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ABSTRACT

Part of the series "Managing Highway Maintenance," the unit is about maintenance standards and is designed for superintendents and senior foremen who are responsible for scheduling and controlling routine maintenance. It describes different kinds of standards, why and how standards are developed, and how standards are to be used and communicated to subordinates. The format is a programed, self-instruction approach in which information is presented in progressive segments for frames. (EA)

CE

MANAGING HIGHWAY MAINTENANCE

STANDARDS FOR MAINTENANCE WORK

PART ONE

Management by Objectives Series

UNIT 8

LEVEL 2

FEDERAL HIGHWAY ADMINISTRATION
Offices of Research and Development
January 1973

This book is part of the series "Managing Highway Maintenance," prepared for the Implementation Division, Office of Development, Federal Highway Administration, under contract FH-11-7600. The series as a whole is described in the *Training Guide and Catalog* volume.

The contents of this book reflect the views of the contractor, Roy Jorgensen Associates, Inc. The contents do not necessarily reflect the official views or policy of the Department of Transportation.

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Implementation Division
Offices of Research and
Development

Washington, D.C.
January 1973

PART ONE

WHAT ARE MAINTENANCE STANDARDS?

AND

WHY ARE THEY NEEDED?

INTRODUCTION

This training is about maintenance standards.

Part One of "Standards for Maintenance Work" describes the different kinds of standards and explains why standards are needed.

Part Two describes how standards are developed -- and some of the considerations in putting standards together.

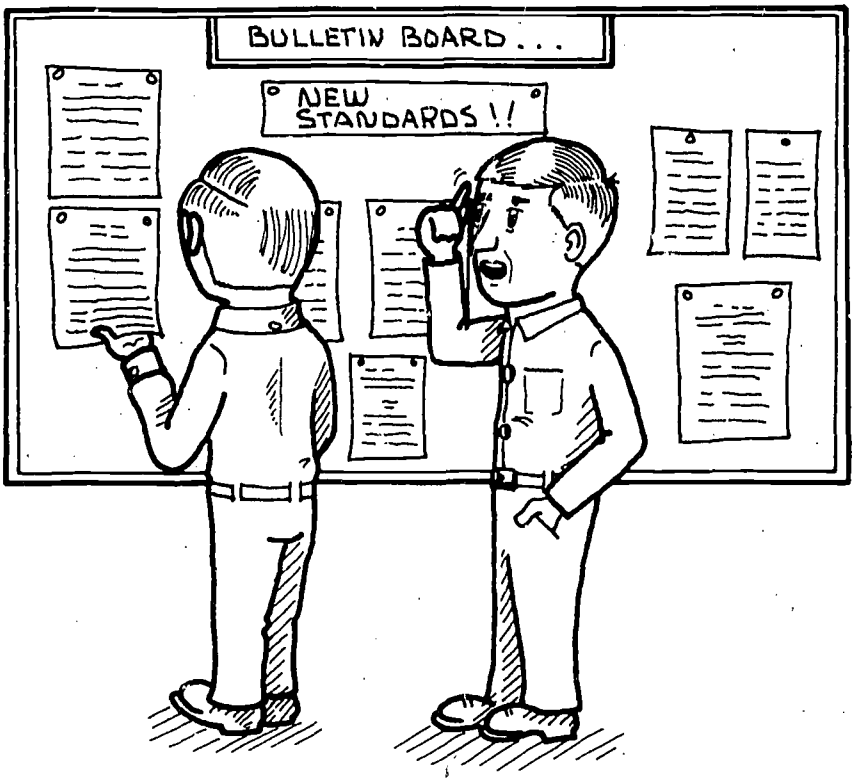
Part Three illustrates the ways in which standards should be used, and how they should be communicated to subordinates.

This unit is designed for maintenance supervisors -- superintendents and senior foremen who are responsible for scheduling and controlling routine maintenance.

TRAINING TECHNIQUE

The information in this unit is presented in small segments -- called frames. Most frames require you to answer a question about the information in the frame. The answer you pick will instruct you to go to a different part of the unit. To complete the training:

+ CAREFULLY READ EACH FRAME.
+ FOLLOW THE DIRECTIONS AT THE END OF EACH FRAME.



Section One

WHAT ARE STANDARDS?

1

Standards are models to be followed or goals to be achieved. You see many examples of industrial standards every day. Take the ordinary car, for instance. The gas pedal is to the right of the brake pedal. The steering wheel is on the left side of the dashboard and the radio usually is in the middle. These are standards that all car manufacturers seem to follow. The designer's model car is made this way and is used by the manufacturers as a standard for all their cars.

1 (continued)

Which of the following examples is not a standard as described above?

A.	The position of the stem on wristwatches is between the 2 o'clock and 4 o'clock positions.	Go to Frame 2.
B.	A highway patrolman should write about 10 violation tickets a day.	Go to Frame 3.
C.	Everyone earning $200,000 a year must file an income tax return.	Go to Frame 4.

2

The position of the stem on a wristwatch seems to be standardized, like the position of the gas pedal in a car. So, this is not the correct answer.

Go to Frame 5.

3

The patrolman and the tickets could very well be an instance of a man trying to follow a standard. If the model patrolman wrote 10 tickets a day, then 10 tickets a day would be a standard -- a goal to be reached. So, if 10 tickets a day is a standard, this is not the correct choice.

Go to Frame 5.

4

Right. The other two examples, the wristwatch and the patrolman, are almost like the gas pedal position. They are examples of standards. But it is difficult to see a standard in the tax return filing example. There is no goal to be reached in filing an income tax return.

Go to Frame 6.

5

Remember that a standard is an ideal. It is something to follow, something to work toward. It's always established by some authority. The Society of Automotive Engineers probably decides on the position of the automobile gas pedal. The American Watchmakers' Institute might decide the position of the watch stem. And some high police officials set the patrolmen's quota of tickets per day. As a result, the auto builders strive to put the gas pedal in the standard position, the watchmakers aim at locating the stem of wristwatches at 3 o'clock, and patrolmen try their hardest to catch 10 speeders every day.

With the general meaning of standards in mind, choose the best example of a standard below.

A.	The crew on a Boeing 747 jumbo jet consists of 14 stewardesses, 4 men in the cockpit and 1 flight director.	Go to Frame 7.
B.	The line forms on the left of the entrance.	Go to Frame 8.
C.	If at first you don't succeed, try, try again.	Go to Frame 9.
D.	Fred's crew consisted of a foreman, Fred, and six other men.	Go to Frame 10.

6

You can see standards in other industries, but are they to be seen in maintenance departments? Or -- a more important question -- should there be standards in maintenance departments? We'll try to answer those questions in the next section.

Go to Frame 11.

7

Right. The crew size is a standard. The airline aims at satisfying the standard by scheduling the standard crew size for each flight.

Go to Frame 6.

8

No. This is simply a statement of fact. "The line forms on the left" has the same kind of meaning as "My car is grey," or "His glasses are on the table," or "Fred's crew consists of a foreman, Fred, and six other men." Now compare this: "A bricklayer must lay 150 bricks an hour to be hired by that company." The difference is that the first sentences don't present any goal to be achieved. This sentence sets a goal of 150 bricks an hour for any bricklayer looking for employment at a certain company. The company set up the standard; the job applicants must try to meet it.

Go back to Frame 5 and choose a better answer.

9

No. This choice does not present any goals to work toward. Study this sentence: "The trucking firm's costs must amount to less than $2.00 per vehicle-mile in order to show a profit." The goal is reducing or holding the operating cost to less than $2.00. This is a standard.

Go to Frame 5 and choose again.

---

10 This is not the best choice. For an explanation, go to Frame 8.

PURPOSE OF STANDARDS

Standards in any management system provide a uniform -- or consistent -- level of maintenance. They give definite direction to everyone who uses them. A consistent level of maintenance means that every pothole will be patched within a set time after it is noticed, with the same quality material, in the same general manner, and at nearly the same speed. There are no really big differences in how any two potholes are patched.

11 (continued)

Standards provide a consistent level of maintenance by:

A.	Helping to keep everyone doing things in the same general way.	Go to Frame 12.
B.	Forcing administrators to think more about their work.	Go to Frame 13.
C.	Helping all workers know what their fellow workers should be doing.	Go to Frame 14.
D.	Letting everyone in the Department know about what's happening in the head office.	Go to Frame 15.

12

Right. If all the people in the Department see standards as goals, they will all make some effort to reach these goals. The result will be that any job will tend to be done in the same way, no matter who does it. Thus, the level of maintenance is more consistent.

Go to Frame 17.

13

Not really. There is no real connection between this answer and a uniform level of maintenance.

Go to Frame 16.

14

Well, maybe. But the important thing shouldn't be knowing what <u>others</u> should be doing, but knowing what to do. There is a better choice available.

Go to Frame 11. Reread the whole frame and choose another answer.

15

No. Knowing everything that's happening in the head office doesn't do anything to provide a uniform level of maintenance.

