MANUAL 90-1

FIELD DATA COLLECTION
FOR
ASPHALT AND CONCRETE PAVEMENT
REHABILITATION PROJECTS

OVERLAY
RECYCLING
MILLING
CPR

Revised November 2005

NOTE: This manual provides a written account of how certain activities are performed and is designed to guide and assist staff members in performing their functions.
When appropriate, there may be deviations from these written procedures due to changes in personnel, policies, interpretation, law, experimentation with different systems, or simply evolution of the process itself.

This manual may be changed at any time. Staff members are encouraged to review this manual periodically and suggest changes in the manual to keep the manual current and to minimize differences between the manual and actual practices.

CHAPTER 18 - FIELD DATA COLLECTION FOR 90-1 SURVEYS

18-1 REFERENCE POINT STATIONS

This information is taken from *"Highway Survey Stationing Guidelines, Revised August 1999"*

The new stations will be known as RP (**R**eference **P**oint) stations.

Stationing will increase continuously from the beginning of a highway. Station 0+00 will begin at the zero (0) reference point.

- On a west-east highway, the stationing will increase continuously in the EASTERLY direction.

- On a south-north highway the stationing will increase continuously in the NORTHERLY direction. Stations, coordinates, & reference point numbers will all increase in the same direction.

This procedure will eliminate almost all duplicate stations on a highway.

A **highway control point** is the point of intersection with another highway. The station value of these points will not move. The **highway control point** station is found by ***on the mainframe RIMS program.*** Under RIMS menu pick the following option in each MENU

B MILESTONE
A BASE HIGHWAY INFORMATION
B REFERENCE POINT INFORMATION

A "+" sign is placed between the second and the third digit left of the decimal point. Stationing will always increase to the next control point (next highway intersection). There will generally be an equation at this point (next highway intersection).

An intersecting highway can move because of relocation. If this happens, the **highway control point** value will change by the amount the intersection moved.

REFERENCE POINT STATION EXAMPLE:

Project is on US#281 at Edgeley
The project begins at the intersection of US#281 & ND#13 (known reference point is 30.680)
Station 1619+90.40 RP (Determined from the RIMS program)

The project ends at the intersection of US#281 & ND#46 (known reference point is 49.707)
Station 2624+52.96 RP (Determined from the RIMS program)

Stationing will increase from 1619+90.40 going north to the intersection of ND#46.
There will normally be an equation at this point.
Assuming we check into the intersection point (ND#46) with a station of 2624+50.20, which is the actual surveyed station, the equation will be 2624+50.20Bk = 2624+52.96Ahd.

18-1.1 BUSINESS LOOPS - 900 SERIES

The RP station for reference point 900 is 47520+00. This is a very large number. Therefore, stationing for the 900 series will drop the 9 out of the reference point number.

EXAMPLE:
The station for reference point number 900 = 0+00 RP
The station for reference point number 920 = 1056+00 RP

The one way pairs in Bismarck and Fargo will be handled as divided highways. The reference points will increase in the north bound lanes throughout the business loop. The south bound lanes will start at the south end with the RP of the intersect with north bound lanes and go north until they intersect with the north bound again. In the case of Bismarck, the southbound lanes station will be larger than the northbound lanes station, at the tie in point. In Fargo, the southbound lanes station will be less than the northbound lanes station at the tie point.

18-1.2 INTERSTATE HIGHWAYS

On interstate highways the project stations every 500 feet are stamped in the concrete. There are many duplicate stations across the state. Asphalt overlays, milling, and CPR projects will cover up or obliterate many of the station marks. Therefore the existing stamping will not be used to determine RP stations. Recycling and new concrete projects will be stamped with the RP stations. The RP stationing will be determined by the same methods used on other highways.

18-1.3 STRUCTURES

Sometimes a bridge survey must be done that is not part of a roadway survey and is far from the beginning intersection (**highway control point**) of that highway segment. When this happens, the bridge number will be used to determine the station at the center of the structure. The distance back to the nearest reference point (not on the structure) along the highway will be measured. The station of that reference point will be an equation point on that highway. **Use the RIMS station value for the stationing of this beginning reference point.** This point must be monumented. It will be used to tie in future surveys.

EXAMPLE:

A bridge survey is needed on highway 31 at bridge # 31-010.364

The field survey distance measured back to the nearest reference point, on the highway, is 1922.92 ft.

The RIMS **RP** stationing for reference point 10 is 528+60.74 **RP (USE THIS STATION VALUE)**

This reference point becomes an equation point on ND#31 and is **monumented**.

The reference point stationing for the bridge becomes 528+60.74 **RP** + 1922.92 = 547+83.66 **RP**.

