CHAPTER 2

SCOPE PROCESS

GENERAL

The SDDOT is an active member of AASHTO to share common national design standards for the state highway system. The AASHTO Task Force on Geometric Design has completed the *Policy on Geometric Design of Highways and Streets* (the "Green Book") in 1990 (English) and 1994 (Metric). These documents are to be referenced for design standard guidance when establishing project criteria if this manual does not provide guidance in a particular design area.

In order to economize major highway construction projects in South Dakota, a formal process to establish the proper scope for these projects should follow the policy "South Dakota's Scoping Process for Highway Construction Projects" found at the following Internet address:

http://www.sddot.com/pe/Roaddesign/docs/policies/E-04-98.pdf

This process addresses the needs of the highway as well as better informs those involved in the design process, maintains consistency across the state, provides more accurate cost estimates and utilizes the available funding in the most effective manner possible. The process should be applied to all pertinent projects in the Surface Transportation Improvement Program (STIP).

The Final Scope Summary is the resulting detailed document used to describe a project's type of work, limits of work and the appropriate design standards to complete the project's construction plans. This document's shell can be found at the following Internet address:

http://www.sddot.com/pe/Roaddesign/docs/A4ScopeSummary.pdf

This document is recommended by the Chief Road Design Engineer (or appropriate Program Manager) and approved by the State Highway Engineer. The assigned designer uses a copy of the document for reference during the design process and places the original document in the project's correspondence file for future reference. The document includes (but is not limited to) compiled highway background information, AASHTO design standards, South Dakota design policies, outside agency needs and a variety of other factors used while determining the final scope of work for the project. The document may also be incorporated as an attachment to the Environmental Classification for project authorizations.

The Chief Road Design Engineer and the State Highway Engineer should approve any deviation from this document. A Program Revision Sheet may be required depending on the proposed changes.

GENERAL CRITERIA

Projects are brought about by the five-year STIP that incorporates a ranking system. The primary factors that drive the ranking system are surface condition, rideablity, remaining surface life, drainage adequacy, surface thickness, maintenance costs, roadway strength, safety and current traffic (including the number of trucks). Many of these factors have an impact on the Final Scope Summary.

Blank Final Scope Summary forms can be downloaded from the following Internet address:

http://www.sddot.com/pe/Roaddesign/Downloads.asp

Following are explanations of the different sections of the Final Scope Summary Document:

1. **Project Description** - Information provided in STIP - Project number(s), PCEMS number(s), county(s), location, length, type of improvement, cost, fiscal year, and STIP category.

   Other requirements are the unit of measure, assigned project coordinator and a list of other projects in the STIP within the area of this project.

2. **Project Background Information** – Background information assists the Scoping Team to make decisions and is obtained from:

   a. "Highway Needs Analysis and Project Analysis Report for State Administered Highways" (prepared by the Office of Planning and Programs)

   - Functional class
   - MRM to MRM
   - Year last graded
   - Year last improved
   - Surface condition index
   - Roughness index
   - Average strength
   - Surface type
   - Shoulder type
   - Total width
   - Right of way width
   - Current ADT
   - Future ADT
   - # of trucks
   - Accident rate
   - # of fatal
   - # of injury
   - # of property damage
   - # of bridges
   - # of box culverts (NBIS)

b. Video Log or On-site Inspection
   - Posted speed limit
   - Passing %
   - # of guardrail sites

c. Microfilm of underlying plans
   - # of horizontal curves @ each 5 mph design speed
   - # of vertical curves
   - Typical inslope
   - # of grades > 4%
   - # of grades >5%
   - Curb & gutter locations
   - # of box culverts not on NBIS

d. Previous inspection letters and related correspondence
   Noted deficiencies or other pertinent observations recorded (Program inspections by Executive Team, HES Team inspections, etc.)

e. Information requested from the Office of Data Inventory
   - Detailed accident data – reports, summary, etc.
   - Detailed traffic data - current ADT, projected ADT, DHV, % trucks