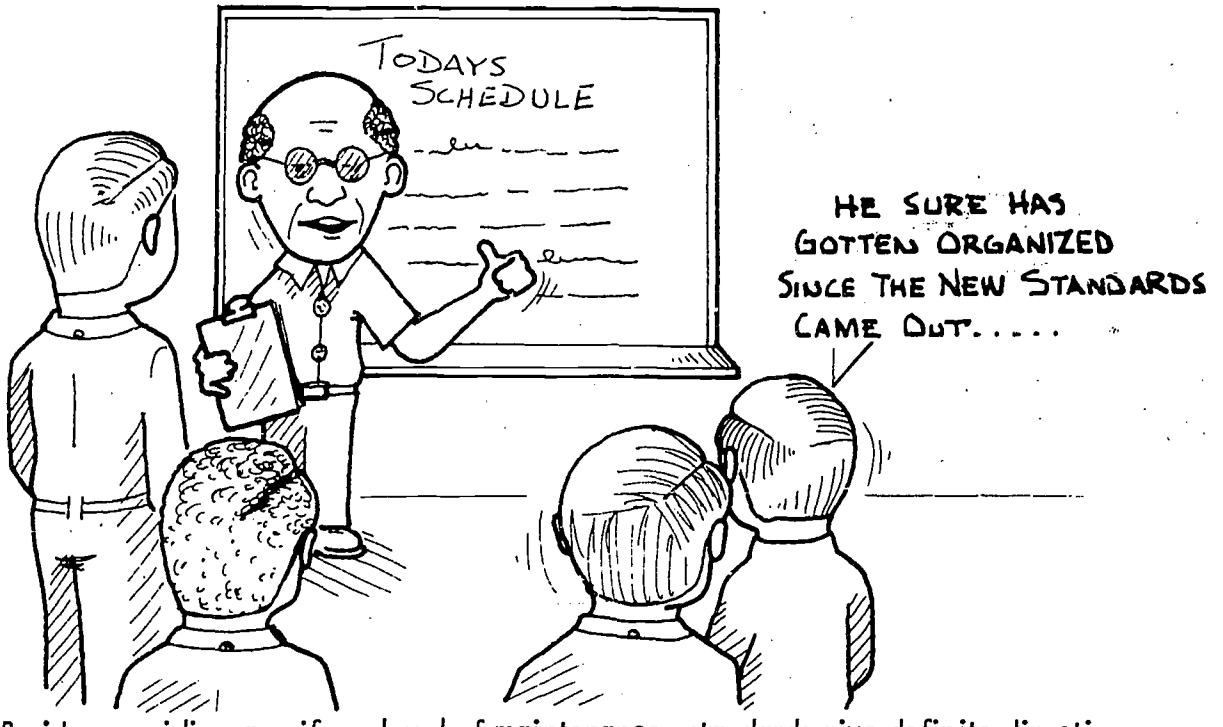
Go to Frame 16.

16

A uniform level of maintenance means the same kind of maintenance for the same kind of problem, no matter where the problem happens, no matter which crew works on it. Standards can bring about a more consistent level of maintenance by giving all the people the same goals. For example, the goal for pothole patching is to start work within a certain time, use so many men, do the work in a certain way, etc. If everyone involved in patching potholes is given the standard -- the goals and objectives of the pothole patching operation -- chances are great that all such operations will be done in the same way. That is, all potholes will be patched in nearly the same manner.

Now go to Frame 11. Look at the whole frame again. Then choose another answer.

17



Besides providing a uniform level of maintenance, standards give definite direction to those who use them. They show when work should be done, how many men should do it, and how much should be done in one day. In this way, standards help reduce the number of decisions field personnel would ordinarily have to make -- such as: Should work be started? How many men should do it? How soon can they expect to finish?

17 (continued)

Which of the following questions would be answered if you had a standard on mowing operations?

A.	Which crew will do the mowing?	Go to Frame 18.
B.	Will it rain tomorrow?	Go to Frame 19.
C.	How fast should the tractors travel?	Go to Frame 20.

18

No. Standards make recommendations and suggestions, but not concerning the individual crew to do the job. If the activity is suited only to one specialized crew, this crew would be recommended in the standard. But mowing is not such an activity.

Go to Frame 17 and try again.

19

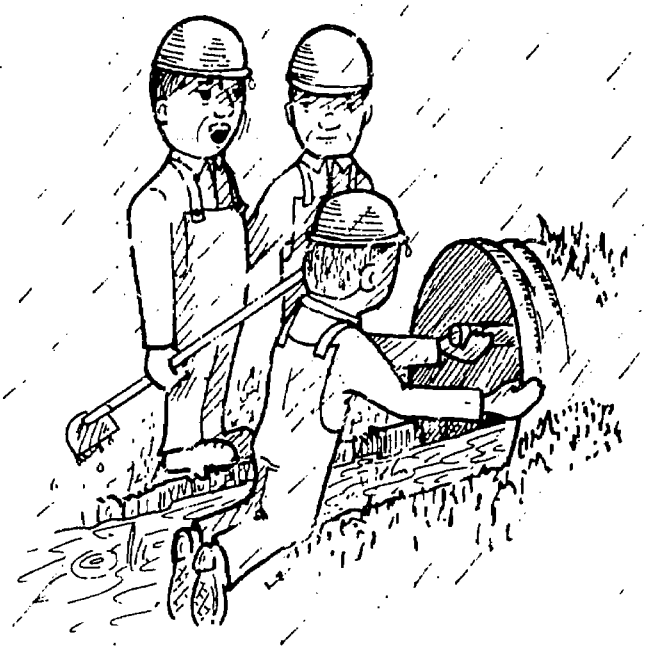
You're not serious are you? Nothing can predict tomorrow's weather.

Go to Frame 17 and make a better choice.

20

Right! If standards state recommended procedures, they would also recommend a certain tractor speed in mowing.

Go to Frame 21.



IMPORTANCE OF STANDARDS

Standards are very useful tools in a maintenance department -- or are they? Let's look at a maintenance department without formal standards.

> Leslie and his crew of five were scheduled to pick up litter this morning, but it's raining. The alternate activity is culvert inspection, so Leslie takes his five workers on a wet inspection tour. At every drainage structure, the men all get out of the trucks, three go to each end of the culvert and inspect for trouble. If debris is clogging the inlet, they remove it. If the ditch needs minor reshaping or redigging, they do it. If there is a major problem like deep silt or debris clogging the middle of the pipe, they note the site so that future work can be scheduled.

21 (continued)

What's wrong with this whole procedure?

A.	There are too many men doing the inspections together.	Go to Frame 22.
B.	Nothing's wrong.	Go to Frame 23.
C.	Culvert inspection shouldn't be done during the rain.	Go to Frame 24.
D.	No work should be done on an inspection.	Go to Frame 25.

22

You're absolutely right. There are too many men for an inspection operation. The job could be done just as well with two or three men. If the culvert inspection operation were standardized, and only two men were recommended, these six men would have formed two or three crews and accomplished two or three times as much work in a day.

Suppose now that the next day is nice, so Leslie and his five men go out to pick up litter. They spread out about five feet apart, and walk together picking up litter. Whenever one of them fills his bag, they all walk over to the truck and empty their bags. At the same time, several miles away, Bill and his five men are also picking up litter. They use a different procedure: each man is assigned an area to pick up in the same general area -- maybe they're 100 feet apart.

What can be said about the two methods?

A.	Their differences are slight and unimportant.	Go to Frame 30.
B.	Their differences seem slight, but may be important if they affect the amount of work done.	Go to Frame 31.
C.	I don't know.	Go to Frame 32.

23

Nothing's wrong? Maybe nothing's very unusual, but the situation probably could be better.

Go to Frame 26 for another example, perhaps more clearly making the point.

24

On the contrary, there's no better time to inspect a culvert than when it is supposed to be in use. If it is or isn't working correctly, the inspectors can see it immediately. They don't have to guess whether or not the drainage would be adequate if it rained.

There is something wrong in the case of the crew inspecting culverts -- but maybe it's not too clear.

Go to Frame 26 for another example.

25

Not true. It wouldn't be practical not to repair minor faults found during inspection. The men are there at the site. They have the tools necessary, and they can spare the time better than someone else sent from the garage on a special trip. So, there's nothing wrong with Leslie and his crew doing some minor work while inspecting.

However, something is wrong in that example. Go to Frame 26 to see another example.

26

Suppose a seal coating crew of 16 men is prevented from sealing by rain. The foreman issues an order: "Everyone get into the trucks and follow me. We're going to inspect culverts." So 16 men pile into two pickups and three dump trucks and set out like a procession to inspect culverts in the rain.

What's wrong with this situation?

A. Nothing's wrong. Go to Frame 27.

B. Just as in the case of Leslie and his crew, there are too many men to make up just one inspection team. Go to Frame 28.

C. They should have used just one dump truck with three men in the cab and 13 men in the dump bed. Go to Frame 29.

27

Something is wrong. How can a 16-man crew inspect the same culvert at the same time? Think about it -- what would each man do?

Go to Frame 26 and try again.

28

Correct -- but go back and read Frame 22 again. Then pick Answer B in Frame 22.

29

Sixteen men in one dump truck? No! This choice doesn't make sense. It's hard to see how any work could be done under these conditions.

Go back to Frame 26 and make a better choice.

30

Perhaps. The differences between the procedures used by Leslie and Bill do seem to be slight and unimportant, but we really can't say for sure until we've seen their results.

Go to Frame 33.

31

True. The differences seem slight. But maybe they're just big enough to make some change in the amount of work done. The proof of the procedure is in the production. If one procedure results in more litter being picked up per day, it is better than another procedure which seems very similar but which does not result in as much litter removal.

If this example involved an operation which used material, there probably would be even more differences. If Leslie and Bill had been doing spot patching of non-paved shoulders, the cost of the gravel would affect the total cost of the operation. If Bill used a more productive procedure, he also used up more gravel, so each of his crew-days costs more than each of Leslie's.

In the above spot patching example, which crew uses the better procedure?

A.	Leslie's crew; a crew-day for him costs the taxpayers less.	Go to Frame 34.
B.	Bill's crew; he gets more work done in a day.	Go to Frame 35.