18-1.4 ROADWAY SURFACE IMPROVEMENTS

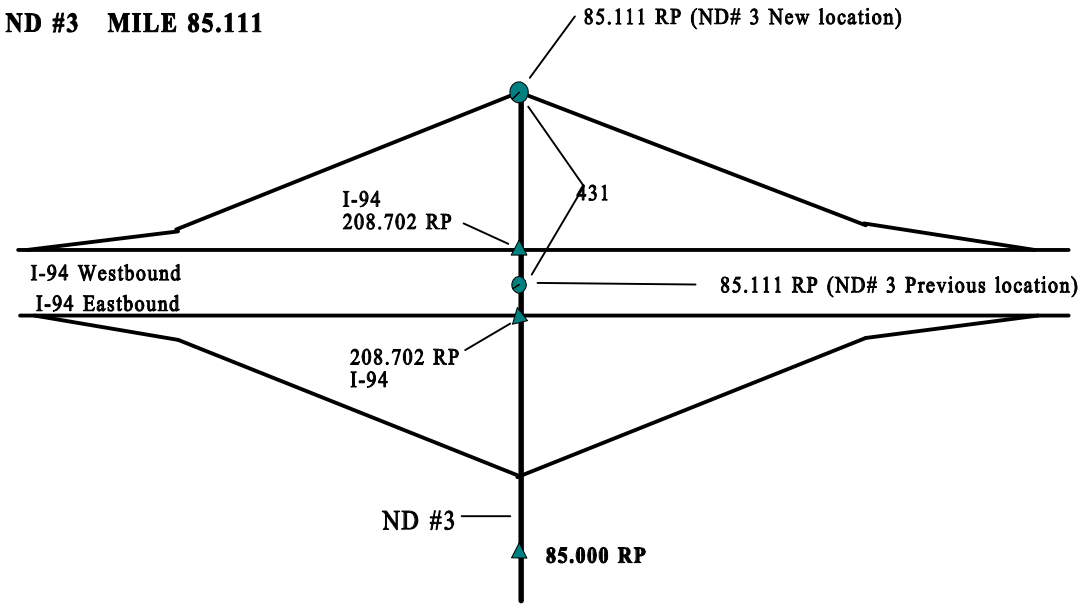
NOTE: In February 2001, it was decided that old plan stationing will be used on surface improvement projects that currently have old station values.

18-1.5 CHANGE IN CERTAIN REFERENCE POINT VALUES

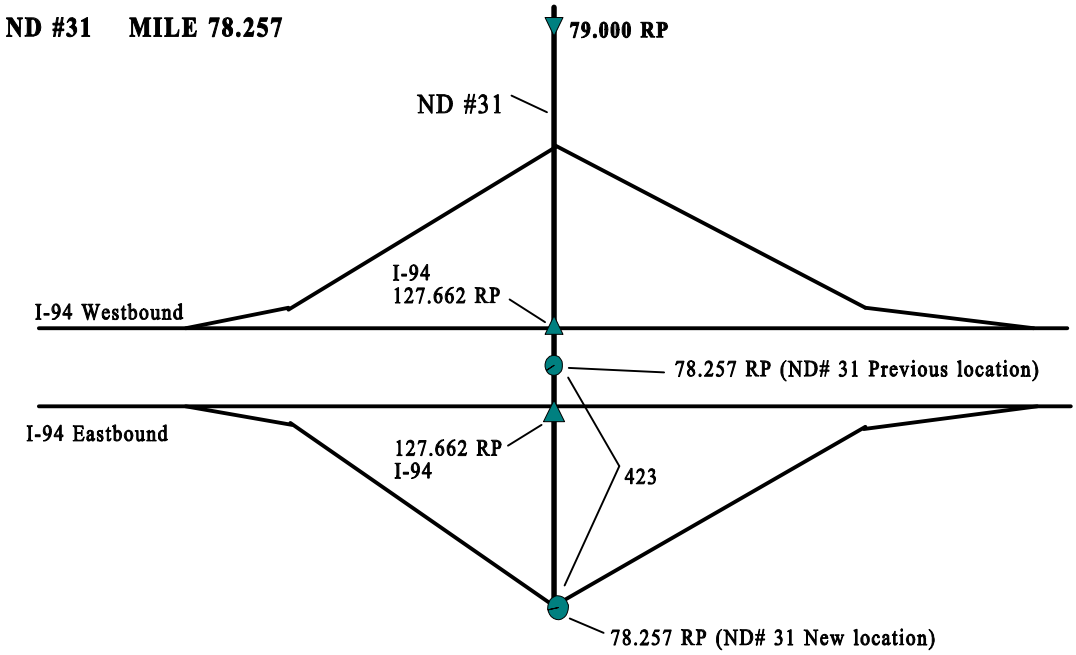
There are about 60 locations (mostly interchanges) where the reference point placement has changed from the middle of the structure or the middle of a divided highway. The reference point has been extended to the farthest ramp or the intersection of the farthest roadway on a divided highway. These changes only occur where a highway BEGINS or ENDS at a divided highway. This change has added length to each of the affected highways. The following pages list the affected highways and also show examples of how these changes were done.

HWY	SUFFIX	DIRECTION	REF. PT.	DISTANCE	HWY	SUFFIX	DIRECTION	REF. PT.	DISTANCE
1		N	70.926	532 ft North	***53***		E	21.014	43 ft West
1		N	76.423	538 ft South	***54***		E	7.695	53 ft West
2	B	W	903.855	51 ft South	***59***		E	0.000	426 ft West
2	B	E	903.855	51 ft South	***81***	B	N	940.000	448 ft West
2	B	E	910.126	23 ft North	***81***	B	S	931.024	573 ft West
2	B	E	909.720	128 ft South	***81***	B	N	931.024	573 ft West
3		N	93.053	426 ft South	***81***	B	N	920.000	429 ft West
3		N	85.111	431 ft North	***81***	B	N	949.222	1283 ft North
10	B	E	932.625	3127 ft West	***81***		N	163.105	441 ft East
10		E	0.000	454 ft South	***81***	B	S	940.000	448 ft West
10		E	14.552	454 ft North	***83***	B	N	920.000	68 ft South
13	B	E	920.000	43 ft North	***83***	B	N	925.419	45 ft East
14		N	110.581	57 ft North	***85***		N	201.265	208 ft South
14		N	114.295	53 ft South	***85***		N	183.743	67 ft North
15		E	134.137	381 ft East	***94***	B	E	932.511	436 ft South
20		N	0.000	14 ft West	***94***	B	E	928.128	350 ft South
30		N	42.426	1134 ft North	***94***	B	E	926.867	327 ft North
30		N	153.084	54 ft North	***94***	B	E	908.765	645 ft North
31		N	78.257	423 ft South	***94***	B	E	900.000	44 ft North
32		N	158.736	44 ft North	***94***	B	E	903.603	435 ft North
32		N	164.197	43 ft South	***127***		N	22.695	18 ft North
35		N	0.000	43 ft South	***200***		E	188.892	45 ft East
36		E	0.000	55 ft West	***200***		E	192.873	51 ft West
37		E	61.920	42 ft East	***281***	B	N	900.000	51 ft South
38		N	0.000	765 ft South	***294***		E	0.000	376 ft West
41		N	0.000	57 ft West	***297***		E	0.000	487 ft West
41		N	86.222	44 ft North	***1804***		N	324.991	41 ft North
46		E	120.318	427 ft East	***1804***		N	82.973	54 ft East
48		N	52.167	27 ft North	***1804***		N	113.383	55 ft North
52	B	E	900.534	13 ft North	***1806***		N	70.086	25 ft North
52		E	268.114	40 ft South					

