upon the classification of traffic projections as either light, medium or heavy traffic, respectively. For the purpose of classifying traffic volumes, light traffic shall be considered less than 1000 vehicles per day, 20-year projection; medium traffic from 1000 to 2000 vehicles per day, 20-year projection; and heavy traffic over 2000 vehicles per day, 20-year projection.

(c) Base and Surface Types

The type of construction selected is determined by the type and volume of traffic, comparative costs, and special requirements pertinent to the project. In general, the following relationships shall govern;

Traffic	Base Type	Surface Type
Light	Granular	Road or Plant Mix Bituminous
Medium	Granular or Concrete	Plant Mix Bituminous
Heavy	Granular or Concrete	Concrete or High Type Bituminous

The classification of traffic shall be the same as for subsection (b) Base Design.

Provision made for changing state aid standards

The above procedure for revising rules and regulations began in November of 1958 and the public hearing was held on January 5, 1959.

New Rules and Regulations for State Aid Operations were promulgated on January 9, 1959. State Aid standards were not changed. However, the following provision for changing same was changed to read as follows:

Section 1.6 State Aid Standards - Subject to approval by the Commissioner, geometric design standards shall be cooperatively determined for use on all state aid roads and streets.

(1) Geometric Design Standards The Commissioner, in cooperation with representatives of the Minnesota County Highway Engineers Association or the Minnesota City and Village Engineers Association, as the case may be, shall establish desirable minimum geometric design standards for use in improving County-State Aid and Municipal-State Aid Routes. Copies of these current standards shall be furnished with these Rules and Regulations.

(a) Revisions When need for revision of state aid standards arises, the Commissioner shall confer with representatives of the county or city engineers associations and determine such change as might be necessary or desirable, and cause such change to be made in the same manner as outlined above.

Revisions

Rules and Regulations were again revised on September 1, 1959, with no change in Construction Standards.

In 1960, Rules and Regulations were revised with the joint committee of county and municipal officials meeting on July 26, 1960. The public hearing was held on September 29, 1960. Rules and Regulations were approved on the 20th of October, 1960.

On September 29, 1960, new Construction Standards were issued as "Minimum Geometric Design Standards," for State Aid operations. The new standards provided changes in base materials requirement on flexible and rigid pavement designs.

STATE AID (5-800)
Minimum Geometric Design Standards
For Approved Construction Projects (5-802)

5.802.1 PURPOSE

These cooperatively established minimum design requirements are provided to insure that every construction project, approved for state aid participation, shall be built to approved engineering standards, consistent with anticipated traffic volumes.

5.802.3 SCOPE

All projects submitted for approval under the State Aid program shall be designed to meet these standards. Any deviation below these specified minimum requirements will not be approved unless the deficiency is adequately justified to the satisfaction of the Commissioner.

5-802.3 POLICIES

The selection of construction projects, design features and surface type is to be determined by the local officials consistent with the following minimum requirements:

1. County State Aid Highways

Those sections of County State Aid Highways, located through areas that are sufficiently developed to warrant the use of a municipal design, may be improved in accordance with the standards adopted for similar traffic volumes on the Municipal State Aid Streets. Rural sections shall conform to the following:

A. Table 5-802 3A presents Roadbed and Surface Geometrics-Rural Design.

B. Table 5-802.3B indicates Design Speed.

C. Table 5-802.3C shows Maximum Degree of Curvature.

D. Table 5-802.3D illustrates Maximum Gradient.

E. Table 5-802.3E indicates Non-passing Sight Distances.

F. Table 5-802.3F shows Bridge Standards.

G. Table 5-802.3G indicates Bridges Temporarily Permitted to Remain Within An Improvement Project.

H. Base Design

1. Base thickness for flexible pavements shall conform to the "Flexible Pavement Design Standards" as contained in 5-291.374 of the Design Manual and shall be consistent with the volume and type for a 20-year projection of traffic.
2. Base thickness for rigid pavements, having a projected traffic volume of less than 10,000 vehicles per day, may be proportionately reduced to not less than 4 inches in total depth.
3. A rigid base will require substantially the same depth of subbase as the above indicated base courses for rigid pavements.