32

You don't know? That's really a pretty good answer. Maybe the difference between Leslie's procedure and Bill's procedure seems great -- in which case the other two answers aren't very good. Maybe the difference is very important, no matter what the production shows. After all, production isn't the only result. Maybe one procedure is safer for the worker. Maybe one procedure is better for roadside appearances. There are many possible reasons for your not picking the other choices.

However, we consider one of those other choices the right answer. Go to Frame 33 for an explanation.

33

Both crews seem to be doing basically the same thing: walking along with a pointed stick and a big bag, picking up litter. The only difference is that Leslie's men are close together. They can talk, they can work together. Maybe their conversation can cause them to be slack on their safety precautions. Maybe their conversation slows down their work. In any event, we can't judge the two procedures unless we compare their results.

Go to Frame 22 and answer the question again.

34

Although Leslie's crew day costs less, his crew does less work than Bill's. What would you have chosen if we had said that Leslie's crew did nothing while on the job? Then certainly a crew-day of work would cost less because no gravel would be needed. That kind of crew-day is as useless as it is inexpensive.

Go to Frame 36.

35

Right. Bill's crew-day may cost more, but he more than makes up for it by finishing the work sooner. The total cost of the job would be less for Bill's crew than for Leslie's.

Go to Frame 36.

36

If several crews do the same work but use different procedures, the results probably are different costs and different production rates. This means the tasks of planning the year's work and the year's budget and hiring enough manpower become extremely difficult.

What could be done to ease these difficulties?

A.	Simply make plans more general and less rigid.	Go to Frame 37.
B.	Develop some standards.	Go to Frame 38.
C.	Call in an outside adviser.	Go to Frame 39.

37

No. Less definite plans would make the situation worse. There's a better way to help solve the planning problem.

Go to Frame 36 and try again.

Right. The development of standards will help the whole Department become more consistent. This makes planning much easier.

STANDARDS MAKE PLANNING EASIER

One more example of work without standards: Suppose that Leslie goes out to do some crack filling with his crew. He passes by the cracks he can't fit a pencil into and fills only the bigger ones. And he's careful not to fill any cracks if the temperature is too high. But, Bill goes out whenever he can (he likes the job), and fills all the cracks he sees.

What can you say about this situation?

A.	If all the other foremen also have different ways of doing things, the Department is disorganized.	Go to Frame 40.
B.	Leslie's procedure is too specific.	Go to Frame 41.
C.	Bill's procedure is too loose; he needs a little more control.	Go to Frame 42.
D.	Both Leslie and Bill are doing their jobs O.K. They must have different but equally good ways of doing them.	Go to Frame 43.

39

An outside adviser might help but probably isn't needed. The best choice is to make the suggestions the adviser would make, and follow the advice he probably would give.

One such piece of advice is given as a possible answer to the question in Frame 36. Go to Frame 36 and try again.

40

Right. No one could really say exactly how much work was done, since each crew's crew-day would represent a different amount of work. For the same reason, no one could accurately account for the costs of the jobs. No one could even be sure that needed work was being done, because there would be no real agreement about when work was "needed" or what was to be done when work was needed.

So what? Why all the fuss? As long as the work is done, why bother about different crews doing the same activity at different speeds, in different ways and with different crew sizes?

A.	Money	Go to Frame 48.
B.	Order.	Go to Frame 49.
C.	General principles.	Go to Frame 50.

41

Leslie's procedure is too specific? Maybe, but if everyone's procedure were as specific as Leslie's, things might be more consistent.

Go to Frame 44.

42

Bill's procedure may be too loose -- but really it's not. He seems to have very definite and rigid guidelines. Any crack he sees, he fills. Any time he can go on a crack-filling operation, he does. The problem seems to be that Leslie and Bill use different guidelines.

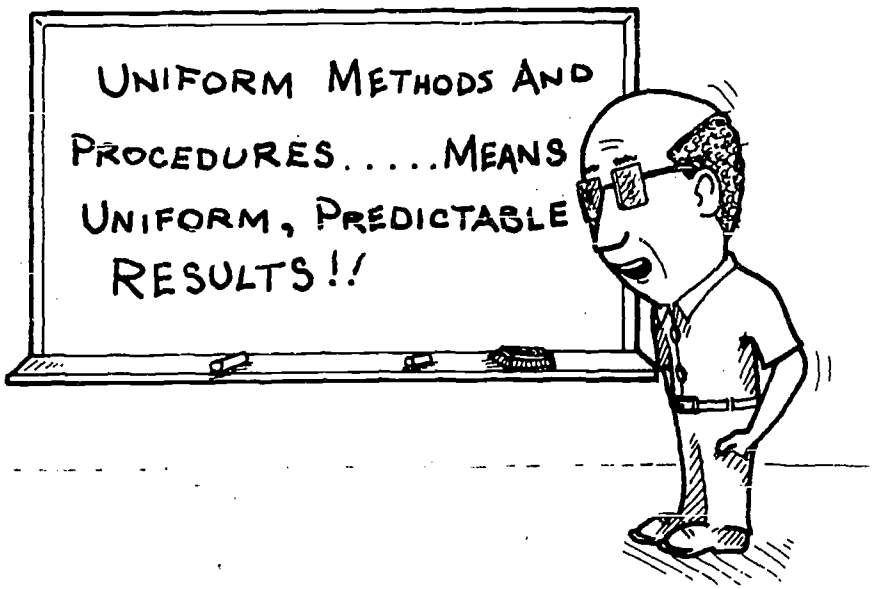
If everyone used the same guidelines, would the Department run more smoothly? Go to Frame 44 to find out.

43

No. It's very hard to imagine two foremen, like Leslie and Bill, working with such different work procedures and still being considered "doing their jobs O.K." From Bill's point of view, Leslie isn't doing his job because he fills only some of the cracks. In Leslie's mind, Bill is wasting asphalt by filling small cracks.

What would the situation be like if both men followed the same line of thinking? Go to Frame 44.

If everyone followed the same guidelines, more foremen would do work in the same way. And if the foremen all do the work in the same way, the results of the work can be predicted. This way you can determine what the results of the work will be before the work is done. All the activities of the Maintenance Department can be planned ahead.



When everyone follows the same guidelines, the whole Department becomes more consistent. The Department can achieve this effect by:

A.	Raising the salaries of its employees.	Go to Frame 45.
B.	Developing standards.	Go to Frame 46.
C.	Hiring only those who seem willing to follow guidelines.	Go to Frame 47.

45

No. Studies have shown that raising salaries by itself does very little to change work procedures and attitudes permanently.

Go back to Frame 44 and try again.

46

Right. Developing standards is developing guidelines for everyone to follow. And if everyone does not follow the same guidelines, there will be some confusion in the Department. Right?

Go to Frame 40.

47

Hiring only those who are willing to follow guidelines is a standard practice anywhere, isn't it? Not many organizations are willing to hire a person who says that he won't follow suggestions.

There's a better choice in Frame 44. Go there and choose it.

48

Right. The Department isn't as wealthy as it sometimes seems. It has to use its funds carefully and effectively in order to make them last the whole year and still do what has to be done. When standards are used, the Department's overall efficiency goes up. The result is that the cost of the work goes down.

Go to Frame 51.

49

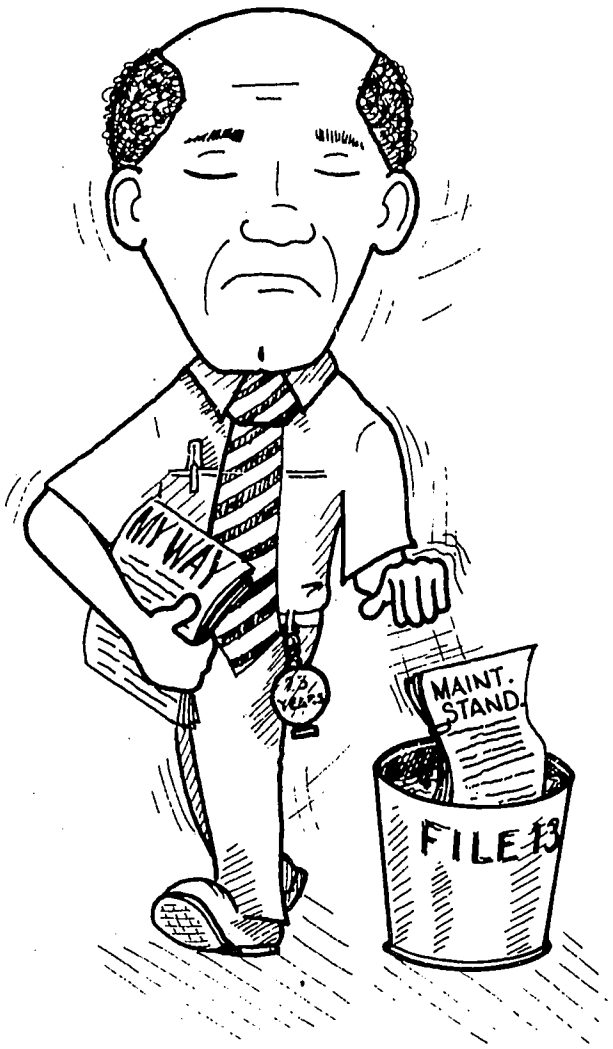
"Order" is a pretty good answer here. If there is order in the Department, there's not much trouble in finding out what's happening, who's doing what, what has been done and what will be done next. Order helps the Department to do work well and also to spot work that's not done well more easily. Finally, order helps the Department to operate more carefully -- money-wise.

Go to Frame 51.

50

General principles? You may be thinking of the right idea, but the term "general principles" means nothing definite to most people. Be more definite.

Go back to Frame 40 and choose again.