EXAMPLE 1

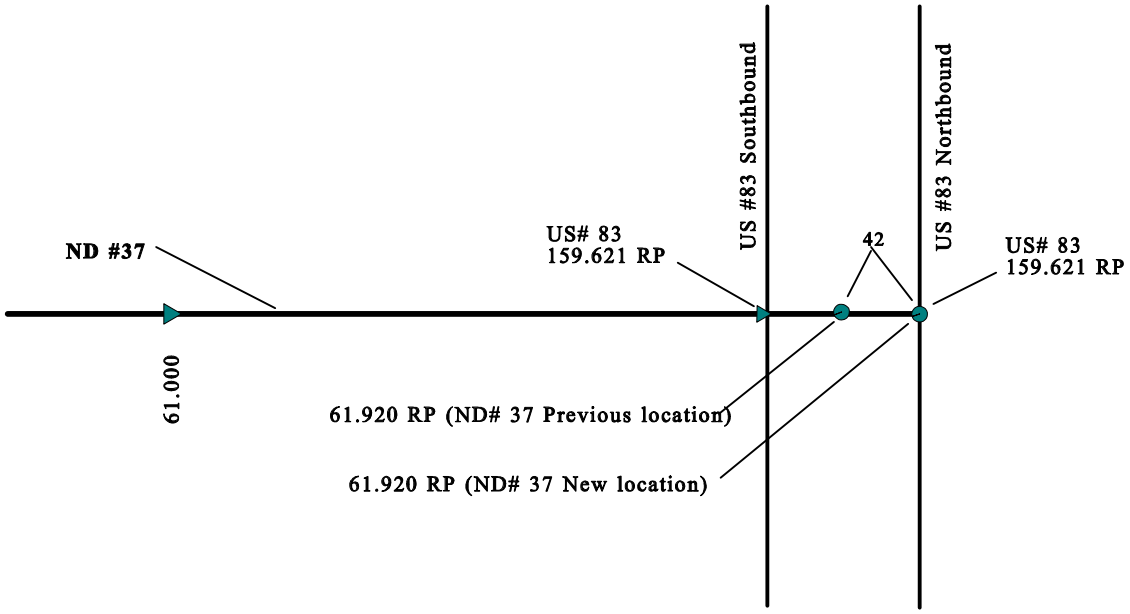


EXAMPLE 2



EXAMPLE 3

ND #37 MILE 61.920



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18-2 ASPHALT PAVEMENT PROJECTS

This manual is intended to provide instructions for the collection of field data on pavement rehabilitation projects. The Milestone program gives a target date for the completion of this survey under the activity "Ground Surveys." (The Milestone program is a project-monitoring program administered by the Planning and Programs Division.) It is important for these field surveys to be completed on or before the target dates so that other project development schedules can be met.

Questions about any survey item in this manual, interpretations of the instructions or suggestions for improvement should be sent to Surveys and Photogrammetry Section of the Design Division. **All survey data should be sent to the Surveys & Photogrammetry Section of Design Division to be analyzed, transmitted to the Records Section, and forwarded to other users.**

18-2.1 LOCATION AND FREQUENCY

Information is to be obtained directly adjacent to each reference point on the project and in other areas (such as: cross sections at all reference points, culverts, and middle of horizontal curves) where significant information may be necessary, as determined by the field survey supervisor. Locations such as badly deteriorated sections, bridge approaches, unusually narrow roadways, railroad crossings, and portions which have received unusually high amounts of maintenance repair should be considered as being significant whenever they are considerably different from the typical sections.

18-2.2 PAVEMENT CORES

1. A core will be taken at each reference point and at each quarter mile point throughout the length of the project for depth determination. Depth measurements should be submitted to the Materials and Research Division.

2. Cores should be taken at least 12 inches from any longitudinal or transverse cracks.

3. If a project is to get a mined base, the cores required will be at each reference marker and at each eighth mile in alternating lanes throughout the length of the project for depth determination.

4. For four lane highways, only the driving lane is to be cored. On two lane roadways the core locations should alternate between left and right lanes.

5. The District should contact Materials and Research prior to coring to determine the extent of the coring required and any additional coring needs.

6. If the project calls for recycled HBP, an additional ten cores shall be taken at each of five equally spaced locations, in alternating lanes, and will be submitted to Materials and Research for evaluation of the mix. Cores are to be taken according to figure 1 (shown on the next page). The spacing between individual core holes shall be at least two feet. This will assure a representative sample, but the core holes will be far enough apart to not cause weakening of the pavement structure.

