REORGANIZATION TO CREW SPECIALIZATION

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•PENNSYLVANIA has recently adopted the policy of crew specialization as representative of its efforts to modernize the maintenance organization. By definition, crew specialization is the organizing of existing manpower and equipment into management units capable of performing a limited number of specialized tasks with the goals of increasing productivity and the quality of work, complete utilization of specialized equipment, and a more uniform level of maintenance throughout a given area.

Associated with this concept are a number of advantages and disadvantages. The advantages are:

- 1. Simplifies training of personnel;
- 2. Facilitates mechanized production;
- 3. Improves expertise for one or two operations;
- 4. Permits greater utilization of specialized equipment;
- 5. Mandates advance planning and scheduling of operations; and
- 6. Reduces the degree of error associated with an unfamiliar operation.

The disadvantages are:

1. Increases crew travel time;

2. Creates some difficulty in setting up secondary operations during foul weather conditions;

- 3. Reduces the association of a crew to a given section;
- 4. Necessitates reimbursement for the use of the foreman's pickup; and
- 5. Changes the status quo generating political feedback.

To understand why this policy was adopted it is necessary to analyze the present system being maintained. The Pennsylvania Department of Transportation maintains approximately 44,000 miles of roadway broken into those categories and percentages shown on Figure 1. The state is divided into 11 engineering districts, Figure 2, with each district further divided into counties. The number of counties in each district varies from district 11 with two counties, to district 8 with nine counties. On the average, however, there are six counties in each district with a total of 67 counties in the state. To assist in understanding the situation, information on the smallest and largest counties within the state is given in Table 1.

Within each county there is located a headquarters with an equipment repair shop, storage area, and offices. Also, each county has its own radio base station. In some of the larger counties there are satellite buildings strategically located to serve as maintenance yards.

Let's take a look at Bradford County (Fig. 3) and examine how they made the transition to crew specialization and the subsequent results. The county is located in the northeast section of Pennsylvania, district 4. It has approximately 1,046 miles of roadway to maintain within its 1,147-square-mile area and is considered rural in nature.

Prior to 1958 the organization (Fig. 4) contained a county superintendent, one principal assistant superintendent, four assistant superintendents, approximately 32 caretakers and four foremen. The county was divided into areas as shown in Figure 5. Basically the foremen worked out of the county office under the supervision of the principal assistant superintendent and were concerned mostly with "construction" as opposed to "maintenance work."



Figure 1. Categories of highways in Pennsylvania.



Figure 2. Pennsylvania highway administration.



Figure 3. Bradford County, Pennsylvania.

This type of system allowed each caretaker to have three or four laborers working under his direction, and each caretaker had preconceived ideas with regard to the standards required. This system worked rather well in most areas until the era of higher type, limited-access expressways came into existence. As traffic increased, a higher quality of maintenance was required and more equipment was needed to increase production and offset rising labor costs. It was not possible to equip every caretaker to do the required work in his section.

After 1958 the county was reorganized as shown in Figure 6 by eliminating the caretaker, increasing section boundaries, and creating foremen crews having a standard work size (Fig. 7). This provided some degree of flexibility within the county work

County	Road Mileage	Population	Area (sq mi)
Smallest			
Cameron	127	7,727	401
Forest	207	4,549	420
Montour	203	18,091	130
Largest			
Lycoming	830	113,384	1,215
York	1,255	245,716	914
Bradford	1,046	54,538	1,147
Westmoreland	1,305	358,240	1,025
Philadelphia	335	2,071,397	127
Allegheny (Pittsburgh)	1,215	1,563,555	-

TABL	51					
ROAD	MILEAGE	IN	SMALLEST	AND	LARGEST	COUNTIES
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Figure 4. Bradford County organization prior to 1958.



Figure 5. Area breakdown, Bradford County prior to 1958.



Figure 6. Bradford County organization after 1958.



Figure 7. Area breakdown, Bradford County after 1958.







Figure 9. Area breakdown, Bradford County after 1967.





