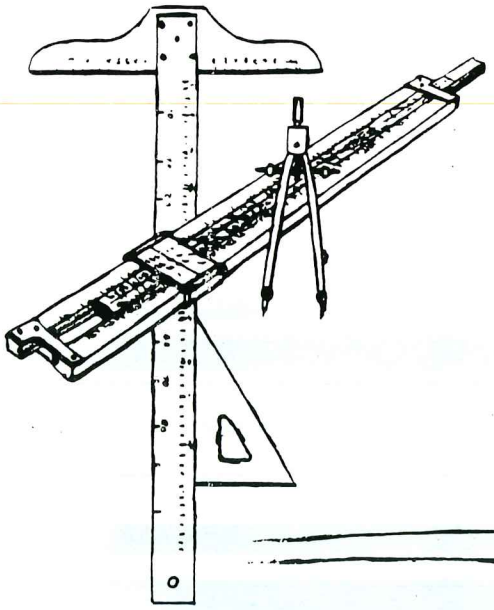
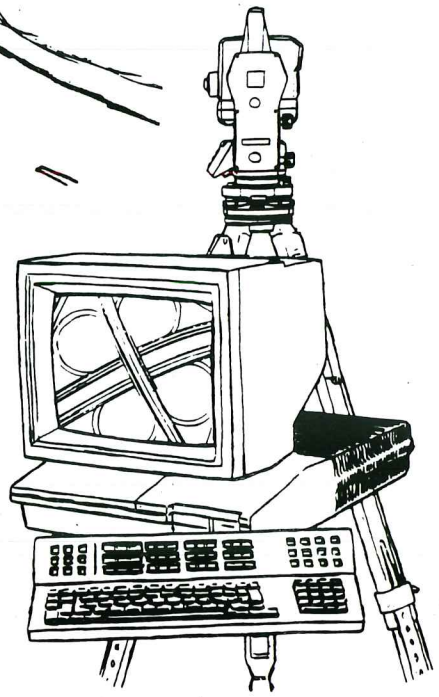


MN/DOT ENGINEERING RELATED STAFFING NEEDS

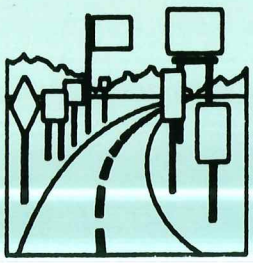
A GUIDE TO THE FUTURE



June 1988

Minnesota Department of Transportation

Table of Contents



Executive Summary

Task Force Report on Mn/DOT Engineering Related Staffing Needs

A Guide To The Future

EXECUTIVE SUMMARY

Introduction

In March 1988, a Task Force was created to study future engineering and para-engineering staffing needs in the Minnesota Department of Transportation (Mn/DOT). The charge to the Task Force is included in Appendix A of this report. This report provides background information and documents principal Task Force findings and recommendations for enhancing engineering flexibility and clarifying engineering specialist roles and responsibilities in Mn/DOT.

Assumptions

In analyzing future engineering related staffing needs, the Task Force used the following baseline assumptions:

- Annual highway construction and maintenance programs will remain at relatively the same work activity levels.
- Future comparable highway program levels will be met without increases in permanent complement positions.
- Growing travel demands and more complex transportation issues will result in continuing needs for innovative, flexible and diversified engineering skills.
- The current complement of 150 principal engineer positions are critical to successful program delivery.

- On average, Mn/DOT engineers and engineering specialists can be expected to retire from service at the age of 61. However, the adoption of different state retirement provisions, such as the Rule of 90, could significantly change the attrition rates and staffing needs described in this report.

Study Findings

Based on an analysis of complement trends, issues and needs, the Task Force identified the following study findings:

- Future transportation challenges will require a continuing commitment to quality engineering in the delivery of transportation programs and services.

- The vision of the future calls for highly professional, technologically progressive and innovative engineering skills.

- The combined effects of retirements and promotions will reduce the numbers of incumbent Mn/DOT principal engineers by over 60 percent (97 individuals) in ten years and over 95 percent (146 individuals) in fifteen years.

- Anticipated administrative and principal engineer attrition rates exceed the number of graduate and senior engineers presently available in the department to competitively fill anticipated vacancies.

- The culture of the work force is changing. Two wage earner families are common and individuals are becoming more reluctant to consider relocation opportunities. Therefore, Mn/DOT must develop an adequate pool of competent potential candidates for all classes to fill future positions.

- Engineering specialist classifications have played and will continue to play a valuable role in program delivery by providing important para-engineering support.

- Work activities performed by engineering specialist classes have become more diverse and specialized.

- It is becoming more and more difficult to distinguish between the engineering specialist and senior engineering specialist classes.

- Senior engineering specialist classifications overlap traditional senior engineering functions.
- Substantial anticipated retirements in both engineering specialist classifications will provide opportunities to evaluate alternative strategies for ensuring engineering stability.
- Job tasks and responsibilities in Mn/DOT district office functional units are similar and comparable. Therefore, a single preferred district organization model can be developed to manage future staffing decisions.
- There is currently a fairly large salary and Hay rating gap between senior highway technicians and engineering specialists.
- Present classifications do not include provisions to address the number of senior highway technicians in Mn/DOT that have exceptional technical skills or perform some supervisory responsibilities.

Recommendations

Based on study findings the Task Force believes that Mn/DOT should adopt and implement staffing strategies that will ensure a continuing strong commitment to QUALITY engineering in the delivery of future transportation programs and services. Furthermore, Mn/DOT should progressively increase engineering skills in the department to ensure all functional work units are capable of meeting future transportation challenges and work program expectations.

To accomplish these objectives, the Task Force recommends that Mn/DOT:

1. Annually increase the number of engineers hired by the department, until a desired combined complement level of 225 is achieved for graduate and senior engineers.

2. Clarify criteria and develop guidelines to determine when engineers, engineering specialists or other appropriate classifications should be used to create new or fill vacant engineering specialist positions.

3. Create an interim management review team, that includes Task Force members, to review all requests over the next two years that propose to use engineering specialists for filling vacancies, reallocating jobs or creating new positions.

4. In the next ten years, evaluate opportunities to convert 30 percent of the engineering specialist vacancies to senior or graduate engineer positions as engineering specialists retire or leave the department.

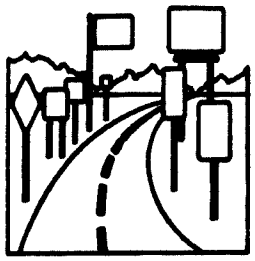
5. In the next ten years, convert the estimated 30 senior engineering specialist vacancies to senior engineering positions as senior engineering specialists retire or leave the department. This recommendation should continue to be implemented until all senior engineering specialist positions are reallocated.

6. Investigate the feasibility of creating new classifications between the senior highway technician and engineering specialist classes to address department needs for individuals with exceptional technical or supervisory skills.

7. Develop succession planning models for all key classifications that are directly related to program delivery so that future staffing issues and needs may be identified and managed.