TABLE 5-802.3A
ROADBED AND SURFACE GEOMETRICS—RURAL DESIGN

A.D.T. Projected	Base Design	Surface Type	Subgrade	Width	
				Finished Roadbed	Surface
Under 100	—	Traffic Bound	24	24	22
100 — 399	5 Ton	Flexible	* 30—32	26	22
400 — 999	7 Ton	Plant Mix or Conc.	* 32—34	28	24
1000 and over	7 T Ult. 9 ton	Plant Mix or Conc.	* 34—36	30	24

**Variable subgrade widths, dependent upon necessary depth of base.*

**TABLE 5-802.3B
DESIGN SPEED (IN MILES PER HOUR)**

20-Year Projected Average Daily Traffic Volume	Terrain		
	Flat	Rolling	Mountainous
Under 100	45	40	30
100 — 399	50	50	40
400 — 999	60	50	45
1000 and over	60	50	45

**TABLE 5-802.3C
MAXIMUM DEGREE OF CURVE (IN DEGREES)**

20-Year Projected Average Daily Traffic Volume	Terrain		
	Flat	Rolling	Mountainous
Under 100	10	12	22
100 — 399	8	10	14
400 — 999	5	8	10
1000 and over	4	5	8

**TABLE 5-802.3D
MAXIMUM GRADIENT (IN PERCENT)**

20-Year Projected Average Daily Traffic Volume	Terrain		
	Flat	Rolling	Mountainous
Under 100	5	7	10
100 — 399	4	5	8
400 — 999	3	5	7
1000 and over	3	4	6

**TABLE 5-802.3E
NON-PASSING SIGHT DISTANCE (IN FEET)**

20-Year Projected Average Daily Traffic Volume	Terrain		
	Flat	Rolling	Mountainous
Under 100	320	300	275
100 — 399	350	350	300
400 — 999	475	350	320
1000 and over	475	350	320

**TABLE 5-802.3F
BRIDGE STANDARDS**

20-Year Projected Average Daily Traffic Volume	New Bridges	
	Clear Width	Design Load (AASHO)
Under 100	24 feet	H — 20
100 — 399	*24	H — 20
400 — 999	30	H — 20

**Minimum of 24 feet but not less than 2 feet wider than surfaced widths on structures of 80 feet or less in length.*

General Note: Consideration should be given to constructing all short span structures to full shoulder width.

TABLE 5-802.3G
BRIDGES TEMPORARILY PERMITTED
TO REMAIN WITHIN AN IMPROVEMENT PROJECT

20-Year Projected Average Daily Traffic Volume	Clear Width	Safe Load (Posting Basis in Tons)
Under 100	18 feet	10 ton
100 — 399	24	15
400 — 999	24	15

II. *Municipal State Aid Streets*

A. *Rural Design*

Those sections of Municipal State Aid Streets located through areas that are not sufficiently developed to warrant the use of a municipal design may be improved in accordance with the rural standards adopted for similar traffic volumes on the County State Aid Highways.

B. *Municipal Design*

The design geometrics for the construction or reconstruction of the Municipal State Aid Streets shall be related to the type and volume of projected traffic and shall provide the necessary width to accommodate the specified number of normal traffic lanes and parking lanes. A minimum width of two feet shall be included for driver reaction from all medians, curbs and other obstacles.

1. Table 5-802.3H indicates Minimum Roadbed Widths.

2. *Base Design*

a. All base construction for flexible pavements shall provide a 7 ton or 9 ton axle load to conform with the "Flexible Pavement Design Standards," as contained in 5-291.374 of the Design Manual, consistent with the volume and type of traffic anticipated in a 20 year projection.

b. Base thickness for rigid pavements shall conform with those provided under Regulation 5-802.3H for County State Aid Highways.

III. *Subdrainage*

The proportional share of storm sewer installations on County and Municipal State Aid Routes shall be based upon the following schedule:

A. *Catch Basins and Leads.* The initial installation or the necessary relocation of all catch basins and lead lines located within a County State Aid Highway or Municipal State Aid Street shall be eligible for full reimbursement. (Exception: Catch basins serving as manholes on the storm sewer main shall be computed as a part of the main.)

B. *Main Trunk Sewers, Outlets, and Manholes.* Storm sewer collection mains, outlet mains, and their manholes will normally be approved in the ratio that the drained area of the Municipal State Aid Street or County State Aid Highway, as adjusted, bears to the total area drained, as set forth in 5-892.605 of the State Aid Manual. For the purposes of this policy the total area drained is defined as all of the drained area immediately adjacent to and including the State Aid street or highway. Local areas outside of this definition could be drained in the proposed State Aid sewer by oversizing the basic systems at one-hundred (100) percent city or county expense to provide addi-

tional capacity for the added areas. For State Aid sewer outlets into an in-place city/county storm sewer, for all or part of the State Aid street drainage, a reasonable credit will be allowed. This will have the effect of increasing the participating State Aid cost of the storm sewer system over and above the basic split ratio. Except for said

outlet connections as noted above, State Aid payments will not be made on existing facilities.