3. **Geometric Needs** – Information needed for designer to complete the project's plans according to the appropriate geometric standards as follows:

   a. **Design Speed** is the selected speed used to determine the various geometric design features of the highway. Design speed is derived from many factors and the following are to be considered during the decision process:

      - Highway functional classification – The highway's classification can dictate the design speed. However, route continuity should be reviewed to ensure driver expectancy is not compromised and safety is maintained. The following table provides guidance to consider:

Classification	Preferred (mph)	Acceptable (mph)	Minimum (mph)
Rural Interstate	75	70	65
Urban Interstate	75	65	55
Rural NHS & Arterial	70	65	50
Rural Collector	70	55	40
Rural Local Road	65	55	40
Urban NHS & Arterial	50	40	30

- Traffic data – This data may need review for capacity of the highway and if a certain design speed can improve capacity of the facility. For example, a higher design speed will not back up traffic (i.e. a horizontal curve or weaving between ramps)

- Terrain – categorization of Level, Rolling or Mountainous is derived from the video log, microfilmed plans and/or USGS quadrangle maps. The decision is somewhat objective, but is normally an obvious choice. Note that South Dakota's river breaks are considered mountainous where steeper grades are necessary. A project can have more than one terrain, however, route continuity should be reviewed. The following table can be referred to for consideration:

Type of Terrain	40 mph	50 mph	55 mph	60 mph	65 mph	70 mph
Level					x	x
Rolling			x	x	x	x
Mountainous	x	x	x	x	x	

- 85th-percentile speed – Generally, the current posted speed limit reflects this speed and the design speed should equal or exceed it. For example, normally a 70-mph design speed is desired in a 65-mph speed zone.

- Safety – Accident reports often reveal areas where speed is a factor. A higher design speed is a consideration, but not always the best solution.

- Cost – Review of cost is necessary if a higher design speed causes extreme excavation or right-of-way acquisition.

- Environmental impact – Review of impacts of a design speed on the surrounding environment is always necessary. Refer to FHWA's "Flexibility in Highway Design" guide (Publication No. FHWA-PD-97-062) for further assistance in selecting the proper design speed when flexibility may avoid such impacts.

The Region Engineer, Operations Engineer, Area Engineer, Office of Planning & Programs, Environmental Engineer and the general public should have input included in the final decision.

Design exceptions may be granted with appropriate supporting data submitted on a design exception form. Projects in the Black Hills and other areas which logically cannot be built to that standard without costing a tremendous amount are obvious candidates.

b. **Lane and Shoulder Widths** – Refer to the table on the following page.

