VUL-SWP-076(1) – Dozer Operations

SAFE WORK PROCEDURE (SWP)	
Description	*Dozer Operations*
Site	Vulcan Mine
Department	*Operations*

PPE Required	**Workplace Risk Assessment & Control Reference**
	VUL-SWP-076(5) WRAC
	Other Relevant Information
	☒ Relevant OEM instructions & specification available
VUL SOP / PRO Reference	☒ Pre-start Meeting
VUL-SOP-073-Checking Mobile Plant VUL-SOP-076-Using Mobile Plant VUL-SOP-065-Personal Protective Equipment VUL-SOP-129-Maintain & Water haul roads VUL-MOP-128-Design & Construction of Mine Roads VUL-SOP-144-Lighting VUL-TAR-003-Geotechnical Failure Recognised Standard 19	☒ OCE Report

People, Equipment, Materials and Tools Required

People	Equipment	Materials	Tools
Operators	Dozer		
	Service Truck		
	Lighting Plant		
	Light Vehicle		
	Water Cart		
	Grader		
	Excavator		

1. Area Inspection

1.1. Operators shall ensure they take action to ensure they are familiar with locations, and directions assigned to them.
1.2. Area to be inspected to determine suitability/required actions to take to improve conditions. VUL-SOP-94-Check Examine and Restrict Work Areas
1.3. Notify Supervisor/OCE of any identified issues or if conditions change during the task. Consult the Open Cut Examiner or Geotechnical personnel regarding new or identified geotechnical issues. VUL-TAR-003-Geotechnical Failure

2. General Dozer Operations

2.1. Conduct a Take 5 as a minimum prior to undertaking any work
2.2. A prestart check and or walk around inspection must be conducted in accordance with VUL-SOP-073-Checking Mobile Plant.
2.3. Equipment must be parked in a suitable location for a prestart inspection and service as per VUL-SOP-076-Using mobile plant.
2.4. During the hours of darkness ensure there is adequate lighting in area of operations. VUL-SOP-144-Lighting and VUL-SWP-144(1)-Setup Lighting Plant.

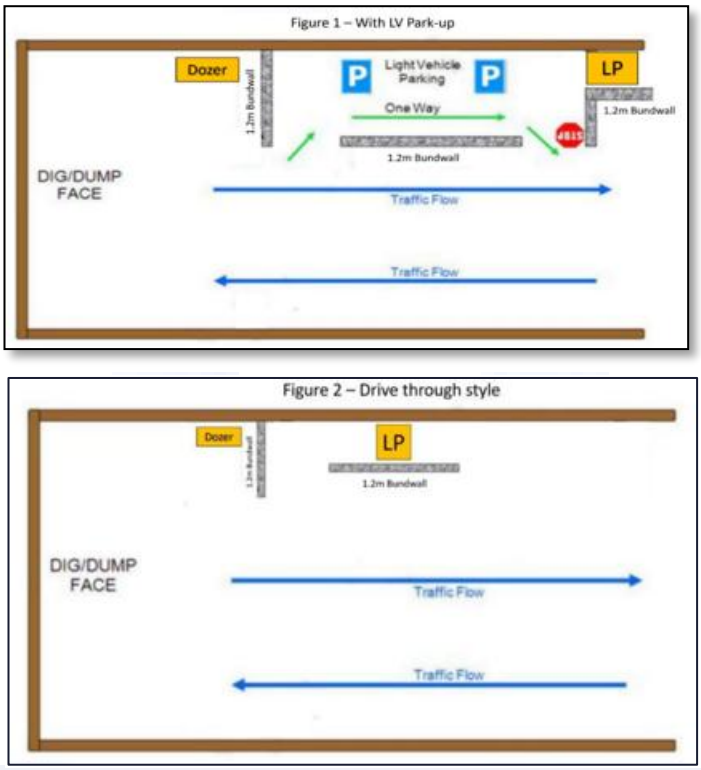
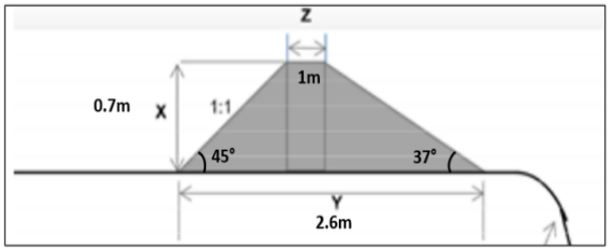


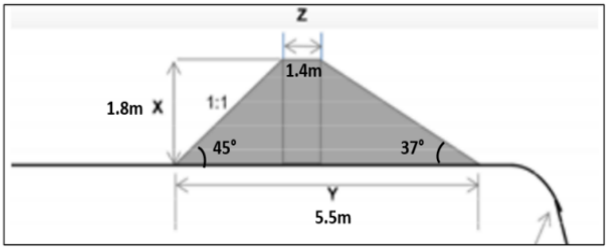
Figure 1 – Dump LV parking set up

2.5. If bodies water or other liquids deeper than 1m are present a JHA must be conducted prior to commencing the task.
2.6. Emergency access must be maintained during any dozer operations. It is reasonable to expect that other equipment working in close proximity are able to make access available in an event.
2.7. It is important to be aware of the whole operating area around the machine to anticipate changes, observe in front, behind and to the side of the dozer.
2.8. Listen to the mine radio for reports of machine movements, road conditions and any other changes in the mine.
2.9. If there is a pit design available, the dozer operator must comply and ensure parameters are not exceeded.
2.10. Maintain a level cut for the best performance. Fill the blade, carry the load to the destination, avoid lugging or stalling the machine. Avoid spinning the tracks.