C. *Maintenance.* No payments for sewer maintenance other than the regular State Aid maintenance allotment will be made on Municipal State Aid Streets or County State Aid Highways.

TABLE 5-802.3H
MINIMUM ROADBED WIDTHS

Through Lanes Number of lanes	Lane width, feet	Total width in feet Face to face of outer curbs					
		Undivided; no parking lanes	With median no parking lanes		Undivided; with parking lanes		With 4' median and two parking lanes
			4' med.	14' med.	One side	Both sides	
2**	A*10	—	—	—	—	40	—
	B 11	26	—	—	—	42	—
	C 12	28	—	—	36	44	—
4	A 10	44	44	48	58	60	68
	B 11	48	48	52	62	64	72
	C 12	52	52	56	66	68	76
6	A 10	64	68	78	72	80	88
	B 11	70	74	84	78	86	94
	C 12	76	80	90	84	92	100
8	A 10	84	88	98	—	—	—
	B 11	92	96	106	—	—	—
	C 12	106	104	114	—	—	—

* — Minimums
 A — Absolute minimum — to be used only under extreme conditions
 B — Acceptable minimum — where conditions warrant
 C — Desirable minimum — wherever feasible
 ** — Should not be considered except where continuous shoulder or parking lane is provided on each side.
 Traffic warrants for all multiple lane design will be based upon currently approved A.A.S.H.O. standards.

5-802.4 PROCEDURES

The following procedures will govern the selection and approval of State Aid construction projects:

I. The City or County Engineer prepares construction plans in accordance with approved design criteria and submits them to the appropriate District Engineer for his recommendations and approval.

II. The District Engineer then submits the plans if acceptable to the State Aid Section, where the Plans Unit makes a detailed check to assure compliance with the minimum standards and that any deviation therefrom is adequately justified, economically sound and consistent with good engineering practices. Following this check, the Plans Unit Supervisor recommends approval or disapproval of the plans to the State Aid Engineer. Upon final approval, the project then becomes eligible for State Aid participation.

III. The approved plans are then sent to the Reproduction Group, Road Design Section, where three prints are made. These prints are sent directly to the originating City or County Engineer. The original set of plans is then microfilmed and returned to the originating City or County Engineer. The film is filed by the State Aid Section.

5-802.5 RESPONSIBILITY

Responsibility for implementing these policies is assigned as follows:

I. City or County Engineer

A. To develop plans for all State Aid construction projects to meet these minimum requirements or to adequately justify to the satisfaction of the Commissioner any deviation therefrom.

B. To submit construction plans to the State Aid Engineer through the District Engineer for approval.

II. District Engineer — To review and transmit those recommended for approval to the State Aid Engineer.

III. Plans Unit, State Aid Section — To make a detailed check of the plans submitted to ascertain whether they meet the minimum requirements.

IV. State Aid Engineer — To review all plans, approve and record those found acceptable.

/s/ L. P. Zimmerman
Commissioner of Highways

Rules revised in 1961

Rules and Regulations were again revised with the State Aid committee meeting on July 20th and a hearing was held on September 29, 1961. Later in the year the rules were again promulgated on November 1, 1961. No changes were made in construction standards.

New construction standards established

In 1962 the need for changes in construction standards became a priority. On September 29, 1962, a committee met to establish new construction standards. Committee members were:

County Engineers:

Frank Turnacliff, Kanabec County
H. M. McLaird, Houston County
Carl Erickson, Washington County
L. P. Pederson, Hennepin County
Ray Stenburg, Clearwater County
George Wellner, Beltrami County

City Engineers:

C. A. Thompson, City of Minneapolis
Roger Nelson, City of Austin
Harley Schneider, City of New Ulm

District State Aid Engineers:

Ed Pearson, District 5
Graydon Boeck, District 9

The new standards, which became effective on January 7, 1963, were substantially those adopted by AASHO in December 1961. This was also the beginning of the use of "desirable" and "minimum" design standards listings. A standard permitting the use of concrete pavement for state aid rural construction was included.

Up to this time 8 degree curves were in use for 50 MPH design. The new standard provided for 7 degree curves as the new minimum.