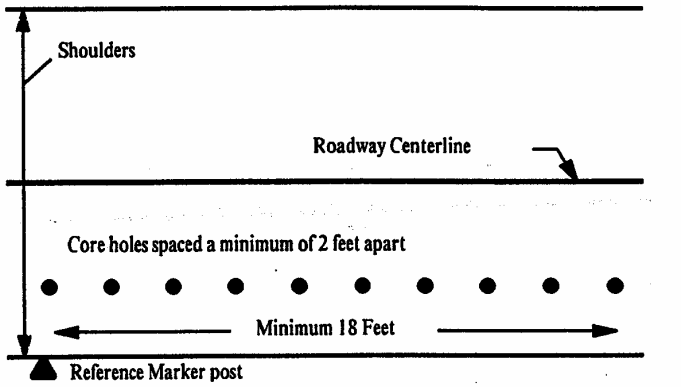


FIGURE 1
Cores are to be taken in a straight line.
Use SFN 17395

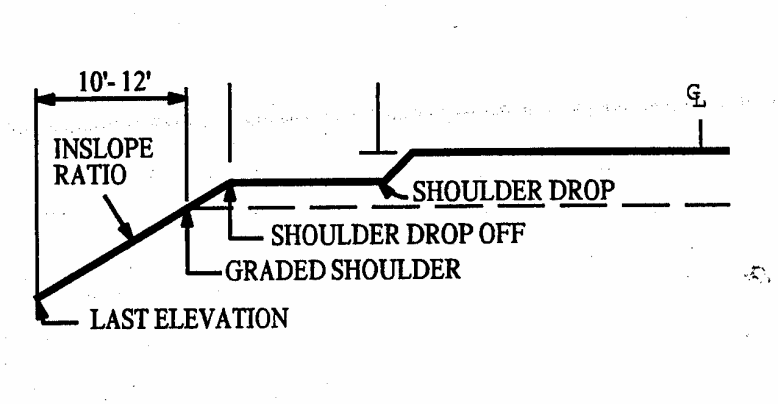
18-2.3 SOIL INVESTIGATION AREAS

Areas that develop frost heaves or break up in the spring should be identified. The district should notify Materials and Research of these areas. Materials and Research will investigate and make recommendations on how to eliminate these areas.

18-2.4 CROSS SECTIONS

Accurate cross sections, taken at or near existing reference points and all **6** pipe locations, are required to show the following:

1. Pavement width.
2. Rutting.
3. Shoulder drop.
4. Shoulder width.
5. Shoulder drop off.
6. Slope of inslope.



The last elevation should be taken to the low point of the ditch bottom right and left of the graded shoulder so the inslope ratio can be established.

Centerline of the pavement may be used as a base elevation reference. Cross sections must be oriented to show the relationship of left and right to the field location. An additional cross section should be taken at the middle of each horizontal curve to determine the superelevation of the existing curve. Get the water level elevation (sea level) of any existing high water in the ditch over 2 foot depth ***(see 18-2.10 item 10).***
NOTE: Use the pipe invert elevation as the sea level datum.

18-2.5 HAUL ROADS

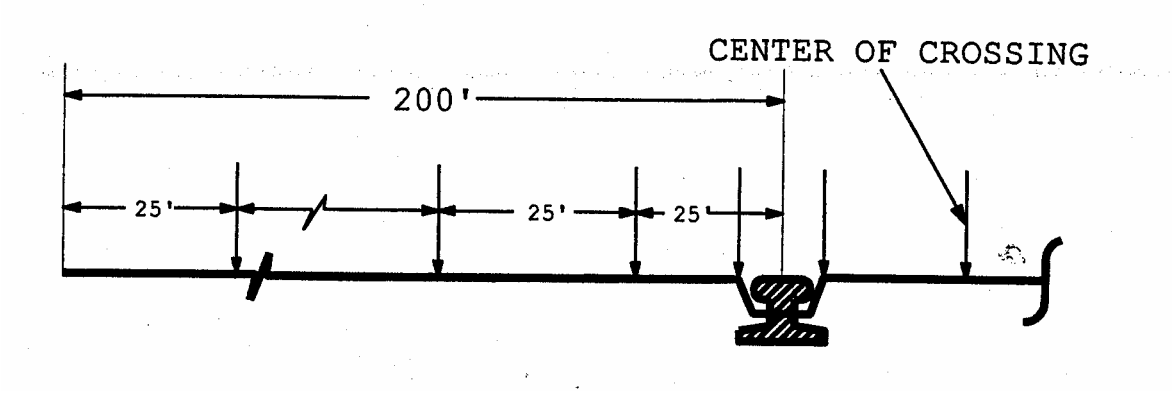
The district is to identify, on county maps, those roadways in the vicinity of the project that will not be available for use as haul roads. This will require coordination with the various governmental subdivisions which have jurisdiction over the adjacent roadways for their input. Any roadway systems thus identified are then identified in the plans.
(This information shall be submitted no later than six (6) months prior to Bid Opening date.)

The district may want to contact Materials and Research for probable pit locations that could influence the contractor's hauling pattern.

18-2.6 RAILROAD CROSSINGS

When railroad crossings are encountered on a surfacing project, a complete inventory of crossing conditions and district recommendations as to improvements is required.
These items are as follows:

1. Existing condition of the crossing.
2. Type and width of the crossing.
3. Recommendations for the crossing improvement, if any.
4. Photographs of the crossing.
5. Updating of Planning Division's inventory sketch of the crossing.
6. Type and condition of railroad crossing protection (signs, signals, or cross bucks).
7. Determine the existence and location of any roadside hazards.
8. Centerline elevation at the centerline of the crossing, on the top of the rails, the roadway immediately adjacent to both sides of each rail, and at 25 foot intervals out to 200 feet on both sides of the crossing. See the diagram below.