Section Two

WHY STUDY STANDARDS?

51

If standards are so useful, important and seemingly simple, why spend a whole unit of training on them? For several reasons:

First -- Some people might feel that standards could never be developed for maintenance work.

Second -- Some might feel that if standards were developed for maintenance work, they could never be applied.

Third -- Almost everyone agrees that standards would really be confusing if people did not understand them or know how to use them.

51 (continued)

This training unit tries to provide some information on the use of standards and to show that standards can be developed and used in highway maintenance work.

Why are we spending all this time on standards?

A.	Because they're so important.	Go to Frame 52.
B.	Because the subject material is so difficult.	Go to Frame 53.
C.	Because it's important for maintenance people to know more about standards.	Go to Frame 54.

52

It's true: standards are very important. Section One spent a lot of time showing how important standards can be. We could stop now if that were the main purpose of the course.

But it's not.

Suppose that in a surprise move the Department furnished each maintenance garage with a small computer system. Which of the following would be the right kind of reaction on the part of the supervisor?

A.	"Great! We can do all sorts of things now!"	Go to Frame 55.
B.	"A great machine, if we can use it; an expensive showpiece, if we can't."	Go to Frame 56.
C.	"We'll never be able to use that."	Go to Frame 57.

53

Surprisingly, the subject matter for this training unit is not difficult. You'll see, as you continue on with the unit.

Go to Frame 51 and make another choice.

54

That's correct. A standard is a management tool, and a rather simple tool, too. But even a simple tool isn't too useful if almost no one knows how to use it well.

Go to Frame 59.

55

This reaction is perhaps too eager. Unless the supervisor has some plans and some personnel to use the computer, having it in the garage will serve no useful function. On the other hand, it would be foolish to say that the computer was useless merely because nobody know how to use it. Any new tool is of limited use unless someone knows how to use it.

Go to Frame 58.

56

This seems to be a good reaction. The computer system could be a very useful tool if someone can find a use important enough to offset its cost. But if no one knows how to use it, the computer is a very expensive decoration to the garage.

Go to Frame 58.

57

What a gloomy viewpoint! Maybe it's true, but we can't make a good guess until we've looked into the uses of the computer. This should have been done, of course, before moving it into the garage. Let's assume that the supervisor has not studied the usage of this new computer.

Now go to Frame 52 and choose a different reaction.

58

The computer is a tool, an aid to work, just as standards are. In order to use these tools, people have to know something about them: what they're used for, how they're used, when they can be used, and when they can't.

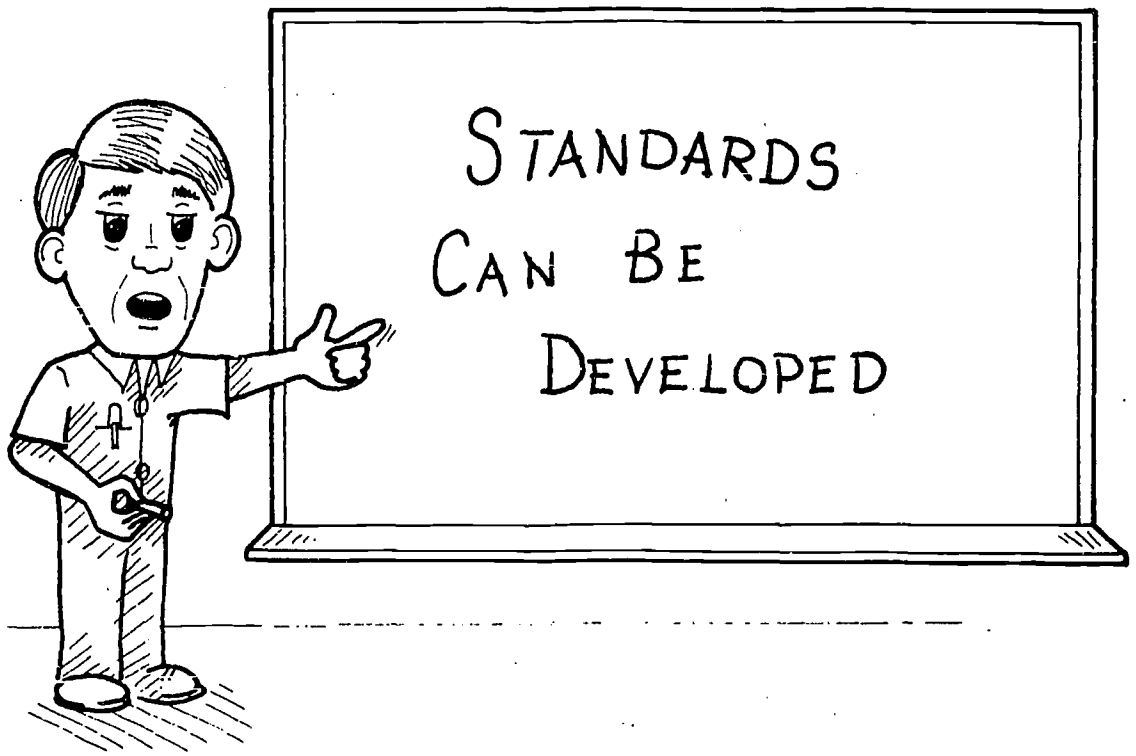
Go to Frame 59.

59

You are studying standards in this unit of training because people in the Maintenance Department need to know more about standards.

Go on to Frame 60.

60



STANDARDS CAN BE DEVELOPED

Many people feel that the results of highway maintenance work is highly unpredictable, depends too much on weather, and never repeats itself. These people say that standards are impossible.

Which of the following statements would probably be in their arguments?

A. The only activities that can be standardized are regular, routine everyday ones. Go to Frame 61.

B. It doesn't matter whether or not highway maintenance work is routine, regular and independent of weather -- standards still cannot be used. Go to Frame 62.

C. Both of the above. Go to Frame 63.

61

These people probably would say this: Only regular, routine, everyday operations can have standards.

Go to Frame 64.

62

This statement doesn't make a great deal of sense, does it? These people say that highway maintenance standards are impossible just because of the kind of work they do. Then they say that the kind of work they do doesn't matter; standards are still impossible for highway maintenance work. That's like saying, "The only reason I can't buy a new house is that I don't have enough money." And saying at the same time, "I couldn't buy a house even if I had enough money." The two ideas clash with each other.

Go to Frame 65.

63

Both of those statements? No.

Remember the sense of the question. Which of the statements might be said by those who think maintenance work can't be standardized? The first statement is that only regular, routine activities can be standardized. The second is that highway maintenance work can't be standardized even if it is regular and routine. This second statement needs an explanation.

Go to Frame 62.

64

This assumption is false. On a small scale you can't predict maintenance work. It does depend a lot on weather, and almost never repeats itself. But these features don't make standards impossible.

Let's look at how maintenance needs are unpredictable. Suppose a foreman is in charge of just one road segment, 10 miles long. He can't tell exactly when and where along this road the next pothole will develop. But he knows from past experience about how many potholes will have to be filled in a reasonably long period of time -- maybe a year. So, he has a good idea of how much premix he will need. If he were in charge of more territory or if the period of time were longer, his estimate could be even more accurate. He would also be able to predict where (on a bigger scale) and when (in a bigger time period) potholes would develop -- better than he could on a small road segment.

Does the unpredictable nature of maintenance work rule out the possibility of work standards?

A. Yes. Go to Frame 66.

B. No. Go to Frame 67.

65

If the second statement doesn't make sense, then the first statement is the answer we're looking for. People who use the nature of highway maintenance work as an argument against work standards assume that the only work that can be standardized is dull, routine, regular work.

Go to Frame 64.

66

No! Because maintenance work is not really unpredictable on the large scale of a highway maintenance agency. On a small scale, yes; on a large scale, no.

So just because work is unpredictable does not mean you can't have standards.

Go to Frame 68.

67

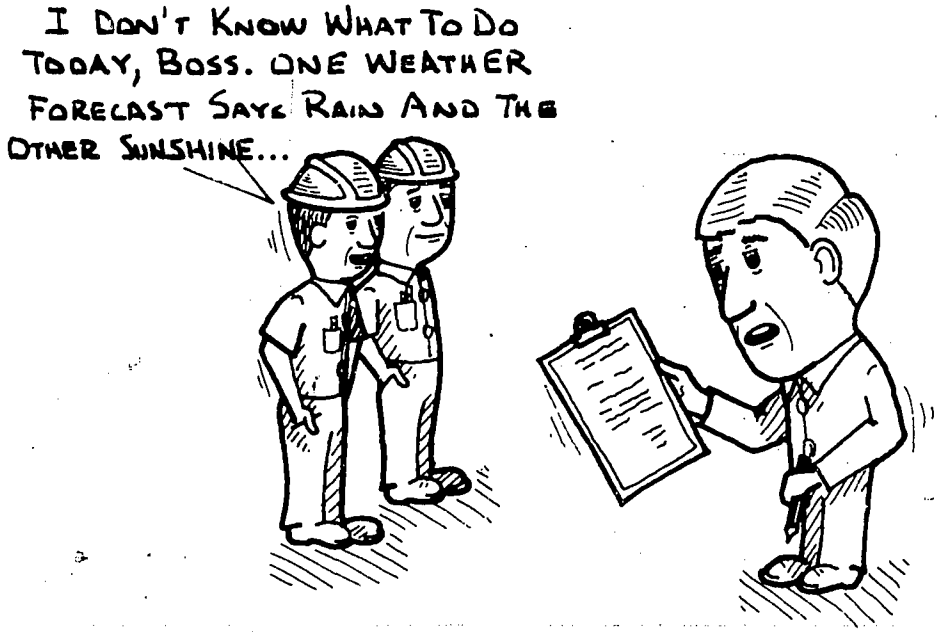
Right. Because maintenance work on the large scale of a highway department is not really unpredictable.