TABLE 5-802.3A
(1) RURAL DESIGN GEOMETRIC STANDARDS

20-Year Projected A.D.T. Volume	Terrain	Basis of Design		Surface Type	Surface Width	Finished Roadbed	(2) Design Speed	(3) Max. Degree of Curvature	(4) Max. Gradient
		Desirable	Minimum						
Under 100	Flat	—	—	Traffic Bound	22	28	45	9	4
	Rolling	—	—	—	Traffic Bound	22	28	40	12
26									
Mountainous		—	—	—	Traffic Bound	22	26	30	23
	24								
	100 — 399	Flat	5 Ton	—	Plant Mix	22	30	50	7
28									
Rolling		—	—	—	Plant Mix	22	30	50	7
	28								
	Mountainous	—	—	—	Plant Mix	22	30	40	12
26									
400 — 749 (DHV — 100 to 199)		Flat	7 Ton	—	Plant Mix	24	36	60	5
	30								
	Rolling	—	—	—	Plant Mix	24	36	50	7
30									
Mountainous		—	—	—	Plant Mix	24	36	45	9
	28								
	750 — 1500 (DHV — 200 to 400)	Flat	7T Ult. 9T	—	Plant Mix or Conc.	24	40	60	5
32									
Rolling		—	—	—	Plant Mix or Conc.	24	40	50	7
	32								
	Mountainous	—	—	—	Plant Mix or Conc.	24	40	45	9
30									
Over 1500 (DHV — Over 400)		Flat	9 Ton	—	Plant Mix or Conc.	24	44	60	5
	34								
	Rolling	—	—	—	Plant Mix or Conc.	24	44	50	7
34									
Mountainous		—	—	—	Plant Mix or Conc.	24	44	45	9
	32								

- (1) The geometric design of all State Aid and Federal Aid Secondary Projects shall conform to either the Minnesota "Desirable" or "Minimum" Standards as approved January 7, 1963.
The Desirable Standards are substantially those adopted by A.A.S.H.O. in December 1961, and shall apply to all construction projects on which there has been no previously approved stage construction work; except as hereinafter provided. The Minimum Standards shall apply to the completion of all previously approved stage construction projects, and on new construction only where it is determined by the Commissioner that the Desirable Standards are not economically feasible or justified.
- (2) Determines Minimum Stopping Sight Distance.
- (3) Based on maximum superelevation of 0.08 Ft./Ft. Curves sharper than 7 degrees must be justified for all Projects have a projected A.D.T. of over 100 vehicles.
- (4) Short grades less than 500 Ft. in length may be 1 percent steeper. In Urban Areas and Extreme Cases, steeper grades may be considered.

**TABLE 5-802.3B
BRIDGE STANDARDS**

20-Year Projected Average Daily Traffic Volume	New Bridges	
	Clear Width Face to Face of Curbs	Design Load (AASHO)
Under 100	26 feet	H-20
100 — 399	28	H-20
400 — 749	28	H-20
750 — 1500	28	H-20
Over 1500	28	H-20

General Note: Consideration should be given to constructing all short span structures to full shoulder width.

The minimum horizontal clearance both right and left on structures, from the edge of the traffic lane to the face of parapet or railing shall be not less than 3.5 feet.

**TABLE 5-802.3C
BRIDGES TEMPORARILY PERMITTED
TO REMAIN WITHIN AN IMPROVEMENT PROJECT**

20-Year Projected Average Daily Traffic Volume	Clear Width	Load Capacity Inventory Rating
Under 100	18 feet	H12 — S9.6
100 — 399	23	H12 — S9.6
400 — 999	24	H12 — S9.6

TABLE 5-802.3D
MINIMUM ROADBED WIDTHS

Total width in feet
Face to Face of outer curbs

Through Lanes Number of lanes	Lane width, feet	Undivided; no parking lanes	With median no parking lanes		Undivided; with parking lanes		With 4' median and two parking lanes
			4' med.	14' med.	One side	Both sides	
2**	A*10	—	—	—	—	40	—
	B 11	26	—	—	—	42	—
	C 12	28	—	—	36	44	—
3	A 10	44	48	58	52	60	68
	B 11	48	52	62	56	64	72
	C 12	52	56	66	60	68	76
6	A 10	64	68	78	72	80	88
	B 11	70	74	84	78	86	94
	C 12	76	80	90	84	92	100
	A 10	84	88	98	—	—	—
	B 11	92	96	106	—	—	—
	C 12	106	104	114	—	—	—

*— *Minimums*
A — *Absolute minimum — to be used only under extreme conditions*
B — *acceptable minimum — where conditions warrant*
C — *Desirable minimum — wherever feasible*
**— *Should not be considered except where continuous shoulder or parking lane is provided on each side. Traffic warrants for all multiple lane design will be based upon currently approved A.A.S.H.O. standards.*

1963 changes

Rules and Regulations were again revised in 1963 following recommendations of the joint committee of county and municipal officials. They were approved November 12, 1963.