Conclusion

Throughout the years, Mn/DOT success has been directly tied to the strength of employee skills and the strong commitment to quality public service. Implementation of Task Force recommendations will continue this tradition by providing the long-term flexibility and diversity in engineering, para-engineering and technical skills required to meet future transportation challenges in Minnesota.



Task Force Report

Mn/DOT Engineering Related Staffing Needs

A Guide To The Future

Task Force Report on Mn/DOT Engineering Related Staffing Needs

A Guide To The Future

INTRODUCTION

Throughout the years, the Minnesota Department of Transportation (Mn/DOT) has benefited from a highly experienced, skilled and creative work force. Employee commitments to public service and engineering excellence have made Mn/DOT a nationally recognized leader in highway design, construction and maintenance activities.

Engineering and technical skills are critical to the successful delivery of Mn/DOT transportation programs and services. Rapidly advancing technology, growing travel demands and more complex transportation issues emphasize the need for more sophisticated and innovative engineering and technical skills.

To meet future transportation challenges, Mn/DOT employee resources must match anticipated work demands. Job requirements and complement changes must be analyzed to assure that appropriately skilled employees are available to maintain a continuing commitment to quality programs and services.

In Mn/DOT, anticipated retirements will significantly affect the levels of engineering skills available in the department.

To address this situation, staffing strategies must be identified to provide the highly professional, technologically progressive and creative engineering skills necessary to meet future transportation needs.

In spring 1988, a Task Force was created to study future Mn/DOT engineering and para-engineering staffing needs. The charge to the Task Force, including study goals and objectives, is included in Appendix A of the report.

Task Force members included the following individuals:

Don Raisanen (Chair)
District Engineer
Brainerd District Office

Don Flemming (Vice Chair)
State Bridge Engineer

Bob Wolfe
District Engineer
Bemidji District Office

Merritt Linzie
Director
Office of Highway Programs

Art Hill
Assistant District Engineer
Detroit Lakes District Office

Richard Sullivan
Director
Office of Materials, Research and Standards

Gerry Rohrbach
Director
Design Services Section

Wayne Brede
Director
Employment Services Section

This report provides background information and documents principal Task Force findings and recommendations for enhancing engineering flexibility and clarifying engineering specialist roles and responsibilities in Mn/DOT.

STAFFING TRENDS AND NEEDS

To deliver an average annual highway construction program of approximately $350 million requires an appropriate balance of engineering, engineering specialist and technician skills.

A variety of classifications are used to distinguish between different levels of engineering, engineering specialist and technician skills and responsibilities. These classifications, bargaining units, staffing levels and salary ranges are depicted in Figure 1.

Figure 1

MN/DOT Engineer, Engineering Specialist and Technician Employee Classifications

Classification	Bargaining Unit	Current Complement	Range	Salary-July 1988 Min	Max
Administrative Engineer		77			
Senior	M	(18)	20M	$44,119	-$58,527
Management	M	(46)	18M	40,987	- 54,497
Professional	MGEC	(13)	12I	37,187	- 50,175
Principal Engineer	MGEC	150	11I	35,830	- 48,337
Senior Engineer	MGEC	97	08I	32,030	- 43,222
Graduate Engineer	MGEC	81			
Graduate 2	MGEC	(56)	04G	27,562	- 34,536
Graduate 1	MGEC	(25)	01G	24,701	- 30,861
Senior Engineer Specialist	MGEC	52	07I	30,861	- 41,593
Engineering Specialist	MGEC	123	05I	28,647	- 38,607
Senior Highway Technician	AFSCME	550	69I	24,597	- 30,923
Intermediate Highway Technician	AFSCME	363	64I	21,360	- 26,893
Highway Technician	AFSCME	168	59I	18,646	- 23,260

Note:
M= Management
MGEC= Minnesota Government Engineers Council
AFSCME= American Federation of State, County, and Municipal Employees, Council 6, AFL-CIO

The following provides a brief description of the various trends and issues that are affecting Mn/DOT staffing needs in the engineering, engineering specialist and highway technician classifications.

ENGINEERS

Skills and Responsibilities

Engineering continues to be the mainstay of most highway design and construction activities. Engineers have a college degree that covers a broad range of scientific and problem solving skills. This basic knowledge coupled with training in the application of new technology has allowed Mn/DOT engineers to be innovative and flexible in the field of transportation. In Minnesota, engineering registration is required for the signing of all project plans and the approval of all construction activities. Engineers also serve as the predominate source for Mn/DOT management positions.

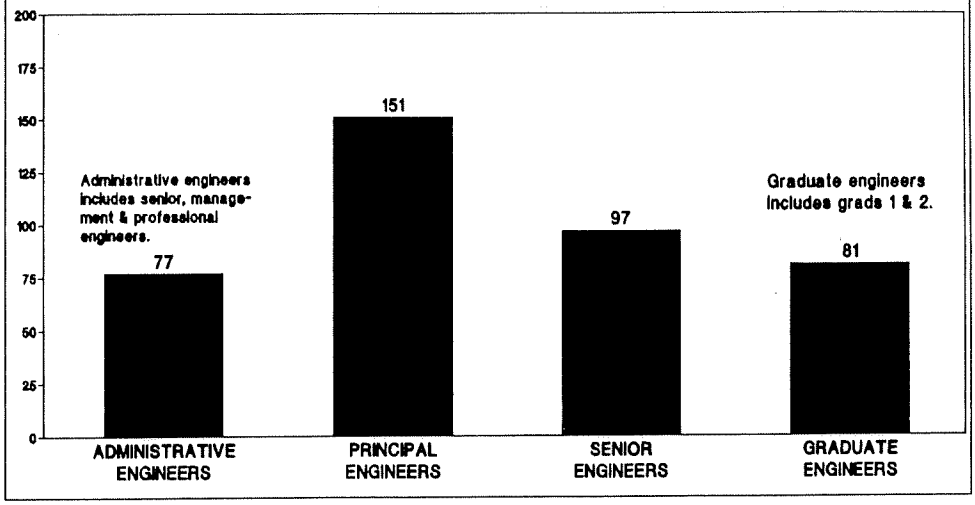
Classifications and Staffing Levels

Mn/DOT's engineering complement can be divided into the following four major classifications based on experience requirements and job responsibilities.

- Administrative Engineers (including senior, management and professional classifications)
- Principal Engineers
- Senior Engineers
- Graduate Engineers (including Graduate I and Graduate II classifications)

Figure 2 shows the approximate number of current employees in each of the four major engineering classifications as of April 1988.

Figure 2
CURRENT NUMBER OF MN/DOT ENGINEERS IN MAJOR JOB CLASSIFICATIONS



Over the years, the successful delivery of Mn/DOT's annual highway construction program has come to be closely associated with the numbers of seasoned and experienced principal engineers and senior highway technicians employed by the department. Because the program has remained at relatively constant levels since 1975, conscious efforts have been made to achieve about 150 principal engineering and approximately 550 senior highway technician positions.