This can't be used as an argument against maintenance standards.

Go to Frame 68.

68

Another argument used against standards is that highway maintenance work depends too much on the weather.



68 (continued)

It's true that most highway maintenance work depends heavily on the weather. Overlays and seal coats are done only in warmer months and then only on dry days. Mowing isn't done during a snowstorm; and plowing isn't done on a warm summer day. But, as these examples show, the greatest effect of weather is in deciding when work should be done. How work is done is not affected much.

Suppose a crew is patching a pothole on a main thoroughfare in central California. The climate is hot and dry and the terrain is rocky. In four other areas, other crews are also filling potholes on main thoroughfares. Which of these crews would probably use a work procedure most like the one used in California?

A.	The crew in Louisiana, where 10 times as much rain falls, and the ground is flat.	Go to Frame 69.
B.	The crew in Maine, where the temperature averages 20 degrees lower than in California.	Go to Frame 70.
C.	The crew in Iowa, where the land is flat, the rainfall moderate, the temperature varied.	Go to Frame 71.
D.	The crew in western Washington, where rain is frequent and the terrain is mountainous.	Go to Frame 72.
E.	All the crews could (and probably would) do the work using the same general work procedure.	Go to Frame 73.

69

The climate and terrain are quite different in California and in Louisiana, but the work procedures used by premix patching crews could be similar. You're right.

But why did you choose the Louisiana procedure and not the Washington procedure as the one most like California's? Think about that.

Go back to Frame 68 and make another choice.

70

The air is colder in Maine than in California, and Maine isn't as dry as California. Maybe there is an even greater difference in the terrains of the two states. But, still, the potholes are patched in a similar way. Right.

But why do you think Maine's procedure and not Washington's is most like the one used in California? Think about it.

Go to Frame 68 and try another choice.

71

With all of Iowa's differences from California, the pothole patching procedures probably are much alike.

But how does Washington, then, compare to California? What about Maine? Or Louisiana? Why did you choose Iowa's procedure, and not the other states', as most like California's?

Go to Frame 68 and choose again.

72

There may be big differences between the climates of Washington and California, but they don't seem to affect the pothole patching procedure.

There is one slight problem. Why Washington? Why not Maine, Louisiana or Iowo? Why did you select Washington's work procedure, rather than those of the other states, as probably most like California's?

Go back to Frame 68 and choose again.

73

Right. When or how often work should be done is determined by climate to a great extent; but climate has very little to do with how the work is actually done.

Some agencies use cold mix to patch potholes all year round; others use hot mix in warm weather and cold mix during winter. These differences are due to department policy and materials on hand -- not necessarily weather. Weather and climate differences really can't be used as an argument against standards in maintenance work.

Go to Frame 74.

74

One of the more frequently used arguments against standards is the one that says no situation ever occurs twice. So every maintenance operation is different. How can we say, "Use these standards for Operation A" when Operation A will need to be done only once?

74 (continued)

It may be true that no two maintenance operations are ever exactly the same, but does it really matter? Let's look at an example. Roscoe is the foreman of a small crew mowing the median strip of a level highway. Floyd has a similar crew mowing on a median strip with a 1% grade.

Are there any directions you might give to one foreman but not to the other?

A.	No, both operations are the same, for all practical purposes.	Go to Frame 75.
B.	Yes, to Floyd you might say, "We'll expect you to cover a little less ground than the others."	Go to Frame 76.
C.	Yes, to Roscoe you might say, "You have to be extra careful because traffic is very fast."	Go to Frame 77.

75

Right. If you didn't know anything about the median strips except their grades, you couldn't give different directions to the two foremen. A 1% grade is not important, so far as mowing is concerned.

Go to Frame 79.

76

No. Go to Frame 78.

77

No. Go to Frame 78.

78

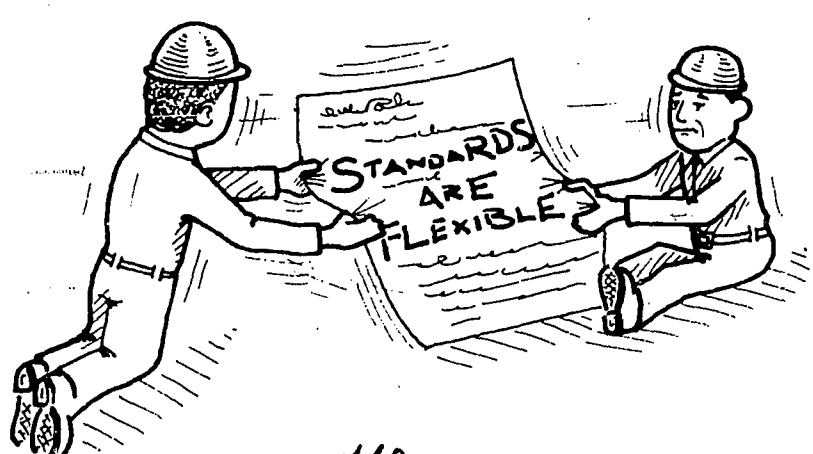
A 1% grade really has no effect on a mowing operation. There may be other factors which do affect mowing, but in this example no other facts are given.

Go to Frame 79.

79

Since the same instructions were given to both foremen, they must be doing the same job. They both have the same guidelines. It doesn't matter that there are small differences in the situations; the guidelines are flexible enough to cover small differences.

The same standards can be applied to many individual cases because standards are guidelines and flexible. The very fact that two activities have the same name indicates that they are enough alike to be using the same standard. Both Roscoe and Floyd were mowing.



79 (continued)

What conclusion is reached within the last dozen frames?

A.	In some maintenance work, standards can't be developed.	Go to Frame 80.
B.	In highway maintenance work, standards can be developed.	Go to Frame 81.
C.	In highway maintenance work, standards cannot be developed.	Go to Frame 82.

80

It's probably true. There probably is some kind of maintenance work which can't or shouldn't be standardized. For example, the job of maintaining all the light bulbs in a house is too small a job to need a standard. The need for this work does not occur often, and so the worker just notices that a bulb has burned out and replaces it shortly afterwards. The number of bulbs is too small, and the lifetime of each one is too long, to really use standards. But, if a worker has to maintain bulbs in a large office building, there might be a need for standards.

But there is a better conclusion in Frame 79. Choose again.

81

Right. In highway maintenance work, standards can be established even though some people think they can't. Perhaps the best proof that standards are possible comes from those agencies that have developed and now use standards. Their operations are more efficient.

Go to Frame 83.

82

No! The conclusion should be just the opposite -- standards can be developed.

We said that highway maintenance work is predictable on the scale of a highway department. We found that weather affects mostly how often maintenance work is done, not the work procedure. And we also said that highway maintenance work repeats itself enough.

So highway maintenance standards can be established. Right?

Go to Frame 81.

STANDARDS CAN BE USED

Some people feel that even if standards can be developed, they can't be used, either because there would be too much red tape or because no one would pay any attention to them.

Let's look at another example. Guy is a foreman who uses standards. Harry is a foreman who does not. Before Guy starts out on a job, he makes sure he has the right number of men and the right kind of equipment. Harry just uses his own judgment and experience to determine resources. Guy tries to follow guidelines and accomplish a certain amount of work each day. Harry just does his best. Guy reports what was done. Harry may or may not.

Whose job involves more red tape?

A.	Guy's.	Go to Frame 84.
B.	Harry's.	Go to Frame 85.

84

Guy has more red tape. Right. Red tape usually means a lot of unnecessary paperwork. Guy has more paperwork than Harry, but is it unnecessary?

Go to Frame 86.

85

Harry's job doesn't have much red tape. In fact, the only paperwork he has is sometimes reporting what was done.

Go to Frame 86.

86

Guy has to think about his job more. He is careful because he knows his supervisor expects good results from him. On the other hand, Harry seems to have an easy, carefree job with not many controls. Some people might call Guy's checking, reviewing, comparing and reporting "a lot of red tape." We prefer to think of it as necessary management. Guy definitely has more responsibilities than Harry. We don't say, however, that Guy has to do too much. Rather, Harry doesn't have to do enough.

86 (continued)

Let's see the results of operations of these two foremen to see if Guy's work really is worthwhile. Suppose Harry did some premix patching with his crew of four. Guy's crew, including himself, numbered three. At the end of the work day, Harry's crew had used three tons of premix. The repair jobs lasted an average of one year. Guy's crew placed two tons of premix and the expected life of the patch was four years.

Which crew's work cost less?

A. Guy's. Go to Frame 87.

B. Harry's. Go to Frame 88.

87

Right. Guy's 3-man crew placed 2 tons in a day and the premix stayed in place for 4 years. That means a ton of premix was used in 12 man-hours, and spread over 4 years, that ton cost the Department 3 man-hours per year. Harry's work cost more. His crew of 5 used 3 tons, so each ton cost $13\frac{1}{3}$ man-hours. Since the premix lasted only 1 year, the Department paid $13\frac{1}{3}$ man-hours per year for that ton. Harry's work was about $4\frac{1}{2}$ times as expensive as Guy's.

Go to Frame 89.

88

Remember, Harry's crew did not use standards. The men followed Harry, and he did what he thought was best.

Let's see how he did. His crew put in 40 man-hours that day and placed 3 tons of premix. Guy's crew used 24 man-hours in placing 2 tons.

Which crew used fewer man-hours to put one ton of premix in place?