SDDOT HIGHWAY WIDTH STANDARDS
for New Construction and Reconstruction Projects

Highway Type	Projected 20 Year Average Daily Traffic (ADT)	Lane Width Ft. (m)	Ultimate Shoulder Width* Ft. (m)	Project's Surfaced Shoulder Width Ft. (m)	Project's Total Surfaced Width Ft. (m)	Project's Bridge Width Ft. (m)	Proposed Shoulder Type	Comments on Different Mainline Surfacing: Asphalt Concrete	Comments on Different Mainline Surfacing: PCCP	Pads for Intersecting Roads, Approaches and Entrances	Comments
2 LANE RURAL AND URBAN (non curb and gutter)	0-250	12 (3.6)	6 (1.8)	**2 (0.6)**	**28 (8.4)**	**28 (8.4)**	Same as Mainline			2" AC	
	251-550	12 (3.6)	6 (1.8)	**4 (1.2)**	**32 (9.6)**	**32 (9.6)**	Same as Mainline	Bottom Lift **Full Width** Top Lift **24' (7.2)** w/12:1 slope		2" AC	
	551-1500	12 (3.6)	6 (1.8)	**6 (1.8)**	**36 (10.8)**	**36 (10.8)**	Gravel	Pave Mainline **28' (8.4)**	Pave Mainline **28' (8.4)**. Rumble Strips on outside 1.5'	2" AC	Gravel Shoulders not to be used over 5% gradeline, adjacent to guard rail, superelevated curves or adjacent to curb and gutter. Rumble Strips are on both shoulders
	1501-2500	12 (3.6)	8 (2.4)	**8 (2.4)**	**40 (12)**	**40 (12)**	Gravel	Pave Mainline **28' (8.4)**.	Pave Mainline **28' (8.4)**. Rumble Strips on outside 1.5'	2" AC	Gravel Shoulders not to be used over 5% gradeline, adjacent to guard rail, superelevated curves or adjacent to curb and gutter. Rumble Strips are on both shoulders
	2500+	12 (3.6)	8 (2.4)	**8 (2.4)**	**40 (12)**	**40 (12)**	Minimum 2" Asphalt Concrete	Bottom Lift **Full Width** Pave Mainline **24' (7.2)**. 1.5' Rumble Strips outside 12' Line	Pave Mainline **28' (8.4)**. Rumble Strips on outside 1.5'	NA	Rumble Strips are on both shoulders
4 LANE DIVIDED ARTERIAL	ALL	12 (3.6)	4 (1.2) Inside 8 (2.4) Outside	**4 (1.2) Inside** **8 (2.4) Outside**	**36 (10.8)**	**36 (10.8)**	Minimum 3" Asphalt Concrete	Pave Mainline **26' (7.8) (includes 2' outside shoulder)**. 1.5' Rumble Strips outside 12' Line	Pave Mainline **26' (7.8) (includes 2' outside shoulder)**. Rumble Strips on outside 1.5'	NA	Rumble Strips are on both shoulders
INTERSTATE	ALL	12 (3.6)	4 (1.2) Inside** 10 (3.0) Outside	**4 (1.2) Inside** **10 (3.0) Outside**	**38 (11.4)**	**40 (12)**	Minimum 3" Asphalt Concrete	Pave Mainline **26' (7.8) (includes 2' outside shoulder)**. 1.5' Rumble Strips outside 12' Line	Pave Mainline **26' (7.8) (includes 2' outside shoulder)**. Rumble Strips on outside 1.5'	NA	Rumble Strips are on both shoulders
INTERCHANGE RAMPS	ALL	19 (5.7) ***	2 (0.6) Inside 4 (1.2) Outside	**2 (0.6) Inside** **4 (1.2) Outside**	**25 (7.5)**	**25 (7.5)**	Same as Ramp			NA	

* - Will be used to determine subgrade width

** - 6' if abutting sections are 6'. 10' shoulder to be used when more than 2 lanes in one direction

*** - Wider on curves with radius of 500' (150 m) or less. Refer to Table X-3 in Green Book

c. **Other Geometric Needs** - Once the design speed and type of terrain is determined, other design criteria are determined. The following list of a criterion is to be extracted from the following chapters or found in the appropriate AASHTO documentation.

- Maximum Superelevation – Chapter 5
- Cross Slope – Chapter 7
- Maximum Degree of Curve – Chapter 5
- Maximum Grade – Chapter 6
- Stopping Sight Distance – Chapter 6
- Climbing Lanes – Chapter 6
- Curb & Gutter – Chapter 7
- Parking – Chapter 17
- Sidewalk and Recreation Trail – Chapter 17
- Design Vehicle – Chapter 12
- Median – Chapter 7
- Right of Way – Chapter 9

4. **Safety Needs** - Reference to policies "Clear Zone, Approach Pipe, Cross Pipe and Approach Slope Treatment", "Interstate Side Slopes" and "Roadside Safety Policy" as well as Chapters 7 and 10 should be made to properly address all the safety needs on the project.

5. **Drainage Needs -** Determine whether existing drainage structures are adequate or need replacement. Also, review drainage issues and whether special treatment is necessary.

   a. Reinforced Concrete Pipe - 50 years old should be considered for replacement
   b. Corrugated Metal Pipe – 30 years old should be considered for replacement
   c. Special Outlets – determine if additional property needs purchasing to maintain proper outlet of drainage
   d. FEMA – Consult with the Hydraulic's Engineer in the Office of Bridge Design whether special flooding criteria needs to be adhered to.
   e. Stream Relocation – Early determination if a stream needs to be relocated is necessary to coordinate efforts with the appropriate resource agency(s). If necessary and allowable, special design methods are necessary and consultation with the Landscape Designers should be made.