Figure 3 shows Mn/DOT complement staffing trends since 1975 for each of the major engineering, engineering specialist and technician classifications in the department. As can be seen, principal engineer and senior highway technician complement levels have remained within 10 percent of their 1975 levels over the thirteen year time period. In contrast, Mn/DOT administrative engineering levels have declined by about 27%.

Figure 3

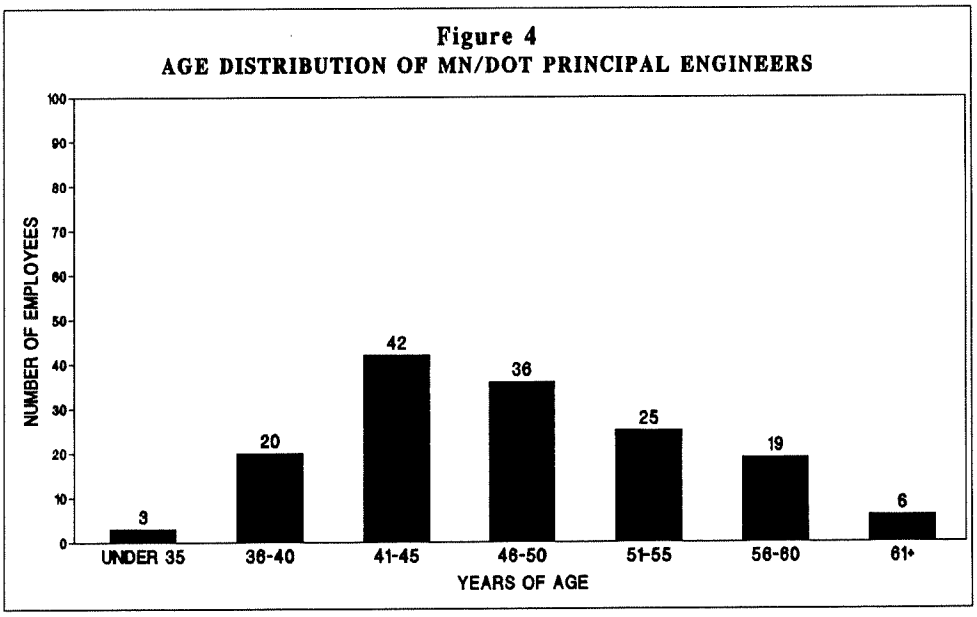
Mn/DOT Complement Trends
1975-1988

	1975	1980	1985	April 1988	% Change 1975-88
Administrative Engineers	106	92	83	77	- 27%
Principal Engineers	158	170	153	151	- 5%
Senior Engineers	107	114	103	97	
Graduate Engineers	44	23	70	81	+ 18%
Senior Engineering Specialists			20	52	
Engineering Specialists	159	164	140	123	+ 10%
Senior Highway Technicians	508	536	546	550	+ 8%

Future Complement Trends and Issues

The aging of Mn/DOT's work force will have a significant impact on future engineering related complement levels. Age distribution data for each of Mn/DOT's engineering related classifications are included in Appendix B. Figure 4 shows the age distribution of Mn/DOT principal engineers as of April 1988.

Figure 4
AGE DISTRIBUTION OF MN/DOT PRINCIPAL ENGINEERS



Based on an average retirement age of 61, one-third, or 50 of Mn/DOT's principal engineers would be eligible for retirement in the next ten years. Looking ahead fifteen years, this percentage jumps to over 57 percent, or 86 of total Mn/DOT principal engineers.

Promotional opportunities to higher level administrative engineer positions will also reduce the numbers of incumbent principal engineers. Data shows that approximately 61 percent, or 47 of Mn/DOT's administrative engineers would be eligible for retirement in the next ten years, with another 13 retirements in the following five years.

A major question arises as to whether sufficient numbers of senior and graduate engineers will be available to fill future principal engineer vacancies. Figures 2 and 3 show that there are currently 178 senior and graduate engineers available to fill future principal engineer vacancies. This represents a ratio of roughly 1.2:1 (178/151).

More dramatic trends emerge when this ratio is adjusted to take into account senior engineer retirements and other factors that will limit the number of individuals available and qualified for promotion. For example, about one-quarter, or 24 of Mn/DOT senior engineers will be eligible for retirement in the next ten years, with another 12 over the fifteen year time period. For the ten year time period, this reduces the ratio of senior/graduate engineers to principal engineers to about 1:1.

The loss of some engineers to employers outside of Mn/DOT and the probability that not all senior engineers will desire or be capable of advancement will further limit Mn/DOT's ability to competitively fill anticipated principal engineer vacancies.

Mn/DOT has been taking steps to gradually increase senior and graduate engineer positions. Referring back to Figure 3, the combined total of graduate and senior engineers has increased from 151 to 178 since 1975.

Although progress is being made, it is clear that more aggressive efforts should be undertaken to expand the department's pool of senior and graduate engineers. Task Force members agree that the ratio of senior/graduate engineers to principal engineers should be increased to about 1.5:1. Meeting this goal would add approximately 50 senior and graduate engineer positions, increasing combined complement levels to about 225 in these two classes.

Increasing senior and graduate engineering complement levels will expand engineering and new technology skills in the department. It will also increase the stability of individual functional units and enhance engineering flexibility and diversity in the delivery of transportation programs and services. In addition, a higher ratio of senior/graduate engineers will increase competition and should result in a more qualified pool of promotional candidates for principal engineer positions.

ENGINEERING SPECIALISTS

Skills and Responsibilities

Mn/DOT has two engineering specialist classes that lie in between registered engineers and highway technicians. For many years, Mn/DOT's engineering specialists have played an important role in program delivery. Engineering specialists perform a variety of para-engineering responsibilities that approach the skill levels of registered engineers. Because most engineering specialists tend to stay in similar positions for long periods of time, they offer stability and long-term knowledge of department processes and practices.

Classifications and Staffing Levels

The engineering specialist classification was created in the 1950's, when the beginning of Minnesota's interstate system produced an increase in work demands. The engineering specialist classification was originally designed to provide para-engineering support in plan preparation and construction supervision. Through the years, the scope of engineering specialist job tasks have grown to include a wide variety of Mn/DOT district and central office engineering related work activities.

By the early 1980's, the skills and job responsibilities of a number of engineering specialists had increased to the extent that they were performing at or close to senior engineering levels. In 1984, a new senior engineering specialist classification was created with a Hay point rating equivalent to the senior engineer class.

As of April 1988, there were 52 senior engineering specialists and 123 engineering specialists in the department. Central offices presently dominate in the use of engineering specialists, while district offices are the predominate users of senior engineering specialist positions.

Figure 5 shows how districts and central offices compare in the use of engineering specialists and senior engineering specialists.

Figure 5

Percentage of Mn/DOT Engineering Specialists
Central Offices vs. Districts

	Engineering Specialists	Senior Engineering Specialists
Central Offices	65%	23%
District Offices	35%	77%
	100%	100%

Future Complement Trends and Issues

Three significant trends are presently occurring which will influence future staffing in the engineering specialist classifications. These trends include:

-- Wider diversity in work assignments and an increasing number of one-of-a-kind jobs are making it more difficult to distinguish between the two engineering specialists classifications.