<u>WORK PROGRAM</u> Specialized Crews

BRADFORD (County)

Location of Work Crew

X Project Completed

(Superintendent)

March 20, 19 (Date)

County Wide

Foreman	No. Men	Equipment	Priority of Projects by Route									
			1	1		2			>	13	14	15
Elliott, H.	6	4-6 Trucks - 1 District 3 Rollers, 1 Loader 1 Spreader or Paver	20	x	021 059 041	x	13 061 08130	x	(072 031 080	045 095 091	08165 14 08100
Hoyt, D.	5	Pickup Truck and other equip. as needed	212	x	14	x	052	*				
Rabanold, R.	6	5 Trucks - 1 Paver 2 Rollers, 1 Water Truck	343	×	025	x	212	x	(
Maryott, W.	5	1 Post Driver	241	×	212	x	287	x)			
Tobin, E.	7	2 Sign and Paint Trucks	T.R. 14	×	T.R. 6	×	T.R. 220	x	\langle			
McKean, J.	5	1 Truck - 1 Chipper 2 Saws	212	x	287	it	20	x)	08193		
Brenchley, J.	5	l Distributor, 3 Trucks l Roller	039	1	075		074		\langle			
Packard, G.	3	As Needed	Assigned Daily by Assistant)					
									5			
	Foreman Elliott, H. Hoyt, D. Rabanold, R. Maryott, W. Tobin, E. McKean, J. Brenchley, J. Packard, G.	Foreman No. Men Elliott, H. 6 Hoyt, D. 5 Rabanold, R. 6 Maryott, W. 5 Tobin, E. 7 McKean, J. 5 Brenchley, J. 5 Packard, G. 3	Foreman No. Men Equipment 4-6 Trucks - 1 District 3 Rollers, 1 Loader 1 Spreader or Paver Elliott, H. 6 1 Spreader or Paver Hoyt, D. 5 other equip. as needed Rabanold, R. 6 2 Trucks - 1 Paver Rabanold, R. 6 1 Post Driver Tobin, E. 7 2 Sign and Paint Trucks McKean, J. 5 1 Truck - 1 Chipper Saws 1 Distributor, 3 Trucks Packard, G. 3 As Needed	Foreman No. Men Equipment 1 4-6 Trucks - 1 District 3 Rollers, 1 Loader 20 20 3 Rollers, 1 Loader 20 21 5 Rollers, 1 Loader 20 22 916Kup Truck and other equip. as needed 212 Rabanold, R. 6 2 Rollers, 1 Water Truck 343 Maryott, W. 5 1 Post Driver 241 Tobin, E. 7 2 Sign and Paint Trucks T.R. 14 McKean, J. 5 1 Truck - 1 Chipper 2 Saws 212 Brenchley, J. 5 1 Distributor, 3 Trucks 039 Packard, G. 3 As Needed Assignment	Foreman No. Equipment 4-6 Trucks - 1 1 20 X 3 Rollers, 1 Loader 20 X Filliott, H. 6 1 6 1 Spreader or Paver 20 Hoyt, D. 5 other equip. as needed 212 Rabanold, R. 6 2 Rollers, 1 Water Truck Maryott, W. 5 1 Post Driver 241 Tobin, E. 7 2 Sign and Paint Trucks T.R. 14 14 14 McKean, J. 5 1 Truck - 1 Chipper 2 Saws 1 Distributor, 3 Trucks 039 Packard, G. 3 As Needed Assigned	Foreman No. Men Equipment 1 2 4-6 Trucks - 1 District 3 Rollers, 1 Loader 20 021 802 9 6 1 Spreader or Paver 20 059 041 Hoyt, D. 5 Other equip. as needed 212 14 Rabanold, R. 6 2 Rollers, 1 Water Truck 343 025 Maryott, W. 5 1 Post Driver 241 212 Tobin, E. 7 2 Sign and Paint Trucks T.R. 14 6 McKean, J. 5 1 Truck - 1 Chipper 2 Saws 212 X 287 Brenchley, J. 5 1 Distributor, 3 Trucks 039 075 Packard, G. 3 As Needed Assigned Daily	Foreman No. Men Equipment 4-6 Trucks - 1 District 3 Rollers, 1 Loader 20 V 021 039 Elliott, H. 6 1 Spreader or Paver 20 V 044 Hoyt, D. 5 Other equip. as needed 212 V 14 X Rabanold, R. 6 2 Rollers, 1 Water Truck 343 V 025 X Maryott, W. 5 1 Post Driver 241 X 212 X Tobin, E. 7 2 Sign and Paint Trucks T.R. X 14 6 McKesn, J. 5 1 Truck - 1 Chipper 212 X 287 Y Brenchley, J. 5 1 Distributor, 3 Trucks 039 V 075 Y Packard, G. 3 As Needed Assigned Daily by 14 5	ForemanNo. MenEquipmentPrior12323Rollers, 1 Loader2020211323Rollers, 1 Loader202006108130409t, D.5Other equip. as needed21221224267Rabanold, R.62Srucks - 1 Paver3432025212Maryott, W.51 Post Driver24124212287Tobin, E.72Sign and Paint TrucksT.R.146220McKesn, J.51 Truck - 1 Chipper 2 Saws2122872020Brenchley, J.51 Distributor, 3 Trucks039075074Packard, G.3As NeededAssigned Daily by Assist	ForemanNo. MenEquipmentPriority12323133Rollers, 1Loader3Rollers, 1Loader46112320X0590415Pickup Truck and other equip. as needed212Rabanold, R.6272Sign and Paint Truck343X025X212X241X212X241X212X251Truck - 1Tobin, E.72Sign and Paint TrucksT.R.146220XMcKesn, J.51Truck - 12Saw1Distributor, 3Trucks90075074Packard, G.3As NeededAssigned Daily by Assistant	ForemanNo. MenEquipmentPriority of Proj123123203Rollers, 1 Loader33Rollers, 1 Loader4613Rollers, 1 Loader204059346149404040404040404040404040404051405140404040404051404040404040515111404040404040404040405140404040404040404040<	Foreman No. Men Equipment Priority of Projects by Ro 1 2 3 13 20 3 Rollers, 1 Loader 20 7021 13 072 2110tt, H. 6 1 Spreader or Paver 20 7059 7061 031 031 460 1 Spreader or Paver 20 7059 7061 0830 080 Hoyt, D. 5 other equip, as needed 212 7 14 7052 7 Rabanold, R. 6 2 Rollers, 1 Water Truck 343 7 025 7 212 7 Maryott, W. 5 1 Post Driver 241 7 212 7 7 Tobin, E. 7 2 Sign and Paint Trucks T.R. 7 2 Sign and Paint Trucks T.R. 7 2 0 08193 Saws 1 Distributor, 3 Trucks 039 075 074 08193 Packard, G. 3 As Needed Assigned Daily by Assistant 08193 <td>Foreman No. Men Equipment Priority of Projects by Route 1 2 3 13 14 4-6 Trucks - 1 District 3 Rollers, 1 Loader 20 V 021 13 072 045 Elliott, H. 6 1 Spreader or Paver 20 V 059 V 061 081 091 081 095 Hoyt, D. 5 other equip, as needed 212 V 14 V 052 V 080 091 Rabanold, R. 6 2 Trucks - 1 Paver 343 V 025 V 212 V 14 V 052 V 050 091</td>	Foreman No. Men Equipment Priority of Projects by Route 1 2 3 13 14 4-6 Trucks - 1 District 3 Rollers, 1 Loader 20 V 021 13 072 045 Elliott, H. 6 1 Spreader or Paver 20 V 059 V 061 081 091 081 095 Hoyt, D. 5 other equip, as needed 212 V 14 V 052 V 080 091 Rabanold, R. 6 2 Trucks - 1 Paver 343 V 025 V 212 V 14 V 052 V 050 091