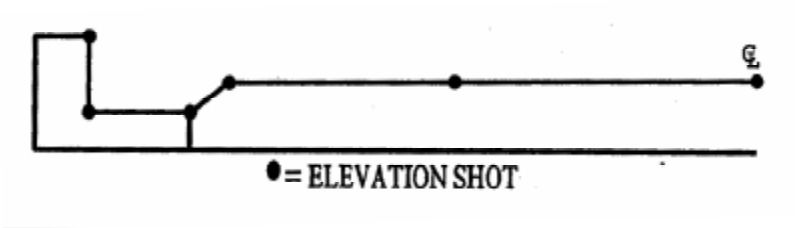
NOTE: Locate any railroad buildings/signals near the railroad crossing.

18-2.7 URBAN SECTIONS

The district shall contact any city which has the maintenance responsibility for a segment of state highway to determine interest in resurfacing or reconstruction.

Inventory the following items:

1. Identify the amount of curb & gutter to be replaced.
2. Identify the square feet of sidewalk that needs to be replaced.
3. Identify all surface utilities.
4. Identify existing handicap ramps, whether conforming to new standards, lack of/or nonconforming curb ramp, identify truncated domes, and areas that should have curb ramps. Take pictures of ramps.
5. Take typical cross sections as shown below.



18-2.8 MATERIAL RECOMMENDATIONS

This area should include, but not be limited to, type and grade of bituminous materials, any specific recommendations as to aggregate, compaction recommendations, and any other miscellaneous information.

18-2.9 MAIL BOXES

Identify all mail boxes on the project. The following items are needed for plan preparation:

(a) Station of mail box (left or right)
(b) Size of mail box (see diagram below)
(c) Number of mail boxes per support

Record the above mail box data on form SFN 51099 ***"Mail Box Inventory".***

TRADITIONAL AND CONTEMPORARY BOX STYLES				
SIZE		INCHES (approximate)		
		LENGTH	WIDTH	HEIGHT
1	(small)	19	6 ½	8 ½
1-A	(medium)	21	8	10 ½
2	(large)	23 ½	11 ½	13 ½

18-2.10 SAFETY REVIEW

A safety review must be conducted on projects scheduled for resurfacing to determine the existence and location of any roadside hazards. The following are the procedures and guidelines to conduct a safety review. Please complete the appropriate forms for each item required. Sample blank forms are shown on pages 18-26 through 18-41.

DOT users can find the forms on the DOT Intranet under the forms tab. These forms can be printed out and filled in by hand or filled in online.

Pictures should be taken of any conditions or situations that are difficult to describe.

1. Identify all private drives, median crossovers, and section line approaches by **plan** stationing and reference point.

   Determine the slope ratio (calculated to the nearest tenth of a foot) of the side slopes for each drive.

   If the approach requires a new pipe or pipe extensions, calculate the pay length for each pipe (See the diagram on next page).

   Where:

   (a) Steeper than 6:1

   When an approach is close to a bridge (within 400 feet), the distance from the bridge end to the approach centerline should be measured. Also measure the approach graded width.This is needed so the designer can look at the possibility of moving the approach to install guardrail.

   The approach pipe survey should be completed by measuring the distance from the approach pipe to the centerline of main line. If the pipe is within the clear zone ***(the clear zone for all 3R projects, regardless of traffic volume, is 20 feet from the edge of the driving lane. On Interstate and other 4-lane divided highways the clear zone is identified in the DOT Design Manual)***, show that it needs to be plugged and determine the length for a new metal pipe to be installed outside the clear zone. If the pipe is outside the clear zone, calculate the pay length of the extensions required to fit the new slopes, as shown on the diagram on the next page.

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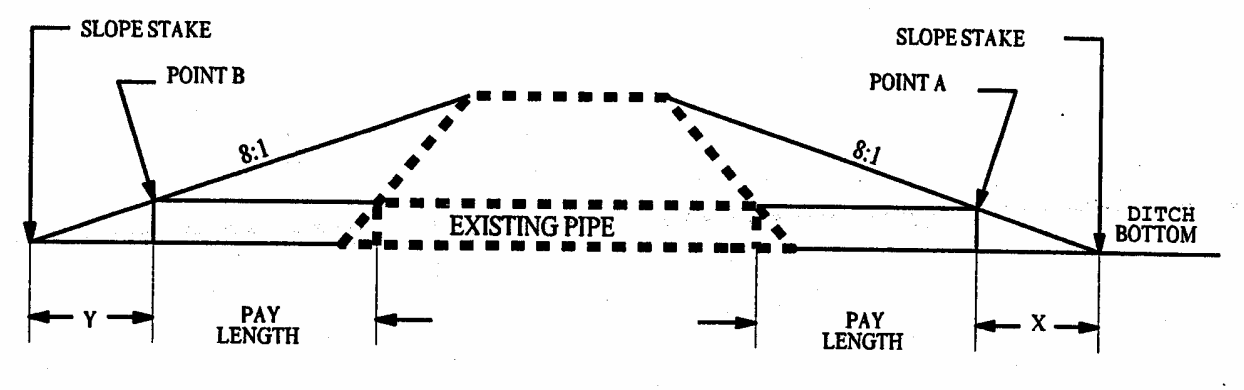
Procedure for Pipe Length Determination



D = Diameter of metal pipes or diameter plus one wall thickness on RCP.

S = Slope of pipe. or $S = \frac{\text{inlet elevation - outlet elevation}}{\text{Length of existing pipe}}$

a. **Determine Y (Inlet).** $Y = \frac{D}{S + .125}$ NOTE: Y has the same linear units as D.

b. Set point B and determine the pay length by measuring from Point B to the existing pipe.

