INSTRUCTIONS FOR GRADER OPERATORS

December 2016

These instructions are for the purpose of aiding grader operators in the proper performance of their normal job duties. These are general instructions that usually apply, however, in some situations the circumstances may be unusual and deviations from the normal instructions are justified. Operators are encouraged to weigh the facts and then determine the correct solution for their individual set of circumstances.

Each operator is assigned a territory or zone consisting of rock, sand or earth roads. The operator has general responsibility for his assigned roads. This includes more than just blading, such as tracking where rock is needed, mowing, brush cutting, culvert cleaning and sign maintenance. There will always be something productive to do in your assigned area and you are expected to do productive work without supervision.

* 1. Blading
1. Purpose: The purpose of any blading is to correct surface defects and maintain a uniform surface for traffic. Traffic and weather redistribute the surfacing material and cause surface problems like potholes and washboards. During winter and wet weather the major road defects are potholes, lack of crown, rutting, and occasional erosion on hills and low spots. In summer and dry periods the major road defects are washboards and dust. When and how we blade a road is dependent on the season and the major defects present at the time. During the winter months the primary purpose of blading a rock road is to restore cross slope, evenly distribute surface material, and correct defects before the road becomes unduly out of shape or rough. During the summer and dry spells we protect the crust by reducing frequency of blading, lighter cutting, and by spot blading problem areas. In any season an effective blading should result in a smooth road with a minimum of dry loose material on the road surface.
2. When to Blade: If possible, conduct maintenance operations when moisture is present so most of the loose material will be compacted by traffic. Damp material is easier to move, cut, and recompact than hard dry material and makes it easier to cut out problems like potholes. Moisture conditions are generally best for blading in the spring and fall. Conditions are also good during the first two or three days after a summer rainfall. On rock roads blading does cut aggregate and expose fines which gradual disintegration and loss of rock surfacing, so blading should only be performed when necessary and effective.
3. Dry Weather: Only a minimum amount of blading should be performed in dry weather. Blading in dry weather is seldom productive and loosens the crust and causes more road dust. Spot blading may be necessary to cut out potholes and washboard for safety reasons. Loose material may need to be windrowed until adequate moisture is present so it can by laid back on the road and recompacted by traffic.
4. Rotate route: Rotate which roads are maintained first, so that over the year all roads can be bladed when they have adequate moisture. Usually higher traffic count rounds dry faster and can be bladed sooner after a rain. Keep in mind that the public is very observant and they expect that all roads should get “equal time”.
5. Crown: Crown or cross slope is of major importance in maintenance of roads. An adequate, A-shaped crown is important for drainage. If a road has too little crown, water from rain or melted snow will collect on the road surface and soften the crust, which can lead to severe rutting and potholes. If there is too much crown, motorists may drive in the middle of the road because they feel as if their vehicles might slip off the road, also farm equipment may high center and drag. A four percent crown (1/2 inch per foot) is generally optimum. More crown is needed in flat areas at tops of hills and in floodplains where potholes tend to develop. Maintain the crown as a straight line from shoulder to centerline. The cross section should look much like the pitch of a roof, or a flat A shape. Worn blades will leave a flat spot in the center part of the road, which will pothole easily. .
6. Windrows. Windrows may be problematic as they keep water from running directly off the road into the ditch. Large windrows may be a safety issue as they tend to narrow the driving surface and may cause loss of control if hit by a vehicle that strays into the windrow. Our agency prefers no windrows on crushed rock and dirt roads and small windrow on sand roads. Larger windrows are appropriate during dry weather where it is necessary to minimize loose material on the driving surface. Windrows should be eliminated or minimized in the fall so they do not complicate snow removal. Cut gaps in the windrow at low spots to allow for roadway drainage.
7. Intersections: Intersections should be maintained so as to have a smooth transition in all directions. At intersections of a main road with a stop controlled side road then it is appropriate to maintain the crown on the main road. Humps and drop-offs at intersection edges and driveways are not acceptable
8. Potholes: Potholes are usually caused by poor surface drainage (lack of crown) and occur where water stands in the track. Potholes are more likely to develop on high traffic roads and during prolong wet spells and rains. Typical locations are flat areas on top of hills and over crossroad culverts. Prevent potholes by maintaining adequate crown on the roadway, and consider more crown in problem areas. Perform temporary repairs of potholes by blading loose material into the holes. Such repairs will not last long. For a permanent repair, when adequate moisture is available blade deep enough to cut out the potholes, reshape the roadway to a proper crown, and compact the surface. Bit blades work well for reshaping and blending larger material with the fines for a longer lasting repair.
9. Washboards are caused by the repeated small horizontal forces from the tires interacting with the surface of the road. The most common location for washboards is near intersections, curves and steep hills. Washboards are more prevalent in dry weather because road surface dries out and does not have moisture to hold the particles together which make it easier for the abrasion of the tires to displace material. Also permanent repairs are more difficult in dry weather as we need moisture to repair washboards. Prevention is always best, and that is accomplished by timely blading when moisture is right, and use of the right type of rock. If the washboards are not too deep, sometimes right after a rain a blade can rough up the surface and then allow traffic to recompact it. Bullet blades work the best for this, but there has to be adequate moisture in the surfacing, so the time after the rain is really critical. Also, avoid leaving dry loose material on the road surface in washboard prone areas as loose material will washboard rapidly. During dry periods it may be appropriate to windrow loose material, rather than spread the dry material on the road where it will washboard again within a few days.