-- Rapid growth in the senior engineering specialist class is resulting in more overlap of traditional engineering functions.

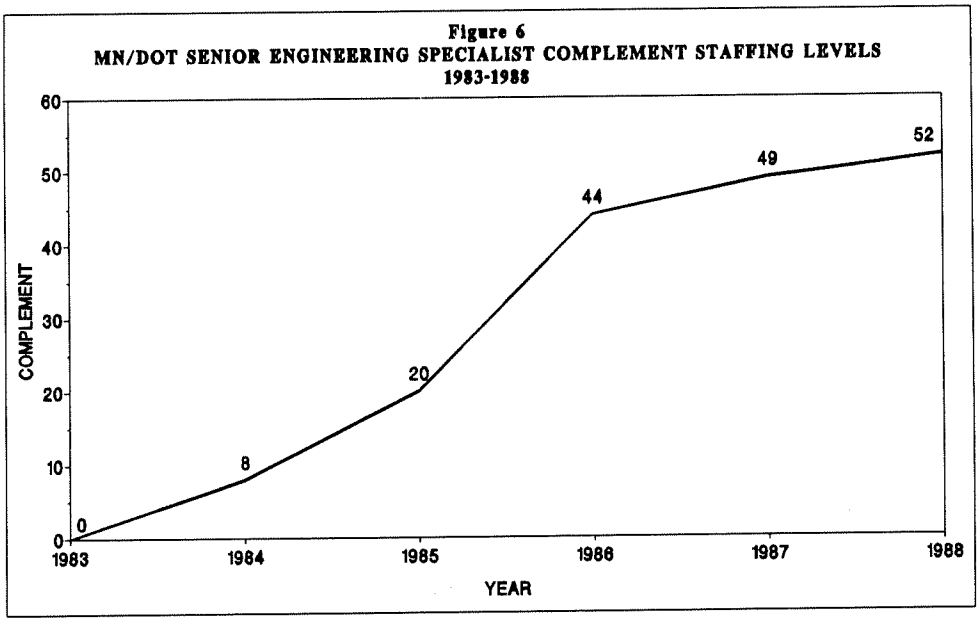
-- Substantial retirements in both engineering specialist classes will challenge the department to evaluate alternative strategies for ensuring stability in the delivery of programs and services.

Recent evidence indicates that the variety of engineering specialist work activities have increased dramatically since the creation of the class. There is also a growing number of one-of-a-kind engineering specialist jobs in Mn/DOT.

It is difficult to determine if this is a function of increasing specialization of work tasks or the result of specific individual skills and motivation.

Wider diversification and increasing specialization make it difficult to distinguish between engineering specialist and senior enginering specialist classes particularly in central office jobs. The inconsistent application of distinguishing criteria has unfairly influenced employee expectations for advancement. It also limits management's ability to determine long-term staffing needs and increases the potential for inconsistent promotional practices.

A second trend influencing Mn/DOT staffing needs is the rapid growth in senior engineering specialist positions. Since 1983, the class has grown to 52 positions. Figure 6 shows the growth that has occurred in this class during the last five years.



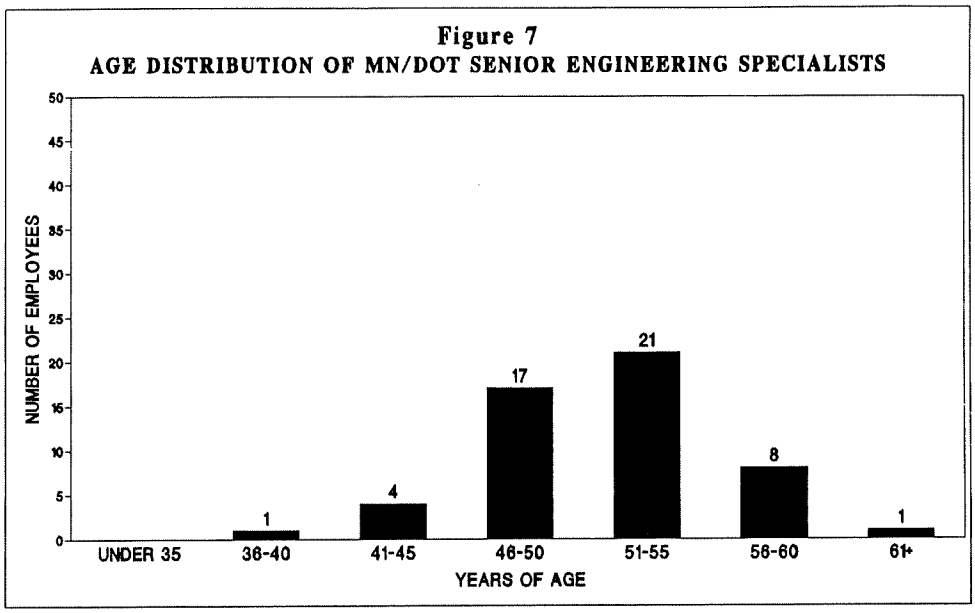
Growth in the senior engineering specialist class has occurred for a variety of reasons. For example, long lengths of service produced well seasoned and experienced engineering specialists that were capable of taking on expanded job responsibilities. The growing size and complexity of Mn/DOT highway projects have also required higher level project design and construction supervision skills.

Based on job responsibilities and Hay point ratings for skills and experience, it is clear that senior engineering specialist positions are overlapping traditional senior engineering functions. Maintaining current or expanded senior engineering specialist complement levels in the years ahead will limit the number of engineering positions available to the department and decrease senior and graduate engineer opportunities for experience and training.

The third trend that will influence future Mn/DOT staffing levels is the significant number of senior engineering specialist and engineering specialist retirements that will occur in the next 10-15 years.

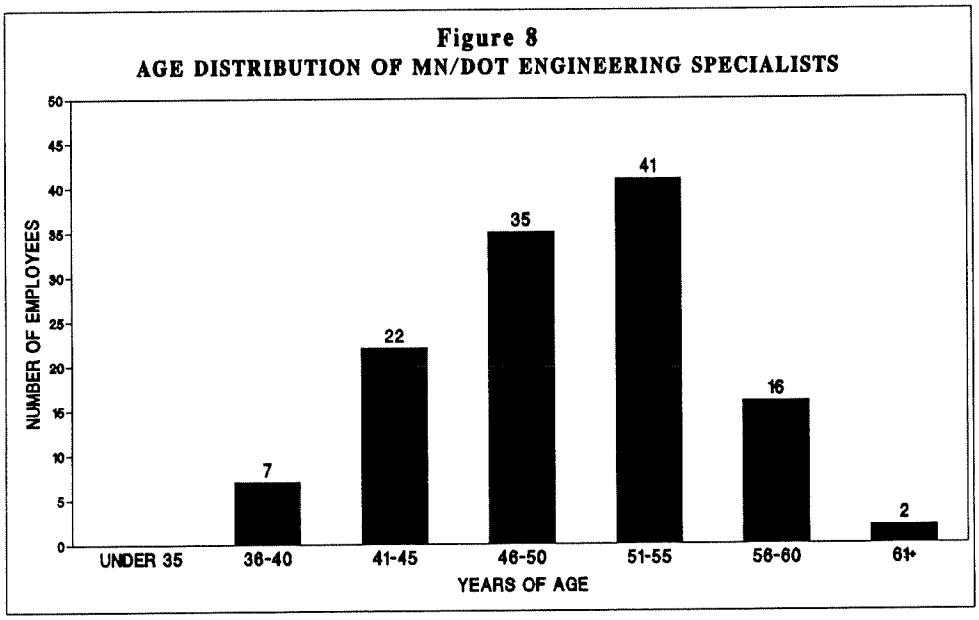
Figure 7 shows that among senior engineering specialists 58 percent, or 30 individuals will be eligible for retirement in the next ten years based on an average retirement age of 61. This percentage grows to 90 percent, representing 47 positions over the fifteen year time period.