A.	Harry's used fewer -- 12 man-hours compared to $13\frac{1}{3}$.	Go to Frame 90.
B.	Guy's used fewer -- 8 man-hours compared to 20.	Go to Frame 91.
C.	Guy's used fewer, 12 to $13\frac{1}{3}$.	Go to Frame 92.
D.	Harry's used fewer, 10 to $13\frac{1}{3}$.	Go to Frame 93.

89

By going through all the "red tape" involved in using standards, Guy's crew did the work at a much lower cost. And the work lasted four years instead of one. In this example, which isn't at all farfetched, Guy's work is indeed worthwhile.

We can't use the red-tape argument against using standards. But we still find the argument that standards can't be used because no one would really pay any attention to them; they're useless.

Here comes another example:

89 (continued)

Rodney and Carl are two supervisors. Rodney has no luck in getting his foremen to use standards. Carl has no problem. Which of the following situations might make the difference?

A. Rodney talks about the standards to his foremen but doesn't seem to care too much if they follow through.

Carl conducts regular meetings to discuss the use of standards. Go to Frame 101.

B. Rodney carries on business as usual. He doesn't know quite what to do about his foremen.

Carl also goes about his normal business. But he puts notices on the bulletin board every time a standard changes. Go to Frame 102.

90

No. Go to Frame 94.

91

No. Go to Frame 94.

92

Right. Harry's crew cost the Department $13\frac{1}{3}$ man-hours for every ton placed.

But Guy's crew placed a ton in 12 man-hours. Guy's crew did work that cost less as far as actual work is concerned. But what about the quality of the work?

Go to Frame 97.

93

No. Go to Frame 94.

94

Harry placed 3 tons in 40 man-hours, so his productivity was 40 man-hours for every three tons. More simply, $13\frac{1}{3}$ man-hours per ton. Guy placed 2 tons in 24 man-hours, a productivity of 12 man-hours per ton.

Now, which crew used fewer man-hours to place a ton of premix?

A.	Guy's.	Go to Frame 95.
B.	Harry's.	Go to Frame 96.

95

Right. Guy's crew did the job more economically than Harry's, as far as costs for the actual work are concerned. Now how about the quality?

Go to Frame 97.

96

Wrong. Harry's productivity rate was $13\frac{1}{3}$ man-hours per ton. That's more (not less) than Guy's rate of 12. Right?

Go to Frame 95.

97

Harry's work lasted only a year. We can say that the repair job costs the taxpayers $13\frac{1}{3}$ man-hours per ton per year.

Guy's work lasted four years. How much did Guy's work cost the taxpayers per year?

A.	Four man-hours.	Go to Frame 98.
B.	Three man-hours.	Go to Frame 99.

98

Four man-hours per ton per year? No.

Go to Frame 100.

99

Three man-hours per ton per year? Yes!

Go to Frame 100.

100

Guy's crew did the work at the rate of 12 man-hours per ton, and the premix patch lasted for 4 years. When the 12 man-hours per ton are spread over 4 years, the cost is 3 man-hours per ton per year. Harry's crew, on the other hand, was about $4\frac{1}{2}$ times as expensive at $13\frac{1}{3}$ man-hours per ton per year.

Go to Frame 89.

101

Right. It takes more than notices on bulletin boards to get employees to really pay attention to standards. Everyone must learn what standards are, why they are used and how to use them.

SUMMARY

In this Section, we have studied some of the arguments against standards. Some people feel that standards are impossible because every highway job is different from every other, all the work is unpredictable and depends too much on weather. We defeated each of those arguments.

Another argument was that standards couldn't be used -- even if they could be developed -- because they involved too much paperwork and no one would follow them. After looking at the situation we decided that there would be more paperwork. But the economic benefits would outweigh the extra effort. Besides, personnel would use standards if they were given the right kind of instruction.

Go to Frame 103.

This situation is not very realistic. Business as usual plus a notice on the bulletin board now and then probably would not account for using standards.

Go to Frame 101.

Section Three

KINDS OF STANDARDS

103

There are three kinds of standards used in highway maintenance work: Quality standards, quantity standards and performance standards.

103 (continued)

QUALITY STANDARDS

Quality stondards are guidelines on how well the road system should be maintained. More to the point, quality standards are guidelines that show under which circumstances work should or should not be done. For example, a quality standard for the crack-filling operation on bituminous pavement might be: "Fill only cracks more than $\frac{1}{4}$-inch wide when the outside temperature is between 30° and 50°F." When these conditions are present, the quality standard says that work should be started. But if the crack is too narrow or the temperature too high, the quality standard says that no work should be done.

Quality standards help to determine _____ work should be done:

A.	how well	Go to Frame 104.
B.	how	Go to Frame 105.
C.	whether or not	Go to Frame 106.
D.	when	Go to Frame 107.
E.	why	Go to Frame 108.

104

How well work should be done? In a way this is true, but it's not the best way to complete the sentence.

Try again -- Frame 103.

105

How work should be done? No. Nothing yet has been said about how work is done.

Go to Frame 109.

106

Right. Quality standards help determine whether or not work should be done in a given situation.

Go to Frame 110.

107

When work should be done? Perhaps. You probably have the right idea about quality standards. In the example, if the temperature is too high, it's not the right time to fill the crack.

In that sense of "when," this is a correct choice.

Go to Frame 110.

108

Why work should be done? No. Quality standards have very little connection with the reasons for maintenance work. And we haven't even brought up the subject yet.

Go to Frame 109.

109

Remember, quality standards state under which conditions work is recommended.

Go to Frame 103 and complete the sentence again.

110

A quality standard helps answer the question, "Should we or shouldn't we?"

Way back in Section One, there was an example in which Leslie, a foreman, goes out to fill cracks. He uses standards in the activity. But Bill, the other foreman, uses no standards. He fills cracks -- all cracks.

Who would have more help in making the decisions about which cracks to fill?

A.	Leslie.	Go to Frame 111.
B.	Bill.	Go to Frame 112.

111

Yes. Leslie has more help. The quality standard tells him which cracks to fill. If the crack is wide enough and the temperature is low enough, fill it. Otherwise, don't.

Go to Frame 113.

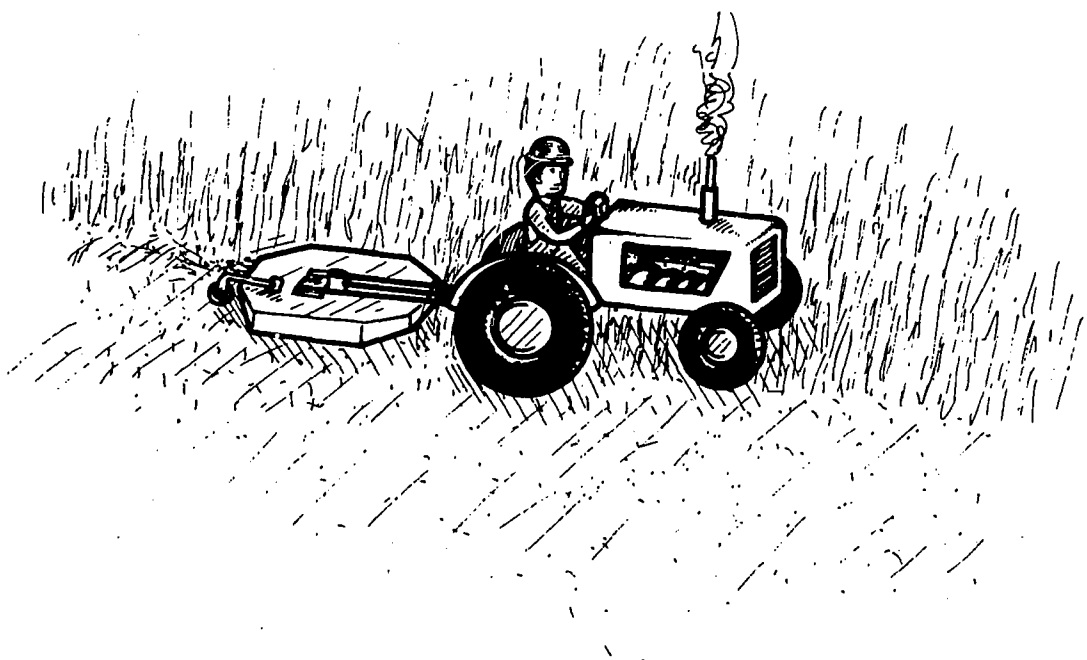
112

No. Bill has no help at all, since he has no standards to guide him. Maybe this is why he just fills all cracks.

Go to Frame 113.

113

Many times, quality standards describe more than conditions which make work necessary. They can also describe expected results of the work. So, the quality standard for mowing might be: "When vegetation reaches the height of 14 inches, it should be cut down to a height of 5 inches."



113 (continued)

What should be the result of this mowing operation?

A.	The vegetation should be 5 inches high.	Go to Frame 114.
B.	The vegetation is 14 inches high.	Go to Frame 115.
C.	The vegetation should be cut.	Go to Frame 116.

114

Right. The result is that the vegetation should be 5 inches high, according to the standard. We call the description of results the "workmanship goal." Often workmanship goals are hard to find on paper. Everyone agrees to them, but they're the kind of thing a foreman tells his crew.

Here is the crack-filling standard again. "Fill only cracks more than $\frac{1}{4}$-inch wide when the outside temperature is between 30° and 50°F.

Is there a workmanship goal contained in this standard?

A.	Yes.	Go to Frame 117.
B.	No.	Go to Frame 118.

115

No, the 14-inch high vegetation is the condition that needs work. How does the vegetation look after good work has been done on it?

Go to Frame 113 and choose another answer.