10. At railroad crossings, zero out the crown on both sides of the crossing for a distance of 20–30 feet. Be careful not to blade aggregate onto the rails, which could cause a train to derail. When blading near the track turn off the radio and air conditioner, and open the door so you can hear a train horn. Numerous graders have been hit by trains because grader operators were concentrating on the work at hand and failed to hear a train horn.
11. Bridge approaches may need more frequent attention than other parts of the roadway because they are difficult to drain and the fill close to the abutment is prone to settling, leaving potholes in the approach. If a bridge deck is crowned, gradually reduce the road crown to match the bridge crown. If the bridge does not have a crown, gradually zero out the road crown to meet the elevation of the bridge deck. Take care not to drag too much rock onto the bridge deck during blading operations.
	1. High Shoulders/Secondary Ditches
12. A secondary ditch is when a high shoulder develops at the edge of the road and prevents water from flowing over the shoulder and into the ditch. Water then flows along the edge of the roadway and begins eroding the road. High shoulders are caused for two reasons, the natural lowering of the roadway surface due to loss of surfacing material through dust or washing, and by improper blading techniques. Improper blading includes not blading all the way to the foreslope, and the use of worn blades that are hollow in the middle. Worn blades make it difficult to carry adequate material along the moldboard without gouging a ridge near the foreslope. Rotate blades when there is 1” hollow area at the center.
13. Prevent the formation of secondary ditches by blading all the way to the foreslope with proper crown, and change blades when they become hollowed out in the center of the moldboard.
14. If secondary ditches are present they need to be cut off so the water can flow directly off the road and down the foreslope. This work is best done when there is minimal vegetation such as early spring or soon after a mowing. Move the windrow to the other side of the road and try to place the excess material in the grove next to the secondary ditch, never mix the dirt and vegetation with the windrow. If cutting off the high shoulder results in too much material it may be necessary to haul off the excess or lose it over the foreslope.
	1. Ditches
15. Road ditches serve two purposes they allow precipitation that falls on the road to flow over the shoulder and they prevent surface water from adjacent land to flow onto the roadway. There is no minimum ditch depth; the ditch only needs to be deep enough to serve these two purposes. Ditches will need to be deeper where the adjacent field slopes toward the road and on longer hills where more water accumulates in the ditch. Usually the ditch has inadequate capacity where erosion occurs along the shoulder after a moderate rain.
16. After a heavy rain rock may be washed into the ditch at certain locations. It may be possible to work this material back on the road to open the ditch.
17. If a ditch fills with silt from an adjacent field it will likely hinder proper drainage, and will need to be cleaned out. On dirt road this material may be pulled up and spread on the road. On surfaced roads talk to the supervisor on how to handle the silt. It may be necessary to windrow the silt and haul off later.
18. Ditching requires a plan that will result in an improvement to the road and will not result in erosion and silting. Utilities need to be located in advance. The existing sod will be removed and excess dirt may need to be disposed of offsite. When completed the areas needs to be seeded and perhaps mulched. Check with your supervisor before initiating ditch cleaning. Remember that ditches carry a concentrated flow of water and erosion is likely before the grass is reestablished.
19. Ditch layback on the adjacent field is the most efficient and least expensive method of correcting ditch drainage problems. Operators are encouraged to do ditch laybacks as they are necessary and as landowner permissions are attained. Such permission needs to be written and signed on the proper form by the landowner or noted by the operator that the landowner has given verbal permission. Materials cleaned from the ditch would be spread into the adjacent field so as not to leave anything resembling a berm at the ditch edge that would prevent good field drainage.
	1. Driveways and Culverts
20. Entrances must be kept smooth for the many types of vehicles having to drive them. Humped up entrances are a source of complaints and where possible they should be eliminated.
21. As time is available check entrance culverts to see that culvert ends are not damaged, clogged or silted in. Clean culvert ends if needed, shovel work may be required. If the culvert end is bent down a jack can be used to pry the end up. Report major damage to your supervisor.
22. Surfacing on a driveway is normally the responsibility of the land owner. When the county replaces a culvert it is our responsibility to replace the surfacing and smooth the surface.
	1. Road Widths.
23. Main county roads are usually wider than roads that serve local traffic. If the main county road has been widened it was likely designed for 26 to 32 feet. Local roads have usually not been widened and the width is dependent on available right-of-way and ditch depth.
24. Local roads are usually 20 ft. to 24 ft. We strive for 24 ft. where possible. Roads tend to widen over the years of maintenance. Wider widths make the road difficult and more expensive to maintain and when the road gets too wide it is necessary to pull or reshape the shoulder-foreslope to establish a proper width.