6. **Traffic Needs** – Review with traffic engineers from Road Design, Operations and the Region offices should be made prior to finalizing any scoping needs.

   a. **Level of Service (LOS)** - A LOS B or better is preferred in most areas of South Dakota and may be the basis for determination of multiple lanes. LOS C is acceptable where traffic growth is not anticipated. Consultation with the Highway Capacity Manual should be made where more complex traffic needs to be analyzed.
   b. **Number of Lanes** –The following should be used for guidance:

No. of Lanes	Traffic Volume (20 year forecasted ADT)	Left-Turn Movements (Peak Hour)	Comments
2	Up to 5000	0-25	
3	Up to 5000	Greater than 25	Depending on turning movements, more ADT is very possible. Analyze LOS.
4	5000 to 30,000	0-5	Use this section only if low turning movements and no accident history
5	5000 to 30,000	Greater than 5	Consider median if there are numerous access
6	Greater than 30,000	Median to be used	Consideration should be given to speed, geometrics and other factors. Refer to Highway Capacity Manual for proper lane numbers.

   c. **Access** - It is always the goal to limit the number of access along our highways and reference to the Access Management Manual should be made to determine appropriate spacing and other access criteria.
   d. **Intersection -** Refer to Chapter 12
   e. **Traffic Signal -** Refer to Chapter 15.
   f. **Permanent Signing & Pavement Marking** – Early determination is to be made whether the project will contain these items or not. Design is to be done by the Region Traffic Engineer.
   g. **Frontage Roads** – If frontage roads are necessary adjacent to a highway in order to provide convenient access to the adjacent property, the standards for such roads are to meet local jurisdiction standards (typically local road standards). Refer to Chapters 12 & 13 as well as AASHTO's Green Book.
   h. **Weaving** – Review of potential weaving problems is necessary to provide a safe and efficient highway. Refer to Chapter 13 and the Highway Capacity Manual.

i. **Pedestrian Traffic** – Review of additional capacity of the sidewalk, crosswalk and/or grade separation should be made to include in the scope of work. Reference to national standards will be necessary until South Dakota develops more demand for state standards.
j. **Construction Signing** – Review of special needs outside the normal should be made to include special traffic handling in the design.
k. **Construction Detour** – Early determination of how traffic will be detoured will allow design details to accommodate special needs.

7. **Materials & Surfacing** – Determination of material needs will clearly identify needs involved with cross sections and whether value engineering is necessary.
   a. **Undercut** – Depth of undercut is normally 2 feet, but determined by the Office of Materials & Surfacing
   b. **Salvage/Virgin/Haul** – Will existing surfacing be salvaged? Amount to be determined by the Office of Materials & Surfacing.
   c. **Borrow** – Early identification of additional dirt needs assists locating sources.
   d. **Surfacing Type** – Type of surface determines grade establishment due to varying depths. The Surfacing Selection Committee will recommend the type for approval of the Director of Planning/Engineering
   e. **Grading Type** – Is it full grading, shoulder widening, etc.? Refer to policy "South Dakota's Scoping Process for Highway Construction Projects" for assistance of acceptable highway conditions prior to complete reconstruction.

8. **Maintenance Needs** – Involvement of maintenance personnel in the scoping process will help identify issues along the project.
   a. **Snow Drifting** – Where snow drifting has been prevalent, 7:1 backslopes should be used and the gradeline should be raised to prevent such drifting.
   b. **Water Overtopping** – Areas noted as having water overtopping should have the outlet of the drainage identified and the height of the highway adjusted accordingly. Other options may include improving the drainage area's outlet or increasing the capacity drainage structures. Coordination with the Hydraulic's Engineer should be made.
   c. **Ditch Work** – If regrading is not being done with this project, areas where ditches cause maintenance problems should be identified. Potential remedies are cleaning the ditch out , shaping the ditch, lining the ditch with concrete, etc.