Highway user fund distribution provided

As a result of legislation and other matters that needed to be corrected, the joint committee of county and municipal officials met on July 22, 1965, to propose changes in Rules and Regulations for State Aid operations. The biggest change was providing for a change in the upper 5 percent of the Road User Fund [Article XIV, Section 5 of the Constitution provides for the distribution of the Highway Users Tax, being 62 percent Trunk Highway, 29 percent County State Aid and 9 percent Municipal State Aid. It also provides the following, "Five percent of the net proceeds of the highway user tax distribution fund may be set aside and apportioned by law to one or more of the three foregoing funds. The balance of the highway user tax distribution shall be transferred to the trunk highway fund, the county state-aid highway fund and the municipal state-aid street fund in accordance with the percentages set forth in the section. No change in the apportionment of the five percent may be made within six years of the last previous change."]

The public hearing was held on the 20th day of October, 1965, with the Rules and Regulations being approved on the 19th day of November, 1965.

Rural design geometric standards issued

On January 3, 1966, new Rural Design Geometric Standards were issued. The changes made were in traffic volume requirements and in some areas the allowable maximum degree of curvature.

(1) RURAL DESIGN GEOMETRIC STANDARDS

20 Year Projected A.D.T. Volume	Terrain	Basis of Design		Surface Type	Surface Width	Finished Roadbed	(2) Design Speed	(3) Max. Degree of Curvature	(4) Max. Gradient
		Desirable	Minimum						
Under 100	Flat	Desirable	—	Traffic Bound	22	28	45	8.5	4
		Minimum	—	Traffic Bound	22	26	40	11.5	5
	Rolling	Desirable	—	Traffic Bound	22	28	40	11.5	6
100 — 399	Mountainous	Desirable	—	Traffic Bound	22	26	35	14.0	7
		Minimum	—	Traffic Bound	22	26	30	21.0	9
	Flat	Desirable	5 Ton	Plant Mix	22	24	30	21.0	10
400 — 999 (DHV — 60 to 159)	Rolling	Desirable	5 Ton	Plant Mix	22	30	50	7.0	4
		Minimum	5 Ton	Road Mix	22	28	45	8.5	5
	Mountainous	Desirable	5 Ton	Plant Mix	22	30	40	11.5	6
1000 — 2000 (DHV — 160 to 299)	Flat	Desirable	7 Ton	Road Mix	24	26	35	14.0	8
		Minimum	7 Ton	Road Mix	24	36	60	4.5	3
	Rolling	Desirable	7 Ton	Road Mix	24	30	55	5.5	4
Over 2000 (DHV — Over 300)	Mountainous	Desirable	7 Ton	Road Mix	24	36	45	8.5	5
		Minimum	7 Ton	Road Mix	24	30	45	8.5	6
	Flat	Desirable	7T Ult. 9T	Plant Mix or Concrete	24	40	60	4.5	7
Over 3000 (DHV — Over 400)	Rolling	Desirable	9 Ton	Plant Mix or Concrete	24	32	55	5.5	3
		Minimum	9 Ton	Plant Mix or Concrete	24	40	50	7.0	4
	Mountainous	Desirable	9 Ton	Plant Mix or Concrete	24	40	45	8.5	5
Over 4000 (DHV — Over 500)	Flat	Desirable	9 Ton	Plant Mix or Concrete	24	32	45	8.5	6
		Minimum	9 Ton	Plant Mix or Concrete	24	40	45	8.5	7
	Rolling	Desirable	9 Ton	Plant Mix or Concrete	24	44	60	4.5	8
Over 5000 (DHV — Over 600)	Mountainous	Desirable	9 Ton	Plant Mix or Concrete	24	34	55	5.5	3
		Minimum	9 Ton	Plant Mix or Concrete	24	44	50	7.0	4
	Flat	Desirable	9 Ton	Plant Mix or Concrete	24	44	45	8.5	5
Over 6000 (DHV — Over 700)	Rolling	Desirable	9 Ton	Plant Mix or Concrete	24	34	45	8.5	6
		Minimum	9 Ton	Plant Mix or Concrete	24	44	45	8.5	7
	Mountainous	Desirable	9 Ton	Plant Mix or Concrete	24	44	40	11.5	8

- (1) The geometric design of all State Aid and Federal Aid Secondary Projects shall conform to either the Minnesota "Desirable" or "Minimum" Standards as approved January 3, 1966.
- The Desirable Standards are substantially those adopted by A.A.S.H.O. in December 1961, and shall apply to all construction projects on which there has been no previously approved stage construction work; except as hereinafter provided. The Minimum Standards shall apply to the completion of all previously approved stage construction projects, and on new construction only where it is determined by the Commissioner that the Desirable Standards are not economically feasible or justified.
- (2) Determines Minimum Stopping Sight Distance.
- (3) Based on maximum superelevation of 0.06 Ft./Ft. Curves sharper than 7 degrees must be justified for all Projects having a projected A.D.T. of over 100 vehicles.
- (4) Short grades less than 500 Ft. in length may be 1 percent steeper. In Urban Areas and Extreme Cases, steeper grades may be considered.