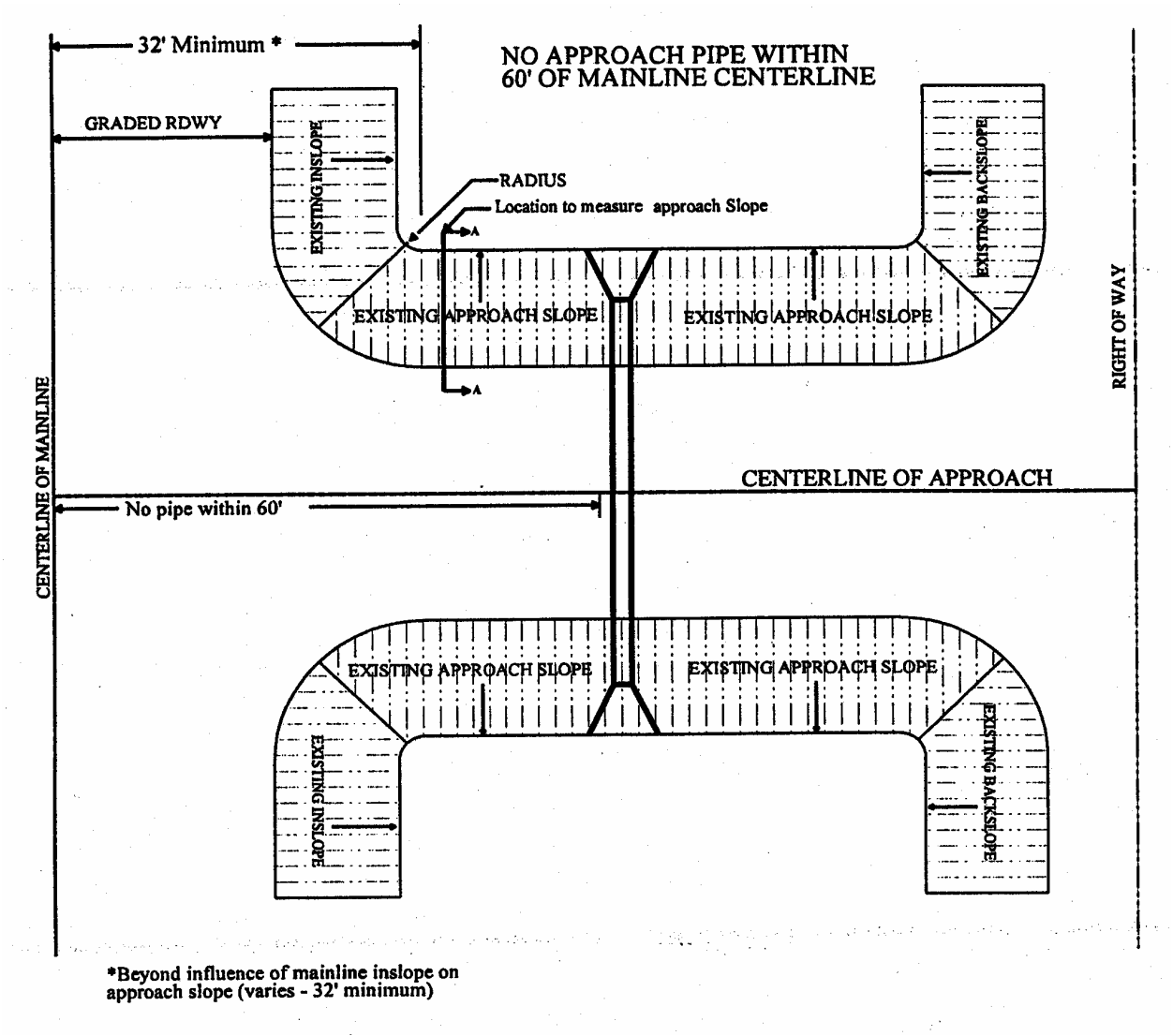
c. **Determine X (Outlet).** $X = \frac{D}{.125 - S}$ NOTE: X has the same linear units as D.

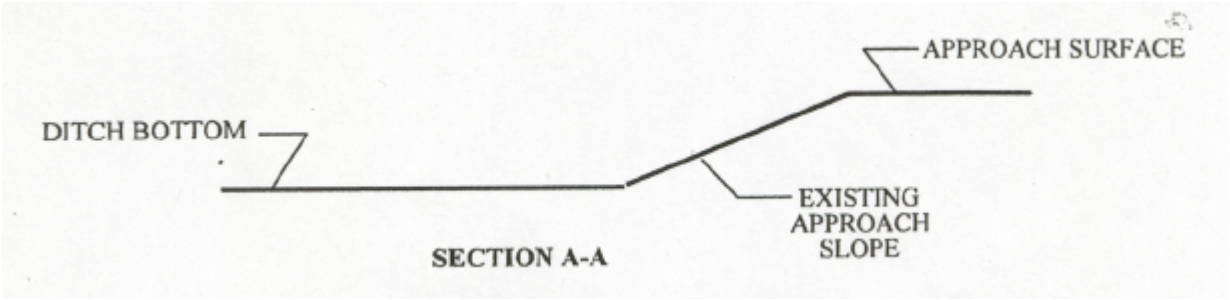
d. Set point A and determine the pay length by measuring from Point A to the existing pipe.

NOTE: On concrete pipe the barrel length (or C distance) of the end section must be deducted from the measured distance to set the pay length.

Identify any damaged sections of the existing pipes that need to be replaced and include the lengths in the pay length for the new pipe. If the existing pipe has end sections, show if they can be removed and relayed.
Call the Design Division if you are uncertain about the required clear zone distance.