Figure 7
AGE DISTRIBUTION OF MN/DOT SENIOR ENGINEERING SPECIALISTS



In respect to engineering specialists, Figure 8 shows that nearly 50 percent or 59 individuals will be eligible for retirement in the next ten years. Over a fifteen-year period this percentage grows to 76 percent, or 94 of all engineering specialist positions.

Figure 8
AGE DISTRIBUTION OF MN/DOT ENGINEERING SPECIALISTS



The magnitude of senior engineering specialist and engineering specialist retirements results in a serious loss of experienced skills for the department. It also presents a challenging opportunity to reassess overall district and central office engineering related needs.

Task Force members spent considerable time discussing the major trends that are occurring in the engineering specialist classifications. After careful analysis of anticipated effects, the Task Force agreed on two key strategies for managing future vacancies and staffing levels.

First, Task Force members agree that more definitive criteria should be developed to provide clear guidance for filling vacancies and creating new positions in the engineering specialist classification. Criteria should consider the long-term need to expand engineering staffing levels and more explicitly describe the types of work situations that match para-engineering skills and experience. In addition to criteria, an interim management review team, which includes Task Force members, should be established to review all requests to fill engineering specialist vacancies over the next two-year period.

Implementation of the above actions will enhance Mn/DOT's ability to determine when engineers, engineering specialists or other classifications should be used to fill engineering specialist vacancies. They can also clarify employee expectations for advancement and result in more consistent promotional practices.

Secondly, Task Force members agree that overlapping functions in the senior engineer and engineering specialist classifications call for a gradual redirection in the use of senior engineering specialist and engineering specialist vacancies. Specifically, Task Force members support using senior engineer positions to fill all future vacancies in senior engineering specialist classifications. In addition, Task Force members believe that roughly 30 percent of all anticipated engineering specialist vacancies could be converted to graduate or senior engineer positions. These strategies are not intended to affect present employees in the specialist classifications. Instead, they call for a redirection in the way vacancies are handled when senior engineering specialists and engineering specialists retire or leave the department.

Redirecting the way Mn/DOT manages specialist vacancies will help expand civil engineering skills in the department and reduce the overlap that now exists between the senior engineer and senior engineering specialist classifications. Placing engineers in reallocated or vacant senior engineering specialist and some engineering specialist positions will also result in more experience and training opportunities for senior and graduate engineers. This will increase the stability within functional areas, enhance the overall flexibility and diversity of Mn/DOT's engineering pool and provide for a more qualified and competitive pool of promotional candidates.

Changing the way senior engineering specialist and engineering specialist vacancies are managed will limit future technician and engineering specialist career opportunities. The impact on technicians can be minimized and Mn/DOT's para-professional engineering needs can continue to be met if actions are taken to address the department's need for technicians with high quality technical or supervisory skills.

HIGHWAY TECHNICIANS

Skills and Responsibilities

The highway technician series represents the largest component of Mn/DOT staff associated with program delivery. The mathematical, design, survey, project development and construction related skills provided by Mn/DOT highway technicians are important and necessary to the day to day delivery of department programs and services.

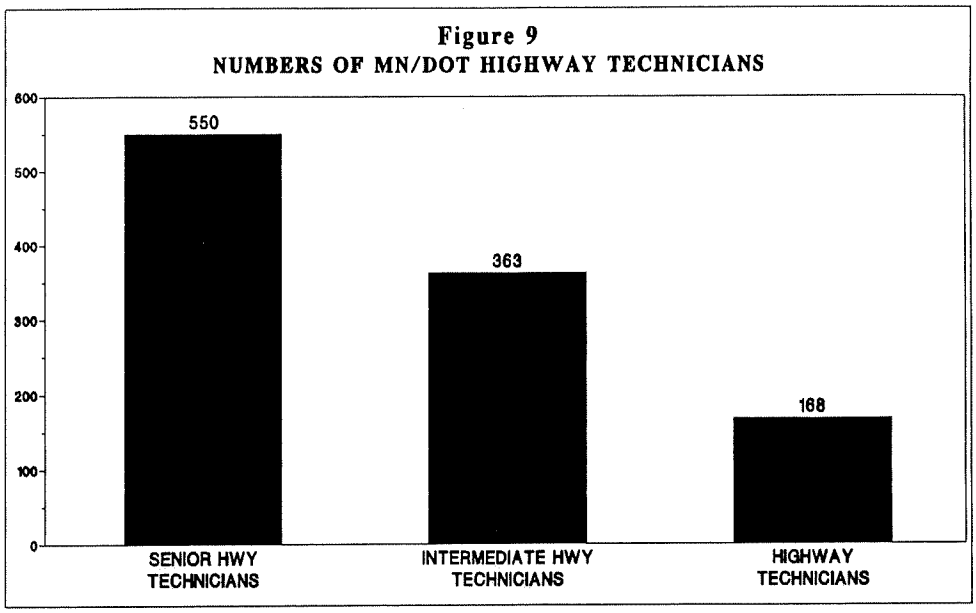
Classifications and Staffing Levels

The highway technician series is made up of the following three principal classifications:

- -- Senior highway technician
- -- Intermediate highway technician
- -- Highway Technician

Current numbers of Mn/DOT employees in each of the three classifications are depicted in Figure 9.

Figure 9
NUMBERS OF MN/DOT HIGHWAY TECHNICIANS



The highway technician classification represents entry level positions for persons with an aptitude for math skills. Usually, vocational school or advanced math training is necessary to pass written test requirements.

After two years of satisfactory experience in at least three different skill areas, highway technicians are eligible for promotions to intermediate highway technician classifications.

Promotions to senior highway technician positions are by competitive exam in different functional areas and include experience and training ratings. The most senior of competent candidates must be appointed to fill vacancies.

Future Complement Trends and Issues

A relatively stable number of trained, experienced and seasoned senior highway technician's are critical to support engineering activities in the department. As depicted in Figure 3, Mn/DOT senior highway technicians have stayed between 508-550 since 1975.

Principal issues experienced in the highway technician series include ensuring that there are enough technicians to support Mn/DOT program needs.