Need to improve roadways under turnback provision

In 1967, the Rules and Regulations had to again be revised to comply with changed legislation. The most pressing need was to provide for improving roadways under the turnback provisions. Under the Rules and Regulations promulgated in 1965, the turnbacks could be restored to the original geometrics but could not be improved.

On July 25, 1967, the joint committee of county and municipal officials met to redraft and put in order the Rules and Regulations. The public hearing was held on the 11th day of December, 1967. The Rules and Regulations were approved on the 23rd day of January, 1968.

However, everyone was put into shock when in February, 1967, the "new" Highway Design and Operational Practices Related to Highway Design was released by the American Association of State Highway Officials. Design standards were to have been changed on all roadways which would have increased construction costs beyond any forecast of future fundings. The new proposed requirements met strong opposition from County Engineers.

As a result of this opposition, Commissioner of Highways John R. Jamieson and Assistant Commissioner J. M. Evans appointed a committee to evaluate design standards by applying principles of engineering; the economic factors; and the safety factors as implied under current Highway Safety Standards, and recommend reasonable, yet workable standards to be used on Minnesota's secondary and county road systems.

The committee was made up of the following members:

Bernard L. Lieder, Polk County Highway Engineer, Chairman
C. E. Weichselbaum, State Aid Plans and Specifications Engineer,
Minnesota Highway Department, Secretary
Deane Anklan, Ramsey County Highway Engineer
I. M. Fellbaum, Morrison County Highway Engineer
Ralph Larson, District State Aid Engineer,
Minnesota Highway Department
R. L. Muchlinski, Redwood County Highway Engineer
Carl Sivertson, St. Louis County Highway Engineer
F. W. Thorstenson, Design Standards Engineer,
Minnesota Highway Department
Howard Bussard, Executive Secretary,
National Association of County Engineers

Design standards study made

The above committee made a detailed study of design standards, design in relation to maintenance equipment and total maintenance costs, and safety considerations, including flexibility to allow for terrain features. After considering all of the above, including the economic factors, the committee completed its study and made its report.

Following the review of report by the Office of State Aid and the nine district state aid engineers, it was submitted to the Executive Committee of the Minnesota County Engineers' Association for review and approval.

On November 15, 1968, it was submitted to Commissioner of Highways N. T. Waldor for his review and approval. Following his approval, the report was forwarded to the Planning and Design Policy Committee of AASHO (now AASHTO).

The submittal to AASHO was made as Minnesota's reply and request to AASHO for modification of the requirement of their "Highway Design and Operational Practices Related to Highway Safety," dated February 1967, also known as the "Yellow Book."

New standards

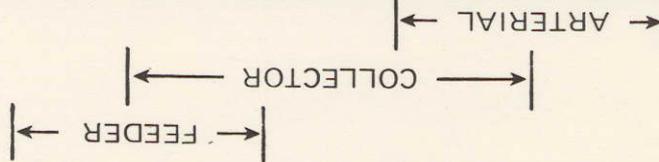
At the annual County Engineers' Institute, the new standards in the Committee of Standards report were adopted on January 22, 1969. However, two changes were made to them, that being width of bridges to remain in place, in the 0-100 ADT and 100-400 ADT categories.

The new standards were sent to the county engineers under Office of State Aid Memorandum No. 69-27, dated August 28, 1969.

The new standards were to be used on all projects designed after October 1, 1969, therefore, the effect was not noticeable until the construction season of 1970. See Exhibit E.