If there is no approach pipe within 60 feet of the centerline, measure the approach slope at 32 feet from the centerline, or just beyond the radius formed by the bottom of the mainline inslope and the approach slope (whichever is greater), in order to calculate the approach slope ratio.
Be sure to note the distance from the centerline where the cross section was taken.
See the diagram on the next page.





NOTE: Approach pipe out 60’ or more from the centerline do not have to be extended.

2. Identify the location, type, size, and lateral distance from the roadway centerline to the opening for all cattle or stock passes and for **all centerline culverts**. Indicate if the cattle pass is still in use. Get the invert elevations of centerline culverts to sea level elevations whenever a BM is near the structure. Note the condition of the flared end sections, and if the culvert needs to be cleaned out.
On 2-Lane highways, the distance is measured from the center of the roadway.
On 4-Lane highways, the distance is measured from the median center line. The distance is always measured to the end of the pipe (the opening of the flared end section).
NOTE: If the centerline culvert has flared end sections, please describe the condition (such as, can they be reused?) on form SFN 16489.
Cross sections are to be taken over the top of all culverts, stock passes, box culverts, etc and at 100 feet back of, and 100 feet ahead of these structures.

On four lane projects, continue the cross section over the culvert in the other lane. The cross section of both lanes shall be under the same HI.
Complete form SFN 16489, ***"Centerline Culverts"***.

3. Identify the location and inslope ratio (6:1, 4:1, etc. calculated to the nearest tenth of a foot) for all ditch blocks. Identify by location and direction any ditch blocks having side slopes steeper than 8:1. Complete form SFN 16490, ***"Ditch Block".***

4. Identify all box culvert locations, size, and lateral distance from centerline of roadway to outside of curb head wall.
Complete form SFN 16491, ***"Box Culvert".***

5. Identify all guardrail locations including the length, height, type, post spacing, type of post,

type of end treatment, condition of the guardrail including the number of damaged rail sections, and lateral distances from the roadway centerline to the face of the guardrail. Where appropriate, show the type of obstruction including the length, width, and lateral distance from the roadway centerline. Show the distance from the obstruction to the beginning of the guardrail. Vertical measurements of the guardrail should be taken every 25 feet.
Photos are required showing the end treatments. Identify the manufacturer and model of the end terminals. Complete form SFN 16492, ***"Guardrail".***

6. At all bridge locations, show the same guardrail information as above plus the type of bridge end connection and the length and alignment of any approach curbs. Indicate locations where no guardrail or curbs are in place. Take bridge curb and rail measurements.
Photos are required showing all bridge connections. Identify the manufacturer and model of the end terminals.
Complete form SFN 16493, ***"Bridge"***, and SFN 16494, ***"Bridge Curb Length"***.

7. Identify rip-rap locations, length, width, and lateral distance(s) from centerline.
Complete form SFN 16495, ***"Rip-rap"***.

8. Locate beginning and end of areas on the main line with side slopes steeper than 4:1.

9. Show location, size, and lateral clearance from the roadway centerline, to all trees, fences, large rocks, or any other objects that may be considered a hazard that are located within 46 feet (clear zone) on 6:1 slopes and 58 feet on 4:1 slopes of the centerline. On interstate projects show the interstate fences.

10. Show the location, the lateral clearance from the roadway centerline, and the dimensions of all water hazards more than 2 feet deep. A distance measurement is needed at the waters edge and the point where the water is 2 feet deep.

11. All light standards and sign supports that are not breakaway should be identified by location and a photo (of the sign and the support post(s)) on all roadways.
NOTE: All photos must be taken from a point parallel to the roadway centerline. On proposed recycling and mine and blend projects all signs and sign supports shall be identified by location and a photo. Also clearly state the condition of each sign. Distance out to the sign shall be from the roadway that the driver is required to react to the sign's message. The size of all signs must be measured, not taken from the mainframe system.
When taking pictures of signs, take the picture so it is possible to see the whole sign, including the post(s) and the location of the sign relative to the roadway. For offset signs, do not need to show the position relative to the roadway.
Digital photographs are preferred.
On photographs of signs, write the corresponding roll and photo number on the FRONT of the photo. Place photos in sheet protectors and insert into binder.

Complete a sign survey, using SFN 50455, ***"Sign Inventory - 90-1 Survey"*** on all 90-1 projects.
Complete a sign survey, using SFN 19953, ***"Sign Inventory - Refacing, overlay, and updating supports projects"*** on signing only projects.

12. Provide information on any high maintenance problem areas which should be considered for contract.

13. Provide information on any geometric safety problems which may exist on the project.

14. On two lane-two way and four-lane divided roadways, show location and lateral clearance to closest edge of signs that are less than 16 feet from the edge of the driving lane.

15. Provide the project number and date of the reference plans used.

16. Additional cross sections are needed at all fills over 10 feet high with slopes steeper than 4:1. Cross sections are to be taken at the beginning, end, and one or more in between, depending on the length of the fill. Identify the toe of all inslopes in the cross section notes. The cross section should go all the way to the highway right of way. On steep inslopes, where the toe of the inslope is outside the present right of way, the cross section should continue to the toe of the slopoe. Also show any scour, rip-rap, and steep backslopes.

17. Locate all mail boxes along rural highways. Show the location with station and offset left or right, mail box size (1=19" mail box, 1-A=21" mail box, 2=23.5"mail box [mail box dimension is approximate]), post(s) type, and if post(s) is/are holding multiple mail boxes. Complete form SFN 51099, ***"Mail Box inventory".***

18. Show all bridge clearance dimensions for every overpass.

    Complete form SFN 17387, ***"Vertical clearance - Single Span"***
    or
    SFN 17388, ***"Vertical clearance - 4-Lane".***

19. For "CPR" surveys, complete form SFN 16513, ***"Concrete pavement repair (CPR) Survey".*** See pages 18-22 to 18-25 for instructions on how to do the survey.