25. Since there is a chance of contaminating surfacing material it is desirable to pull shoulders of gravel roads before the road is resurfaced. When pulling shoulders the ditch is not deepened but the bottom may be widened, usually the foreslope is reshaped. Shoulder pulls are not intended to clean the ditch, just to shape the shoulder. Do not create a secondary ditch.
26. On sand roads especially where the native ground is sandy shoulders need to be pulled on occasion to recover material that has been washed off the road or thrown off the road by traffic or maintenance operations. Fines from the shoulder can provide a good binder for the sand.
	1. Road Surfacing Replacement.
27. Make note of mud holes, areas of weak surfacing, and miles that need surfacing. Be ready and have an effective plan when gravel is hauled to your area so it is placed where it is most needed. Keep a list of areas needing surfacing and provide list to the supervisor when requested.
28. Surfacing hauled after a rain should be spread on the road so it can be packed by traffic. If surfacing is hauled when dry consider windrowing the material until rain is expected.
	1. Minimum maintenance roads.
29. Minimum maintenance roads are signed at each end of the mile. Minimum maintenance is not no maintenance. Drivers expect the road to be passable during dry weather. If the road is impassable it may need to be barricaded.
30. Typical maintenance is spot blading of bad areas to fill in mud holes, washes, etc. Minor work can be performed on request of road users, but refer major work to the supervisor.
31. Report items that make the road impassable or hazardous, such as washouts, collapsed culverts, etc.
	1. Tree removal and trimming
32. Keep the right-of-way free of trees by cutting saplings before they grow into trees. Treat all stumps with chemical to prevent regrowth. Trees are to be cut within two inches of ground to eliminate mower damage.
33. Trim trees regularly for sign and intersection visibility.
34. Larger trees and groupings of trees may be more than an operator can handle and this kind of work needs to be coordinated with the supervisor.
35. If using a chain saw work in pairs and observe safety precautions, and be sure to have communications nearby. Haul cuttings to a burn pile or to the yard for burning. If cuttings are too numerous, request equipment to load and haul to yard.
	1. Reporting problem areas and items needing attention
36. The operator is eyes and ears of the county in his area. Keep an eye out for road hazards and unusual situations that can affect the road or road right-of-way.
37. Following are a list of items that should be reported to the supervisor
	1. Downed and damaged signs
	2. Signs obscured by brush and faded signs
	3. Collapsed or damaged bridges and culverts
	4. Oil field or other activity that is damaging the road or leaving debris on the road.
	5. New driveways
	6. Blocked ditch or change in drainage by landowner
	7. Ornamental brick or rock mailboxes
	8. Utility work
	9. Oil or chemical spills
	10. Dumped trash
	11. New fences close to the road
	12. Mowing right-of-way
38. Operators may be assigned mowing duties when blading roads is not productive. Mow one swath in the summer. In the fall mow back to the right-of-way line if possible.
39. Priority is to cemetery routes just prior to Memorial Day. During normal times priority is to surfaced roads then dirt roads.
40. Be aware there are **NO MOW AREAS** in the county. Do not mow past pedestrians or people working nearby; they may be injured by flying debris.
	1. Snow and Ice Control
41. Follow snow and ice control guidelines. Usually a snow of less than 3 inches does not warrant plowing on non paved road. Operators may be called in to assist with blacktop roads when plowing of non paved roads is not required.
42. Private vehicles stuck in the road usually block snowplowing operations, may be pulled out of the way, be careful to avoid damage to the vehicle.
43. Private vehicles stuck off the road or on the side of the road where they can be avoided should be left in place; the owner is responsible for getting his vehicle moved.
	1. Public Relations
44. The operator is one of the most prominent representatives of our department and is an important link between the citizens and the county. Listen to all complaints and treat citizens with respect.
45. Routine requests for work that you can easily perform need not be reported to the supervisor.
46. Take the name and phone number of citizens requests that will take a crew such as a longer entrance culvert, drainage work and tree trimming. Tell the citizen that a foreman or supervisor will call him back within a few days.
	1. Maintenance of Equipment
47. The operator is responsible for routine maintenance of the grader and other assigned county equipment. Treat the equipment with care like you would your personal property. Operate equipment in manner for which it is designed. Keep equipment clean inside as well as outside.
48. Follow prescribed maintenance schedule and daily checks as per Operator’s Manual. Make daily checks on oil and fluid levels, tire pressure, gauges, and lights.
49. Rotate grader blades when they are hollowed out 1” at the center.
50. Report needed repairs to shop.
51. When using equipment from the central shop it should be checked over before leaving yard. Clean and report needed repairs upon when the equipment is returned to the yard.
	1. Safety
52. Follow all safety procedures as prescribed in department safety policy manual. Report safety problems to the supervisor.
53. Where visibility is limited by hills or curves try to blade in the direction of traffic.
	1. Kansas One-Call
54. When ditching or excavating state law requires that the excavator have utilities located. Failure to call One-Call may result in the county paying for repairs and can result in injury to the excavator. The most common damage is to telephone lines which can be very shallow.
55. Flag the area to be excavated with white flags or use white paint.
56. Notify the supervisor who will notify One-Call and log the call number.
57. One call has two complete working days to mark the lines. Don’t start digging until you know the lines have been marked.