Figure 11. Example of crew specialization implementation.

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Figure 12. Biweekly work sheet.

force. Basically the manpower requirement stayed the same; however, the number of supervisors was reduced from 32 to 16 on the first-line level. This in itself reduced the communication problem with the field forces and enabled a higher production output.

In 1967 the county was again reorganized and expanded into the full concept of crew specialization (Figs. 8 and 9). Again the communication problem was reduced when the assistant superintendent sections were combined. This was facilitated by the advent of a modern radio communications system. Also, new methods of handling bulk material and consolidation of assembly areas and storage sites through a major land-procurement program have improved field operations and management controls.

Figure 10 shows a summary of the work progress as the county reorganized from caretaker sections to the crew specialization concept. As is noted, the percentage of unimproved and stabilized roads was reduced from 35 percent prior to 1958 to 15 percent in 1969.

Figure 11 shows an example of how crew specialization is implemented. Prior to the spring of the year, the schedule is developed by the assistant superintendents together with the county superintendent and his principal assistant. Their selection of routes is determined by communication with the foremen in the field as well as their own personal knowledge of the roads. Figure 12 is the biweekly work sheet used to schedule work on the work program with provisions made to show any changes. The system provides enough flexibility to allow for changes to the schedule; however, there is no change in the crew's specialized operation, other than emergency situations.

Crew specialization is now a reality in all of our counties, but until a maintenance management reporting system is operational, the full benefits of crew specialization will not be realized.