20. The NDCC Sec. 24-01-49 states "whenever any highway on the state or county highway system has an intersection or dead end, there must be constructed, whenever feasible, an approach or escape road, and when not feasible other protective deices, such as warning signs, rumble strips, or barricades". Therefore, at all intersections and dead ends of county roads and Highways, determine if there is an escape road across the state highway from the dead end county route or if there are other protective devices(signs, rumble strips, etc.). The survey shall provide information on the feasibility of placing the escape road with cross sections and identifying what hazards are at or beyond the right of way in the area of the escape road.

21. Take photos of all items that affect the project and require filling out an SFN form. Write the corresponding station and offset on the front of the photo to match the survey form. **NOTE:** It is not necessary to take a photo of every crack of a CPR or every right of way marker. Photograph all the guard rails, bridge abutments, hazard areas, signs, centerline culverts, box culverts, etc. **Digital photographs are preferred**. Submit CD with survey.

22. Fill out the SFN forms completely and legibly. Include the date the survey was taken and who did the survey on each form. Complete the index for each level book along with crew and date information. Use only the SFN forms shown at the end of this chapter and stamp each form with the "409" stamp. Place forms and misc. data into a three ring binder. Separate forms with index tabs.

18-2.11 RIGHT OF WAY MARKERS

The District Engineer will determine if the right of way marker inventory is to be completed. The criterion to be used in deciding if this information will be collected is:

1. The effort needed to gather the information.
2. The shortness of time to complete the 90-1 survey.

Use form SFN 51073, ***"R/W monument & marker post inventory"*** to record all right of way marker data requested below.
Look for all right of way posts (concrete, wood, or pipe) that are shown on the plans or that may be in place. Make a note on the form as to what is found and what is missing at each location. Make a note on the form as to the condition of the post, especially if it needs to be replaced. This information is needed to determine the number of right of way posts that will be replaced.

"Right of way" signs will be attached to all right of way posts. This will be done as a contract item. The contract will include all operations relating to the right of way monuments (replacing missing posts, installing signs [shown on standard drawing D-720-1], establishing missing monuments, etc.).

18-2.12 SUMMARY OF ROADWAY DATA INFORMATION REQUIRED

1. Pavement cores.
2. Identify soil investigation areas.
3. Cross sections.
4. Safety review.
5. Mailboxes.
6. Identify those roadways that will not be available for use as haul roads.
7. Identify railroads.
8. Contact affected city officials.
9. Make materials recommendations.
10. Fill out all applicable SFN forms completely and legibly. Include the date the survey was taken.
11. Use only the SFN forms listed in this manual and make sure to stamp each form with the "409" stamp.
12. Complete the table of contents for each level book along with the survey crew and date information.
13. Include a check list (cover sheet) when returning the survey.
14. Place forms and other misc data into a three ring binder. Separate the forms with index tabs.
15. Include the whole sign support when taking photo's of signs.
16. All photos' should be 3" x 5". This way, you can fit four (4) photos on each side of the sheet. If a digital camera is used, the digital image may be sent in on a CD with the images rotated so the object photographed can be viewed in an upright position (not sideways).

12-2.13 PROBLEMS WITH PAST 90-1 SURVEYS

Following are listed some problems that designers have had with past 90-1 surveys. They should be reviewed so these problems can be avoided in the future.

1. Using incorrect stationing. Some 90-1 surveys were performed using RP stationing instead of plan stationing.

2. SFN forms were not filled in correctly. Instructions may have changed, but the forms continue to be filled in the old way.

3. Using incorrect SFN forms. Example: Use wrong guardrail form for bridge guardrail.

4. Data in level books is inconsistent with data on SFN form.
Example: a centerline pipe is shown as a 24" RCP and the SFN form says it is a 30" RCP.

5. Some features are not located.
Example: End of pipe buried in snow. How can a safety review be performed if the ends of the pipe are not located?

6. Driveway pipe extensions are not always calculated.

7. Cross sections are not always taken at all pipes.
   a. Sometimes only the larger pipes are cross sectioned.
   b. There is not always a cross section taken 100 feet ahead and back of the pipe.
   c. The ends of the pipes and the inverts are not always located in the cross sections.
   d. The ends of the pipes in the level book do not match SFN form.

8. On water hazards, the offset to the water is not located. Survey just states there is water.

9. Light standards are not always located, and if they are, the survey does not always say if they are break away or not.

10. Tee intersections at county/state/US highways are not always identified.

11. Railroad buildings/signals are not always located in the survey. 90-1 Manual should be followed for railroad crossing data collection.

12. Signs are not measured from the edge of the driving lane that the sign pertains to.
   a. Sometimes it is from the centerline and sometimes it is from the edge of the pavement.
   b. Stop signs on crossroads/approaches are measured from the mainline centerline instead of crossroad/approach edge of driving lane.
   c. Photos are only taken of the sign face. The photo should include the sign post, and the location relative to the roadway. Offset signs do not need to show position relative to the roadway.

13. On steep slopes, the cross section should continue past the toe of the slope. If the slope is flattened, it is hard to calculate dirt quantities if we don't know what the ground beyond the toe of the slope look like.

14. Pictures are not always taken of all the hazards. (See #21 in Section 18-2.10)

15. Complete a checklist of all items stating whether or not the item was completed or if there was none of that type of hazard on the project.