116

Yes, the vegetation should be cut, but how much? To follow the standard, the vegetation must be cut down to a height of 5 inches. Now, how can you tell if an area has been properly mowed? How does it look?

Go to Frame 113 and choose again.

117

Where is the workmanship goal? The width of the crack? The temperature range? No. There is no description of how the pavement would look after the crack-filling operation. So this standard contains no workmanship goal. All the workers may have one -- certainly the foreman has one -- but it doesn't show up in the words of the quality standard.

Remember that quality standards describe the conditions which are the basis for deciding whether or not work should be done. And sometimes they say how the finished job should look.

Go to Frame 119.

118

Right, there is no workmanship goal shown on the standard.

Remember that quality standards describe the conditions which are the basis for deciding whether or not work should be done. And sometimes -- through workmanship goals -- they say how the finished product should look.

Go to Frame 119.

TWICE A SEASON

320 gallons per pavement line per year

5 Tons per Lane Mile per Year

16 Lineal Feet Per 100 Feet

QUANTITY STANDARDS

Quantity standards are closely related to quality standards. They are estimates of how much work must be done to satisfy the quality standards. Consider the following case:

> Vegetation grows about 3 feet a year. The mowing quality standard says that 14-inch vegetation should be cut to 5 inches.

119 (continued)

How many times a year should a mowable right-of-way be mowed?

A.	Three times.	Go to Frame 120.
B.	Four times.	Go to Frame 121.
C.	Five times	Go to Frame 122.
D.	More than five times.	Go to Frame 123.
E.	There's no way of knowing.	Go to Frame 124.

120

Let's check it out to see if three mowings will satisfy the quality standard. Remember that the vegetation is not allowed to go over 14 inches in height if the standard is the guideline.

Go to Frame 125.

121

Right. Four mowings are enough to satisfy the quality standard.

Is it obvious to you that four is the answer?

A.	No.	Go to Frame 125.
B.	Yes.	Go to Frame 126.

122

Five times is splurging a bit. If the vegetation is mowed five times, the Department is spending 25 percent more than it has to for mowing.

Go to Frame 125.

123

No. Even five times is a bit too many.

Go to Frame 125.

124

Wrong. There is a way of knowing. We know how much the vegetation grows in a year. We know how high it should be before it is cut and how high afterwards. We should be able to figure out how many cuts are needed so that all three feet of the year's growth are cut during that year.

Go to Frame 125.

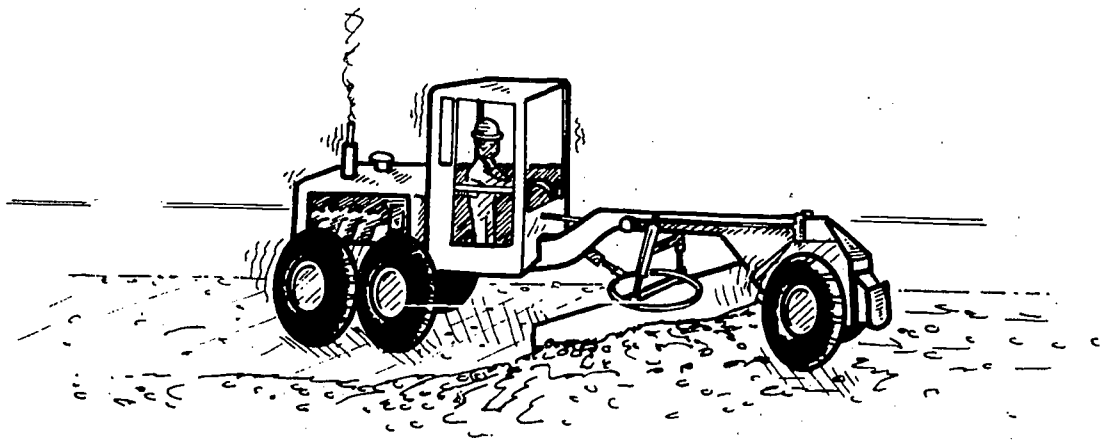
125

When the vegetation reaches a height of 14 inches, it is cut down to 5 inches. Nine inches are cut off. Since this vegetation grows 36 inches per year, it would take four such cuts to cut all 36 inches of this year's growth. So, we say that for every acre there is to be mowed, four acres are mowed per year.

Go to Frame 126.

126

In this case the quantity standard for mowing is "four acres for every mowable acre." Quantity standards always refer to an amount of work to be done on a certain feature of the highway system. For mowing, the feature is a mowable acre; for premix patching, it might be a lane-mile; for drainage maintenance, it's a drainage structure or maybe lineal foot of culvert.



126 continued)

What might be a highway feature for shoulder work?

A.	Shoulder mile.	Go to Frame 127.
B.	Lane mile.	Go to Frame 128.
C.	Ditch mile.	Go to Frame 129.

127

Right. Shoulder work would use a shoulder mile as the feature of the highway system. So the quantity standard for spot patching gravel shoulders might be "half a cubic yard of gravel per shoulder mile" and the standard for reshaping shoulders might be "six pass miles per shoulder mile."

Quantity standards also mention a period of time. What good is it to say, "We can plan on using a quarter-ton of premix for every lane mile" if no time period is given? A quarter-ton placed on a lane mile in a week -- every week --would be too much. An average road would be clogged with work crews at least once a week. On the other hand, if the time period were five years, a crew would probably work less than an hour every five years on one average lane mile. So time is important.

Our quantity standard for mowing is four mowings per mowable acre. This standard would apply best to what time period?

A.	Winter.	Go to Frame 130.
B.	Year.	Go to Frame 131.
C.	Season.	Go to Frame 132.

128

No. For shoulder work is doesn't matter how wide the road is. What matters is how many miles of shoulder there are. So, lane miles, which describe the width of the road, are not too useful when measuring shoulder work.

Go to Frame 126 and try again.

129

No. Very often, where there is a shoulder there is a ditch. But not always. So, knowing how many miles of ditch there are isn't what's needed when shoulder work is in question.

Go to Frame 126 and choose another answer.

130

Hardly -- unless the climate is so mild that grass and weeds grow even in winter.

Go to Frame 127 and make another choice.

131

Perhaps. A year is a pretty good time period because the full cycle of maintenance activities takes place. It's also good because a year usually is the standard time period for planning and budgeting.

But a year isn't the only possible time period. If no mowing is done during the winter, winter is not included in the time period. The quantity standard for mowing could just as well be "four mowings per mowable acre per season," as "per year."

Go to Frame 133.

132

Maybe. During the mowing season, all mowing is done. Outside of the mowing season, no mowing is done. So why include the whole year?

It depends on department policy. Most planning is done on a yearly basis, so maybe it would be useful to use a year as the time period for all quantity standards. Maybe not. As long as the department is consistent, it doesn't matter.

Go to Frame 133.

133

Quality standards and quantity standards serve as a basis for estimating the kinds and amount of work that need doing.

Go to Frame 134.

PERFORMANCE STANDARDS

The third type of standard is a performance standard. A performance standard states the kinds and amounts of resources needed, the procedure to be followed, and the expected results from a particular operation. More to the point, a performance standard gives the kind of equipment and materials, crew size, work procedure and expected daily accomplishment in total units of work and in productivity rates (man-hours per unit of work).

134 (continued)

The following information is about a seal coat operation. Which of the statements belongs on a performance standard?

A.	Sweep all loose debris from pavement.	Go to Frame 135.
B.	Do not schedule during the winter months.	Go to Frame 136.
C.	At least 50% of the surface should be alligatoring before sealing.	Go to Frame 137.
D.	During the season, an average of one out of every six lane miles is sealed.	Go to Frame 138.

135

Right. Sweeping the pavement is part of the recommended procedure -- as found in a performance standard. The other choices are parts of either the quantity standard or the quality standard.

Another part of a performance standard is the expected daily work accomplishment. Accomplishment usually is given in two forms; total amount of work -- production -- and productivity rate. Suppose two men are spot patching a gravel shoulder. In one work day, they spread four cubic yards of gravel.

What is their daily production?

A.	Two cubic yards.	Go to Frame 139.
B.	Eight cubic yards.	Go to Frame 140.
C.	Four cubic yards.	Go to Frame 141.

136

No. This statement gives one rule for whether or not the seal coat activity should be done: it shouldn't be winter. Quality standards, not performance standards, give this sort of information; so you'll have to make another choice.

Go back to Frame 134.

137

No. This choice states one of the rules for determining whether or not a seal coat activity should be started. Performance standards don't help decide whether or not to do work; quality standards do.

Go to Frame 134 and make another choice.

138

No. This is not part of a performance standard. This choice states the average number of seal coats done in a period of time. That's a quantity standard.

Go to Frame 134 and try again.

139

No. The daily production is not two cubic yards.

Go to Frame 142.

140

No. Eight cubic yards were not spread in that one day, according to the example.

Go to Frame 142.

141

Right. The example says, "In one work day they spread four cubic yards of gravel." So, their daily production was four cubic yards.

In the same example, how would the productivity rate be expressed?

A.	In cubic yards.	Go to Frame 143.
B.	In cubic yards per man-hour.	Go to Frame 144.
C.	In man-hours.	Go to Frame 145.
D.	In man-hours per day.	Go to Frame 146.
E.	In man-hours per cubic yard.	Go to Frame 147.

142

Daily production means the amount of work done in a day. How much work did this crew do in one day? It makes no difference how big the crew was or how many hours a day the crew worked. The daily production is how much work is done in one day.

Go to Frame 135 and choose again.

143

No, cubic yard is a measure of work or production. It does not say how many men were used or how long it took to do the work.