Task Force members agree that further study of highway technician related issues is warranted. Specifically, Mn/DOT should investigate the feasibility of creating new classifications, between the senior highway technician and engineering specialist classes, to address the department's need for experienced individuals with exceptional technical skills and/or supervisory skills.

STUDY ASSUMPTIONS

Based on historical experience and forecast trends the Task Force used the following baseline assumptions in analyzing future Mn/DOT engineering related staffing needs:

- Annual highway construction and maintenance programs will remain at relatively the same work activity levels.

- Future comparable highway program levels will be met without increases in permanent complement positions.

- Growing travel demands and more complex transportation issues will result in continuing needs for innovative, flexible and diversified engineering skills.

- The current complement of 150 principal engineer positions are critical to successful program delivery.

- On average, Mn/DOT engineers and engineering specialists can be expected to retire from service at the age of 61. However, the adoption of different state retirement provisions, such as the Rule of 90, could significantly change the attrition rates and staffing needs described in this report.

FINDINGS

Task Force members analyzed Mn/DOT engineering related staffing trends, issues and needs. Based on this analysis, the Task Force has identified the following major findings:

- Future transportation challenges will require a continuing commitment to quality engineering in the delivery of transportation programs and services.

- The vision of the future calls for highly professional, technologically progressive and innovative engineering skills.

- The combined effects of retirements and promotions will reduce the numbers of incumbent Mn/DOT principal engineers by over 60 percent (97 individuals) in ten years and over 95 percent (146 individuals) in fifteen years.

- Anticipated administrative and principal engineer attrition rates exceed the number of graduate and senior engineers presently available in the department to competitively fill anticipated vacancies.

- The culture of the work force is changing. Two wage earner families are common and individuals are becoming more reluctant to consider relocation opportunities. Therefore, Mn/DOT must develop an adequate pool of competent potential candidates in all classes to fill future positions.

- Engineering specialist classifications have played and will continue to play a valuable role in program delivery by providing important para-engineering support.

- Work activities performed by engineering specialist classes have become more diverse and specialized.

- It is becoming more and more difficult to distinguish between the engineering specialist and senior engineering specialist classes.

- Senior engineering specialist classifications overlap traditional senior engineering functions.

- Substantial anticipated retirements in both engineering specialist classifications will provide opportunities to evaluate alternative strategies for ensuring engineering stability.

- Job tasks and responsibilities in Mn/DOT district office functional units are similar and comparable. Therefore, a single preferred district organization model can be developed to manage future staffing decisions.

- There is currently a fairly large salary and Hay rating gap between senior highway technicians and engineering specialists.

- Present classifications do not include provisions to address the number of senior highway technicians in Mn/DOT that have exceptional technical skills or perform some supervisory responsibilities.

RECOMMENDATIONS

To address future engineering, engineering specialist and highway technician issues and needs, the Task Force believes that Mn/DOT should adopt and implement staffing strategies that will ensure a continuing strong commitment to QUALITY engineering in the delivery of future transportation programs and services. Furthermore, Mn/DOT should progressively increase engineering skills in the department to ensure all functional work units are capable of meeting future transportation challenges and work program expectations.

To accomplish these objectives, the Task Force recommends that Mn/DOT:

1. Annually increase the number of engineers hired by the department, until a desired combined complement level of 225 is achieved for graduate and senior engineers.

2. Clarify criteria and develop guidelines to determine when engineers, engineering specialists or other appropriate classifications should be used to create new or fill vacant engineering specialist positions.

3. Create an interim management review team, that includes Task Force members, to review all requests over the next two years that propose to use engineering specialists for filling vacancies, reallocating jobs or creating new positions.

4. In the next ten years, evaluate opportunities to convert 30 percent of the engineering specialist vacancies to senior or graduate engineer positions as engineering specialists retire or leave the department.

5. In the next ten years, convert the estimated 30 senior engineering specialist vacancies to senior engineering positions as senior engineering specialists retire or leave the department. This recommendation should continue to be implemented until all senior engineering specialist positions are reallocated.

6. Investigate the feasibility of creating new classifications between the senior highway technician and engineering specialist classes to address department needs for individuals with exceptional technical or supervisory skills.

7. Develop succession planning models for all key classifications that are directly related to program delivery so that future staffing issues and needs may be identified and managed.

CONCLUSION

Throughout the years, Mn/DOT success has been directly tied to the strength of employee engineering, para-engineering and technical skills. Future transportation challenges and new technology requirements will call for even greater engineering innovation and flexibility.

In the next 10-15 years, retirements and other attrition factors will significantly affect engineering related complement levels in the department and challenge Mn/DOT's ability to continue its tradition of quality program delivery.

This Task Force report has analyzed the various trends and issues that will affect engineering related staffing needs in the years ahead. Task Force findings reaffirm the pressing need for staffing strategies that insure long-term engineering stability in the delivery of Mn/DOT transportation programs and services.

Findings also reconfirm the important role para-engineering and technical skills play in meeting overall department objectives.

Based on Task Force findings, nine recommendations have been developed to:

-- Ensure a continuing commitment to quality program delivery.

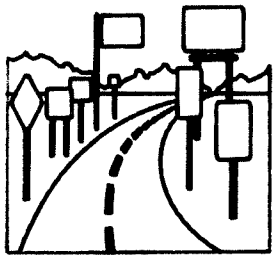
-- Progressively increase the engineering complement levels to ensure future program delivery.

-- Clarify para-engineering roles and responsibilities.

-- Study provisions to address senior highway technician career path issues.

The cummulative effects of these recommendations are depicted in the sample manpower requirements forecast included in Appendix C of the report.

Implementation of Task Force recommendations will provide the stability, long-term flexibility and diversity in engineering, para-engineering and technical skills required to meet future transportation challenges in Minnesota.



Appendix

Appendix A -- Charge To The Task Force

Appendix B -- Age Distribution Data For Mn/DOT Engineering Related Classifications

Appendix C -- Sample Manpower Requirements Forecast

APPENDIX A

DEPARTMENT OF TRANSPORTATION

STATE OF MINNESOTA
OFFICE MEMORANDUM

TO : Don Raisanen, Chair
Don Flemming, Vice Chair
Bob Wolfe, Jerry Rohrbach,
Art Hill, Merritt Linzie,
Dick Sullivan, Wayne Brede

March 24, 1988

FROM : Douglas H. Differt
Deputy Commissioner

612/296-8044

SUBJECT: Engineer, Grad Engineer and Engineering Specialist
Staffing Study Task Force

This is to sincerely thank you all for agreeing to serve on this necessary Task Force and to provide an initial charge or direction for your efforts.

You may make the following assumptions for the study you are about to undertake:

- Assume a constant program for highway construction at today's level of about $350 million.

- Assume the current complement of 150 Principal Engineers is about right.

- Assume that any increase in program level will be handled by consultants without an increase in permanent complement.

Given those assumptions, we ask that you draw on your own backgrounds, networks and constituencies to provide us with responses to the following questions:

- Determine the number of Senior Engineers needed to "feed" the Principal Engineer class considering all factors for attrition in both classes.