9. **Structure Needs** – The Office of Bridge Design determines structure replacement needs and other criteria. The eventual treatment with the project can influence the gradeline, subgrade width, detour needs, approach rail, etc. Early coordination will ensure proper scope of work.

10. **Other Needs** – A few other items to review for project needs should be done to have a complete scope of work.
    a. **Roadway Lighting** – Refer to Chapter 15 and the "Policy & Procedure for Lighting of State Highways"

b. **Rest Areas, Information Centers, Scenic Overlooks** – Refer to Chapter 14
c. **Aesthetics** – In certain areas of the state, it will be necessary to return the project to an aesthetically pleasing site. It may be necessary to coordinate with local historic agencies. Such items as decorative walls, colored concrete, landscaping, etc. will enhance the project's appearance. Refer to Chapter 14.
d. **Erosion Control** – Review of special erosion control needs may require special ditch sections or other special designs to be incorporated into the project. Refer to Chapter 14.
e. **Noise Barriers** – The Environmental Engineer will determine if a noise barrier wall is necessary or not. If so, refer to Chapter 17.
f. **Utilities** – Special accommodations may be needed to avoid expensive to move a utility line. Determination of whether Subsurface Utility Engineering is necessary will help make the design be completed efficiently as well as assist construction activities.
g. **Environmental** – The Environmental Engineer will determine if any special design may be needed to avoid or mitigate impacts to an environmental feature.

11. **Scope Summary**
    a. Project's Design Scope Summary – This is a brief summary of what work will be done on the project.
    b. Project's Type of Improvement – This is a brief title of the work to be performed to better describe the project.
    c. Project's Location and Limits of Work – This describes in detail where the work will be included. It includes necessary side road/street work as well as and outlet work.
    d. Right-of-Way and/or Environmental Needs – This clearly identifies what will be required from these offices to complete the project. What widths of right-of-way, number of parcels and impacts are required?
    e. Survey Need – This identifies what field survey is necessary prior to completing the design. An official survey request is to be sent to the responsible Area Office with a copy to the Survey Group in Road Design.
    f. Design Exception – If a particular design standard cannot be met on this project and a design exception is desired, a brief statement of why the exception is needed is documented. An official Design Exception Form is required to be completed and approval from the State Highway Engineer. The form is located on the following page.

Once the Final Scope Summary is completed, attach the proper county map(s) with the begin and end of the project depicted for identification purposes and use by the Environment Engineer. The Summary is then signed by the recommending office's Program Manager and forwarded to the State Highway Engineer for approval. The Summary is returned and filed in the originating office's file with copies sent to all who were involved in the scoping process.

SOUTH DAKOTA DEPARTMENT OF TRANSPORTATION
REQUEST FOR DESIGN EXCEPTION

Project Numbers: _____ County _____ PCEMS _____
Project Description: _____
Description of Exception(s): _____
Degree Standard is Being Reduced:_____
Mitigation Measures Considered/To Be Provided:_____

TRAFFIC DATA					
Current Total ADT		Current ADT Year		D	
Future Total ADT		Future ADT Year		Current Directional ADT	
Posted Speed		Proposed Design Speed		% Trucks	

SAFETY					
Functional Classification	Rural Interstate			Urban or Rural	Rural
Statewide Accident Rate/This Class:			Accident Rate for this Section of Roadway		
Fatals		Injuries		PDO	

GEOMETRIC DATA - EXISTING (PROPOSED)					
Traffic Lane Width		Shoulder Width		R/W Width	
Vertical Clearance		Clear Zone Distance		Cross Slope	

ADJOINING SECTION GEOMETRICS					
Traffic Lane Width		Shoulder Width		R/W Width	
Vertical Clearance		Clear Zone Distance		Cross Slope	

COST DATA			
Project Cost as Proposed		Project Cost Full AASHTO Standards	

Justification:

Approval:

_____ Date: _____ _____ Date: _____
Program Manager State Highway Engineer

_____ Date: _____
FHWA Division Administrator*

*FHWA exception only needed for non-exempt NHS construction/reconstruction projects on the 13 controlling criteria