Go to Frame 148.

144

No. Cubic yards per man-hour can give a lot of information. In fact, all the information we're looking for is there. But this is not a productivity rate. Try it the other way around.

Go to Frame 148.

145

No, not in man-hours alone.

Go to Frame 148 for an explanation of productivity or productivity rate.

146

No. Man-hours per day does not say how much work was done. It just says how many men were assigned to the job.

Go to Frame 148.

147

Right. Productivity or productivity rate is expressed in man-hours per cubic yard for gravel shoulder patching.

Do you want an explanation of productivity?

A.	Yes.	Go to Frame 148.
B.	No.	Go to Frame 149.

148

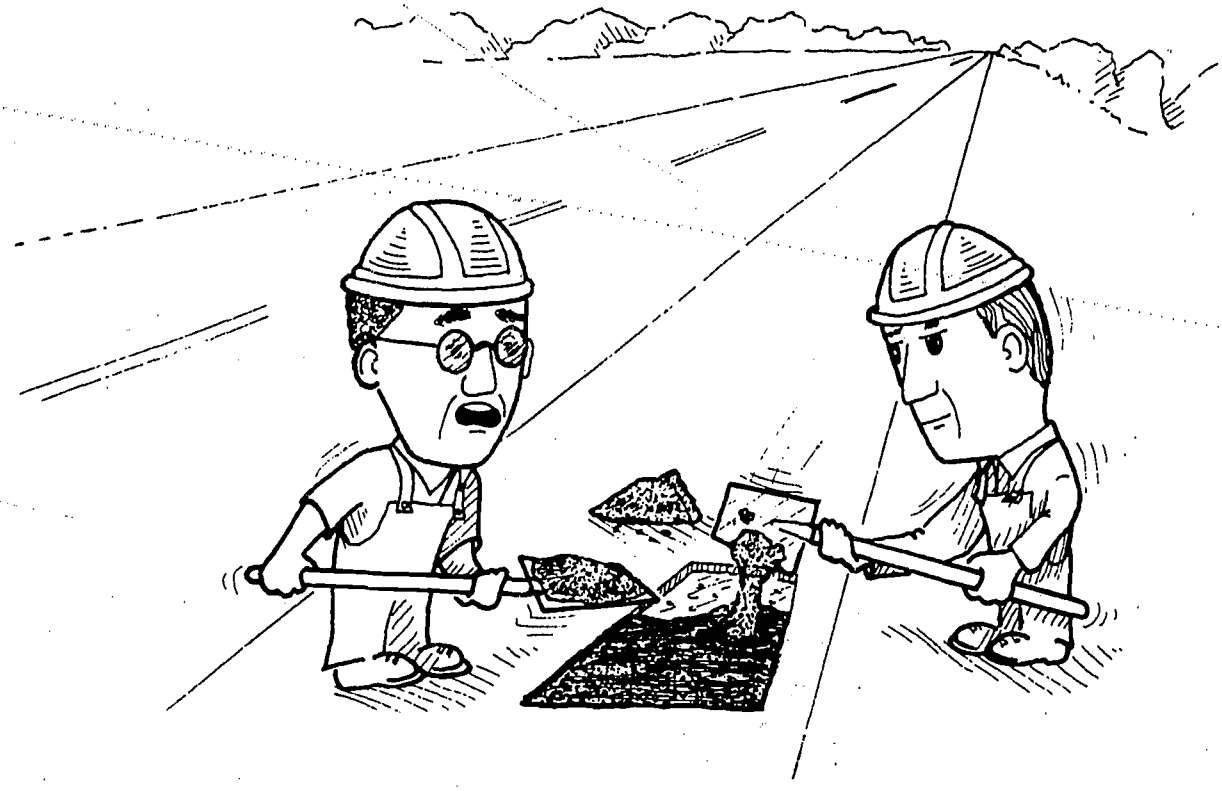
Productivity or productivity rate is one measure of the cost of a unit of work. We can best show what productivity is and how it is used by comparing two crews.

Horace and his helper can do a shoulder patching job in two days. Tyrone's crew can get the same results in just one day.

Who can do the job at less cost?

A.	Horace's crew.	Go to Frame 150.
B.	Tyrone's crew.	Go to Frame 151.
C.	There's not enough information given.	Go to Frame 152.

149



In our original example, two men were spot patching a gravel shoulder. They spread four cubic yards of gravel in one day.

What was their productivity?

A.	Two man-hours per cubic yard.	Go to Frame 153.
B.	Four man-hours per cubic yard.	Go to Frame 154.
C.	A quarter man-hour per cubic yard.	Go to Frame 155.

150

Why would Horace's crew do the work for less? It takes Horace twice as long to do it, so it might cost more.

Go to Frame 148 and make another choice.

151

Tyrone's crew? You would think that since Tyrone could do the job in half the time, he'd do it for half the cost, too. But what if Tyrone's crew had five men instead of the two on Horace's crew?

Think about it. Then go back to Frame 148 and choose again.

152

Right. Time isn't the only thing to think about in measuring the cost of a job. Crew size is just as important. A one-day job does not necessarily cost less than a five-day job. Maybe 10 men were needed to finish in one day, but one man could do it in five days. That's 10 man-days versus five.

In general, the labor cost of a job is determined by its man-hours, which include both time and crew size. Productivity is the number of man-hours needed to do one unit of work. If the productivity rate is low, the cost of a unit of work is low.

Go to Frame 149.

153

No. If one man worked an eight-hour day and used four cubic yards of gravel, there would be eight man-hours used to do four cubic yards of work. That amounts to two man-hours for one cubic yard.

However, two man-hours per cubic yard is incorrect because there were two men, not one.

Go back to Frame 149 and make another choice.

154

Right. Two men each working eight hours makes 16 man-hours, and 16 man-hours for 4 cubic yards comes to four man-hours per cubic yard.

Go to Frame 156.

155

No. You divided the wrong way. Two men work an 8-hour day. That's 16 man-hours. They use 4 tons of gravel. Now, how many man-hours are needed to use one ton? You divide man-hours by tons, 16 by 4, not the other way around.

Go to Frame 156.

156

Here is a list of statements. One of them is not part of the performance standard for premix patching. Which one is it?

A.	Place material in layers not greater than 3 inches in depth.	Go to Frame 157.
B.	Schedule this activity whenever hazardous potholes, edge failures, etc. are noticed.	Go to Frame 158.
C.	Use one 3-cubic-yard truck.	Go to Frame 159.
D.	Use two men plus a flagman as needed.	Go to Frame 160.
E.	Expect to use from 1 to 3 tons of premix per day.	Go to Frame 161.

157

Wrong. This is part of the recommended procedure found on a performance standard.

Go to Frame 162.

158

Right. This statement looks like a quality standard. It helps planners decide whether or not premix patching should be done. It is not part of a performance standard.

Go to Frame 163.

159

No. Recommended resources -- in this case, needed equipment -- are part of performance standards.

Go to Frame 162.

160

No. Suggested manpower is one part of a performance standard.

Go to Frame 162.

161

No. This is the expected daily production, a part of the performance standard.

Go to Frame 162.

162

You chose one of the parts of premix patching's performance standard. As a review, here is a list of the contents of a performance standard:

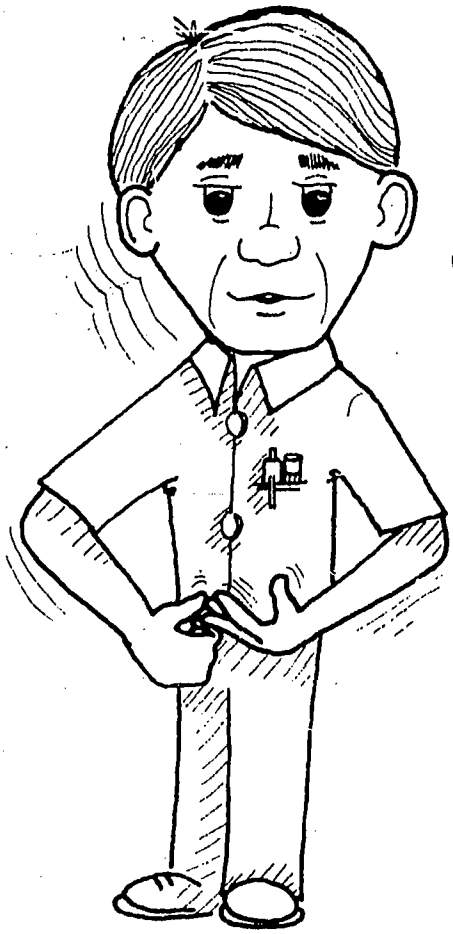
+ A listing of the resources required (manpower, equipment and material).

+ The recommended work procedure.

+ The expected daily accomplishment in work units per day and man-hours per work unit.

One of the statements in Frame 156 does not give a required resource, a recommended procedure or an estimate of daily accomplishment.

Go to Frame 156 and find it.



YOU HAVE NOW FINISHED PART ONE OF THE TRAINING ON STANDARDS. . . . . LET'S REVIEW THE MAIN POINTS HERE . . .

Standards are models to be followed or goals to be achieved. They are useful management tools because they guide employees, promote a uniform level of maintenance and make planning and scheduling easier. In spite of arguments against standards, they can be developed and put to use with less trouble than expected.

There are three kinds of standards: quality standards, quantity standards, and performance standards.

+ Quality standards are guidelines showing under what conditions work should be done.

+ Quantity standards are estimates of how much work is necessary to satisfy quality standards.

+ Performance standards are guidelines for doing the work. They include the kinds and amounts of resources required, the procedure to be followed and the expected daily accomplishment.