- If this is the absolute "minimum" number of Senior Engineers needed, what is the "actual" number needed considering other duties of the Senior Engineer class?

- Does Mn/DOT need to continue using the Senior Engineering Specialist class?

  - If yes, how many?
  - If no, how do we proceed?

- Does Mn/DOT need to continue using the Engineering Specialist class?

  - If yes, how many?
  - If no, how do we proceed?

- How many graduate engineers do we need to feed the Senior Engineer Class?

Finally, a reminder on time frame for this study. Please begin as soon as possible and wrap up by Monday, June 6, 1988. I realize this is very tight, especially considering your other duties, but we do need this analysis and your recommendations both to respond to current requests and to prepare for the next biennial budget. I suggest you invite Dick Keinz, Leo Korth and Bill Yoerg, who served as a steering committee on this subject, to your first meeting which I understand is on Tuesday, April 5, 1988, from 9:00 a.m. to 12:00, in Room 411, to elaborate further on the charge or direction stated above. It will also be helpful to your Task Force to gain input from MGEC early in your work. Whenever you invite MGEC to your sessions please include Jim McKane, the Department's Labor Relations Manager.

Again, thank you for your interest and assistance in this matter.

APPENDIX B

Age Distribution Data for MnDOT Engineering
Related Classifications
April, 1988

Classification	Age Groups						
	Under 35	36-40	41-45	46-50	51-55	56-60	+61
Administrative Engineer (Senior, Management & Professional)	0	5	12	13	24	15	8
Principal Engineer	3	20	42	36	25	19	6
Senior Engineer	28	18	15	12	13	7	4
Graduate Engineer (1 & 2)	75	5	0	0	1	0	0
Sr. Engineering Specialist	0	1	4	17	21	8	1
Engineering Specialist	0	7	22	35	41	16	2
Sr. Highway Technician	51	95	115	129	97	42	21

SAMPLE

MANPOWER REQUIREMENTS FORECAST

Job/Skill Function: Engineer/Engineer Manager Series

Year: 1988 - 1998

Responsibility Level	Number Of Positions At Beginning Of Year	Increase (Decrease) In Staffing	(Age 61) Retirements	Unscheduled Termination	Primary Open Positions To Be Filled	Vacancies Resulting From Promotions and Their Effects On Subsequent Levels						Total Positions To Be Filled	
Mgmt.*	9	- 2	7	0	5	-	-	-	-	-	-	5	
Ad. Eng.**	77	0	47	0	47	5	-	-	-	-	-	52	6/
Prin. Eng.	151	0	50	0	50	5	47	-	-	-	-	102	5/
Sr. Eng.	97	+ 30 1/	24	40	94	5	47	50	-	-	-	196	4/
Grad. Eng. ½	81	+ 18 2/	0	40	58	5	47	50	94	-	-	254	3/
TOTALS													

1/ Convert all S.E.S. Retirements to Sr. Eng.
2/ Convert about 30% of E.S. Retirements to Grad. Eng.
3/ Hire 25+ Grads./Year
4/ Promote 19+ Grads./Year
5/ Promote 10+Sr. Eng./Year
6/ Promote 5+ Prin. Eng./Year

* Mgmt. includes upper level managers from the engineering series.

** Ad. Eng. includes senior, administrative and professional engineers.

APPENDIX C

Paraprofessional & Technical Engineering Series

succession planning

Job/Skill Function: Engineer/Engineer Manager Series

Year: 1988 - 1998 — 10 years / 15 years

Responsibility Level	Number Of Positions At Beginning Of Years (ten) 1988	Increase (Decrease) In Staffing	(Age 61) Retirements	Unscheduled Termination	Primary Open Positions To Be Filled	Vacancies Resulting From Promotions and Their Effects On Subsequent Levels						Total Positions To Be Filled		# of Positions at end of ten years 1998	# of Positions at end of 15 years 2003
t.	9	- 2	7	0	5	-	-	-	-	-	-	5		7	7
d. Eng. Senior Mgt Pro	77	0	47	0	47	5	-	-	-	-	-	52	6/	77	77
Prin. Eng.	151	0	50	0	50	5	47	-	-	-	-	102	5/	151	151
Sr. Eng.	97	+ 30 1/+10	24	40	94	5	47	50	-	-	-	196	4/	127	137
Grad. Eng. ½	81	+ 18 2/+17	0	40	58	5	47	50	94	-	-	254	3/	100	117
Senior Engineering Specialists	52	-30/-17												22	5
Engineering Specialists	123	-18/-10												105	95
~~TOTALS~~ Semi Highly Tech	550	-100												450	450
Super Tech 1/	0	+100												1100	100

1/ Convert all S.E.S. Retirements to Sr. Eng.
2/ Convert about 30% of E.S. Retirements to Grad. Eng.
3/ Hire 25+ Grads./Year
4/ Promote 19+ Grads./Year
5/ Promote 10+Sr. Eng./Year
6/ Promote 5+ Prin. Eng./Year

1/ Create new "Super Tech" class in AFSCME

ten years 30% of 59 = 18
15 years 30% of 94 = 28

ten years = 30 retirements
15 years = 47 retirements

APPENDIX C

totals ↓

1139 — 1139

DRAFT

DEPARTMENT OF TRANSPORTATION

STATE OF MINNESOTA
OFFICE MEMORANDUM

TO : Don Raisanen
District Engineer
Brainerd

June 30, 1988

FROM : Douglas H. Differt
Deputy Commissioner

612/296-8044

SUBJECT: Mn/DOT Engineering Related Staffing Needs

I take this opportunity to commend you and your task force for the excellent work you did on this issue so critical to the continuing success of Mn/DOT.

My staff has reviewed and discussed your report and is in general agreement with its recommendations. We intend to begin implementing those recommendations immediately.

- We agree that there are too few Graduate and Senior Engineers on staff to adequately fill behind Principal Engineers as they are promoted, resign or retire. We feel this can be improved without complement increases, but rather through reallocation of existing technical positions as they become vacant. This includes a moratorium on the further use of the SES class.

- We agree that each Division Management Team should develop preferred organizational structures including cross-division review.

- We agree that a panel should be established to review all requests to fill or reallocate positions in the ES, SES, Senior Engineer classes.

That panel should consist of:

-
-
-
-
-
-

- We agree and hereby direct the Employment Services Section to prepare the justification and work with the Labor Relations Section to seek establishment of a new class between the Senior Highway Technician and the ES classes to fill a need for a class with exceptional technical and supervisory skills.

- Finally, we agree that your task force has developed a model that can be used for succession planning in many areas of the department. The Employee and Information Services Division will modify your model to fit other critical classes within Mn/DOT.