**RURAL UNDIVIDED GEOMETRIC STANDARDS
FOR SECONDARY HIGHWAYS**

Projected ADT	Lane Width	Shoulder Width	(1) Inslope	(2) Recovery Area	(3) Design Speed	Surfacing	Design Strength	(4) New Bridges		(5) Bridges to Remain	
								Width Curb-Curb	Width Curb-Curb	Width Curb-Curb	Structural Capacity
0 — 100	12'	2'	3:1	10'	30 — 50	Traffic Bound	—	28'	18'	H — 15	
100 — 400	12'	4'	4:1	15'	40 — 50	Paved	5T	32'	23'	H — 15	
400 — 750	12'	6'	4:1	20'	40 — 50	Paved	7T	36'	24'	H — 15	
750 — 1000	12'	8'	5:1	25'	40 — 60	Paved	7T	40'	28'	H — 15	
1000 & Over	12'	10'	6:1	30'	40 — 60	Paved	9T	44'	30'	H — 15	



- (1) Applies to Slope Within Recovery Area Only
- (2) Obstacle Free (Measured from Edge of Traveled Way)
- (3) Subject to Terrain
- (4) Minimum Widths Listed shall Apply, Except that Lesser Widths may be Approved upon Sufficient Justification Where the Bridge Length Exceeds 100'
- (5) When the Bridge Width is Less than the Traveled Way, Suitable Transition and Protective Devices shall be Provided
- (6) Curb to Curb Width on FAS Projects — Less than 750 ADT, Full Surface Width — 750 and over Present ADT, Full Shoulder Width

NOTE: New Bridges shall be designed for HS — 20 Loading unless other Loading is Sufficiently Justified

/s/ N. T. Waldor
Commissioner of Highways

Axle weight change

For some time counties had been experiencing high maintenance costs, including the need to construct overlays on roadways built to four and five-ton structural designs. In addition the local units of government and the legislature had been receiving requests to ease the springtime axle loading restrictions for school buses, milk haulers and others.

Therefore, the need to reduce future roadway maintenance costs and increase the structural carrying capacity in tons per axle was increased from five tons per axle to seven tons per axle on October 26th, 1970, for roadways with the structural design for projected traffic from 100 to 400 ADT. No other changes were made to any of the construction standards, county or municipal.

See Exhibit F Attached.

Policy for special resurfacing projects established

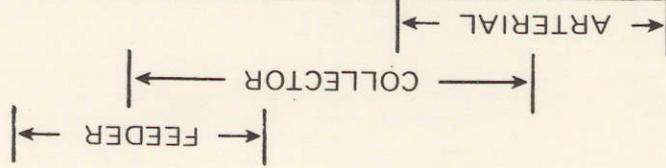
The cost of maintenance and the need for overlays continued over the next two years on the same roadways that had been constructed to four and five-ton structural design standards.

Counties were now facing the need for additional funding to construct overlay projects on existing bituminous-surfaced roadways or be forced to let them deteriorate and revert back to aggregate surfaces thereby losing the complete original investment.

As a result of the above problem, a new policy for Special Resurfacing Projects (overlays) was established on April 5, 1972, using State Aid construction funds. (copy attached) Exhibit G

**RURAL UNDIVIDED GEOMETRIC STANDARDS
FOR SECONDARY HIGHWAYS**

Projected ADT	Lane Width	Shoulder Width	(1) Inslope	(2) Recovery Area	(3) Design Speed	Surfacing	Design Strength	(4) New Bridges		(5) Bridges to Remain	
								Width Curb-Curb	Width Curb-Curb	Width Curb-Curb	Structural Capacity
0 — 100	12'	2'	3:1	10'	30 — 50	Traffic Bound	—	28'	18'	H — 15	H — 15
100 — 400	12'	4'	4:1	15'	40 — 50	Paved	7T	32'	23'	H — 15	H — 15
400 — 750	12'	6'	4:1	20'	40 — 50	Paved	7T	36'	24'	H — 15	H — 15
750 — 1000	12'	8'	5:1	25'	40 — 60	Paved	7T	40'	28'	H — 15	H — 15
1000 & Over	12'	10'	6:1	30'	40 — 60	Paved	9T	44'	30'	H — 15	H — 15



- (1) Applies to Slope Within Recovery Area Only
- (2) Obstacle Free (Measured from Edge of Traveled Way)
- (3) Subject to Terrain
- (4) Minimum Widths Listed shall Apply, Except that Lesser Widths may be Approved upon Sufficient Justification Where the Bridge Length Exceeds 100'
- (5) When the Bridge Width is Less than the Traveled Way, Suitable Transition and Protective Devices shall be Provided
- (6) Curb to Curb Width on FAS Projects — Less than 750 ADT, Full Surface Width — 750 and over Present ADT, Full Shoulder Width

NOTE: New Bridges shall be designed for HS — 20 Loading unless other Loading is Sufficiently Justified

/s/ N. T. Waldor
Commissioner of Highways

Exhibit G

**SPECIAL RESURFACING PROJECTS (Overlays)
(Minimum Requirements)**

Present A.D.T.	Strength in Tons	Surface		Shldr. — Shldr. Width	Design Speed	Max. Grade
		Type	Width			
Under 100	7	Paved	22	26	35	7
100 — 399	7	Paved	22	26	45	6
400 — 750	7	Paved	22	30	45	6
750 — 1000	7	Paved	24	36	45	6
1000 — 2000	7	Paved	24	44	45	6
Over 2000	7 Ult. 9	Paved	24	44	45	6

Projects will be considered for approval as special resurfacing projects if the existing road meets the minimum 1958 geometric standards as published in the State Aid Rules and Regulations of 1957.