Thank you again for a job well done on a subject we have had concerns about for several years.

cc: Task Force Members
Commissioner's Staff

Minnesota Government Engineers Council

525 Park Street • St. Paul, Minnesota 55103 • (612) 227-2316

Bob Hofstad, *President*
Dave O'Connell, *Executive Director*

June 14, 1988

To: Don Raisanen

From: Dave O'Connell, Executive Director MGEC

Re: Draft Task Force Report

Thank you for sharing a copy of your draft Task Force Report on the Future Mn/DOT Engineering Related Staffing Needs with us. You should be commended for the outstanding research and data analysis you have done on the subject. We generally find the report to be a thorough, thoughtful look at a very difficult subject.

We do have a few comments to share with you about the report and/or about the follow up to the report:

1) Appendix C is somewhat lacking in telling the full story of the report. We suggest that the other job classifications that were analyzed in the report be added with their anticipated increases/decreases. (Also include the recommended "super tech" class.)

   In order to make Appendix C show what you want, a comparison of 1988 to 1998 (and we would suggest 2003) you need to add two additional columns showing what the number of positions will be in those job classifications 10 years from now and 15 years from now. This is the real story of the report. We have enclosed a revised chart showing this information. This may actually be too much information for one chart and it might make more sense to break Appendix C into two charts - one showing succession planning data, and one comparing where we are today to where you think we should be in 1998 and 2003.

2) Although the report doesn't come right out and say it, implicit in the projected numbers is the idea that there will no longer be any more promotions into the Senior Engineering Specialist (SES) class. (The current 52 will be reduced to 22 over ten years of retirements and 5 after 15 years of retirements.)

   There may be some positions that are ready for consideration right now that are comparable to other Senior Engineering Specialist positions. Since this moratorium was put on all reallocations some of these may have gotten caught in the process. Shouldn't there be some sort of window period to allow examination of all the current SES requests before putting an end to that class? And what about Engineering Specialist (ES) reallocations?

3) One of the issues that the Mn/DOT-MGEC Labor Management Committee referred to your committee was the question of recombining the SES and ES classes into one class. Your report states that "it is becoming more and more difficult to distinguish between the engineering specialist and senior engineering specialist classes." Yet the question about recombining is not addressed. What is the committee's position on that?

Thank you for your offering us the opportunity to comment.

cc: Doug Differt
MGEC Board of Directors

SF-00006-05 (4/86)

STATE OF MINNESOTA

Office Memorandum

DEPARTMENT : Mn/DOT Field Operations Division
Brainerd

DATE : June 20, 1988

TO : Doug Differt - 408
Deputy Commissioner

FROM : Donald L. Raisanen - Brainerd
District Engineer

PHONE : 828-2463

SUBJECT : Mn/DOT Engineering Related Staffing Needs Report
Narrative for Recommendations

Recommendation No. 1

The additional number of engineers hired by the Department of Transportation should be as dictated by the available number of re-allocated engineering specialist and senior engineering specialists each year. The desirable complement of 225 can be staged over a ten year period but should be attained in a shorter period so our experience and training levels will be enhanced. We are now experiencing the negative effect of past practices but should not overreact by hiring too many engineers immediately as their retirements en masse, at some future date, would cause another knowledge gap within Mn/DOT. The hiring plan should be developed by the Employee and Information Services Division (E/ISD).

Recommendation No. 2

To properly implement this program we must have criteria and guidelines which are understandable, perceived as equitable, and implementable. The preliminary criteria have been developed by the task force but should be reviewed, expanded upon, and checked for conformance with legal and contractual documents by E/ISD. The primary guideline should be a series of preferred organizational structures for each of the divisions. These structures could be coordinated and "sore thumbed" by the respective assistant commissioners. Managers from each division could develop divisional organizational structures and a cross-divisional review should be used as a coordinating body to insure departmental needs are included.

Recommendation No. 3

The interim management review team should be comprised of task force members and/or others to insure the intent of the study is accomplished. The review team would not supplant the Hay Committee as it would review departmental policy rather than warrants of individual positions.

Recommendation No. 4

Over the next 10 years it is estimated that about 30 percent of the engineering specialist positions could be enhanced and re-allocated to engineering positions.

Recommendation No. 5

Because the "Hay" points for the senior engineering specialist are the same as those of a senior engineer, we are re-allocating all future SES vacant positions to engineering positions.

Recommendation No. 6

The engineering specialist position was created to address the lack of available engineers and has evolved through time. There is now a need for individuals who can accomplish para-engineering work up to, but not including, the responsibilities of registration. However, due to the lack of a position which supervises other personnel and/or does highly technical work which does not require engineering judgement, we have been misusing some specialist positions. The E/ISD should be instructed to develop the justification and position description for this new position(s). After the new position is developed, all engineering specialist positions which become vacant or are proposed should be reviewed to determine if they should remain as specialists or become technical supervisors or engineers.

Recommendation No. 7

The principal of succession planning through time which was used in the development of this report is readily implementable for other positions. The E/ISD should continue this effort for all key classifications so that yearly personnel numerical requirements and qualifications can be projected.

DLR/sg

PREFERRED ORGANIZATIONAL STRUCTURE - RURAL AND METRO

DRAFT

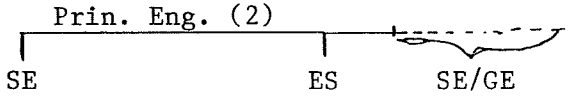
District Engineer

Assistant District Engineer - State Aid
Technician used as an aide

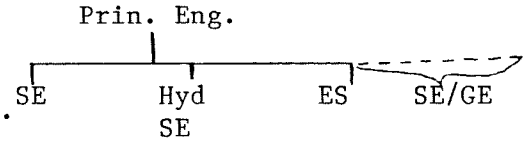
Assistant District Engineer - Maintenance
Rural - Sr. Engineer - Technician
Metro Areas - 2 Prin. Eng. - 1 ES for Bridges - Rest Technicians

Assistant District Engineer - Construction

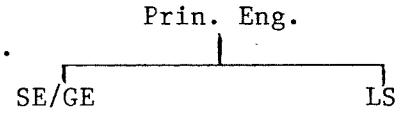
Construction - For each two residents you accept:
2 Senior Engineers
+1 Specialist for Bridges
+1 Specialist for Roadway and,
Remaining supervisors to be engineers or graduates



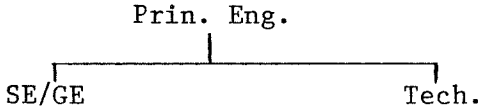
Preliminary Design, Detail Design, Hydraulics - Head with Principal Eng.
- Where the functions are combined in the smaller districts, you should have a Senior Engineer + a specialist.
- Where the functions are not combined you should use engineers.
- The hydraulics position should be filled with an engineer.



ROW/Surveys --- Head with Principal Engineer for ROW or as a Land Management Unit, Principal Land Surveyor or Principal Engineer for Surveys.
- If used as a Land Management Unit use Senior Engineer in ROW and Land Surveyors in Surveys.
- ROW first assistant to be SE/GE



Traffic ------- Head with a Principal Engineer
- Assistant to be SE/GE.
- Technician(s) to be used as aide(s).



Materials/Soils - Head with a Principal Engineer
- Assistant to be SE/GE (Asst. Mat. Eng., Soils)
- Technician(s) to be used as aide(s).