The Money needs for *Additional Mat* will be dropped until the existing Geometric Standards, in effect at the time the road is upgraded, are met.

SEAL COATS

State Aid Construction Funds may be used for First Seal if:

1. Used within five years after construction.
2. Meets Specification 2356.

/s/ R. Lappegaard
Commissioner of Highways

Minimum roadway width increased

In 1975, a request made to have the Rules and Regulations changed was received from the Association of Minnesota Counties. The committee was appointed and held one meeting. Standards were reviewed and the procedure for changing discussed.

Copies of the proposed changes were sent to the Association of Minnesota Counties for review. No reply was received, or request to continue the process of implementing changes to the rules and regulations. There being no other pressing need to make changes the procedure was discontinued.

Over several years the standards for municipal construction projects remained the same. However, on November 21st, 1975, one change was made.

The minimum width of roadway, face of curb to face of curb was changed from 28 feet to 32 feet.

This change was brought about by the increasing numbers of bicycles using streets and the need to provide additional width for safety.

The standards in use as of the date June 1, 1977, and the latest change being November 21st, 1975, are:

MINIMUM URBAN ROADBED WIDTHS

Total width in feet
Face to Face of outer curbs

Number of lanes	Lane width, feet	Undivided; no parking lanes	With median no parking lanes		Undivided; with parking lanes		With 4' median and two parking lanes
			4' med.	14' med.	One side	Both sides	
2*	A 10	—	—	—	—	40	—
	B 11	32	—	—	—	42	—
	C 12	32	—	—	36	44	—
4	A 10	44	48	58	52	60	68
	B 11	48	52	62	56	64	72
	C 12	52	56	66	60	68	76
	A 10	64	68	78	72	80	88
	B 11	70	74	84	78	86	94
	C 12	76	80	90	84	92	100
8	A 10	84	88	98	—	—	—
	B 11	92	96	106	—	—	—
	C 12	106	104	114	—	—	—

A — Absolute minimum — to be used only under extreme conditions

B — Acceptable minimum — where conditions warrant

C — Desirable minimum — whenever feasible

* — Should not be considered except where continuous shoulder or parking lane is provided on each side.

Traffic warrants for all multiple lane design will be based upon currently approved A.A.S.H.O. standards

/s/ Frank D. Marzitelli
Commissioner of Highways

Rules changed to provide bridge fund

In 1976, Rules and Regulations had to be again changed because of legislative action. The first change had to be made to provide for the Town Bridge Account, which provided funds by way of the County Turn-back Account for replacing township road bridges. The second need was to provide rules for using monies made available to counties, municipalities and townships to replace deficient bridges under Chapter 339 Laws of 1967.

However, no changes were made in standards and these rules were promulgated on February 7, 1977.

Type of bridge	Unimproved		With median		Type of bridge	Type of bridge
	One side	Both sides	7' med.	14' med.		
A	40	—	—	—	A	A
B	42	—	—	—	B	B
C	44	30	—	—	C	C
D	46	32	38	48	D	D
E	48	34	40	50	E	E
F	50	36	42	52	F	F
G	52	38	44	54	G	G
H	54	40	46	56	H	H
I	56	42	48	58	I	I
J	58	44	50	60	J	J
K	60	46	52	62	K	K
L	62	48	54	64	L	L
M	64	50	56	66	M	M
N	66	52	58	68	N	N
O	68	54	60	70	O	O
P	70	56	62	72	P	P
Q	72	58	64	74	Q	Q
R	74	60	66	76	R	R
S	76	62	68	78	S	S
T	78	64	70	80	T	T
U	80	66	72	82	U	U
V	82	68	74	84	V	V
W	84	70	76	86	W	W
X	86	72	78	88	X	X
Y	88	74	80	90	Y	Y
Z	90	76	82	92	Z	Z

Prepared by the
 Department of Transportation
 Office of State Aid
 January 1978

W. Frank D. Marzoff
 Commissioner of Highways