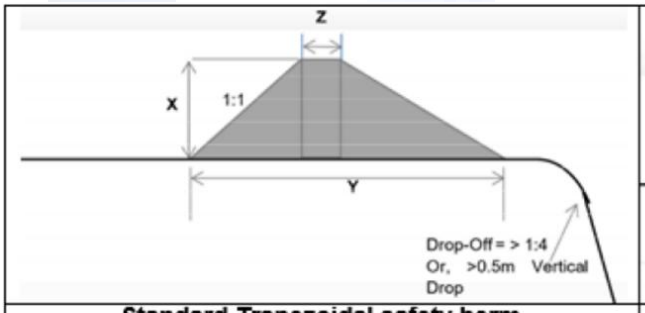
2.11. If turning the machine with a load is necessary, use the tilt cylinders to assist with steering instead of relying solely on the steering levers to steer the machine.
2.12. When working on slopes every attempt should be made to work vertically with the tracks running up and down the slope. If no other work method is available and you are working horizontally on a slope, preferably start at the top of the slope. Work downhill maintaining a windrow of material on the low side of the machine to provide stability. If the machine starts to slide or slip on the slope, lighten the load and turn the machine downhill.
2.13. Ripping shall only be in first gear, once ripper has penetrated the ground tuck the ripper in to protect the ripper boot from damage and premature wear. If ripping near a crest:
2.14. Safety bund shall be in place.
2.15. Ensure ripping direction is away from crest at 90 degrees.
2.16. Reverse to start position in first gear.
2.17. If ripping is required parallel to a crest or face and within 10m a JHA is required.
2.18. Where there is a requirement to push material over a highwall or open edge, refer to section 5.
2.19. Upon completion of task or prior to leaving the work area the dozer operator shall ensure adequate bunding is in place. VUL-MOP-128-Design and Construction of Mine Roads.
2.20. Above all else take the time to set the work area up, work safely and pride in your work to a finish that would be considered a high standard by your peers. "It'll be right isn't good enough".



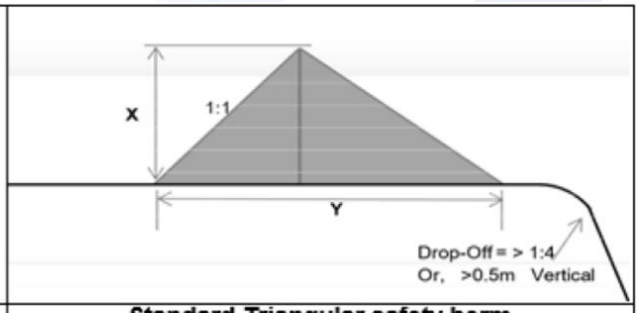
Trapezoidal Berm for Light/Medium Vehicle



Trapezoidal Berm for Heavy Vehicle



Standard Trapezoidal safety berm (minimum height shall be 50% of the diameter of the largest vehicle tyre using the road)



Standard Triangular safety berm (minimum height shall be 66% of the diameter of the largest vehicle tyre using the road)

Figure 2 – Berm Construction

3. Dump Dozer Operations

3.1. The dozer operator oversees the dumping operations. Prior to commencing dumping the dozer operator must ensure the area below is secured and bunding in place to restrict access to the drop zone.
3.2. The dozer operator must carry out regular inspections of dump limits (height, width, toe) throughout the shift to ensure limits are not exceeded. If any issues are identified notify the Supervisor.
3.3. Monitor dump conditions for signs of cracking and or slumping. If identified, cease dumping and notify OCE, Supervisor and dump users of the hazard.
3.4. If body of water or other liquid deeper than 1m is present at the dump toe, cease dumping and notify the OCE, Supervisor and dump users of the hazard. A JHA must be conducted with the OCE involved to determine an acceptable method to manage the hazard.
3.5. Ensure dump is worked from right to left if this is not achievable notify the Supervisor. Consultation with OCE must occur before a change of traffic flow can occur.

3.6. Always maintain a straight tip head bund where possible avoiding rounded corners. It may be necessary to dump short and doze to straighten the bund.

3.7. Corners of tip heads are to be pushed to form a 45-degree angle to enable trucks to be square to the bund. If unable to create 45-degree corner loads must be dumped short and dozed.

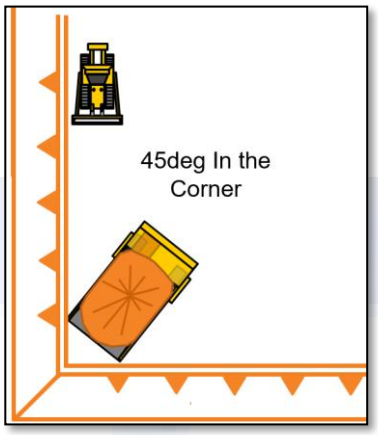


Figure 3 – 45deg dumping

3.8. Construct tip head bunds of competent material and maintain them to a minimum of half the wheel height of the largest equipment that has access to the area. Ensure running bunds are maintained along edges as described in VUL-MOP-128-Design and Construction of Mine Roads.

3.9. Do not dump wet material over the tip head, wet or other unsuitable material should be paddock dumped.

3.10. Dozer should always remain on the on-side of trucks, it is poor practice to be working on the off side of trucks and should be avoided. A minimum of two loads or 50m separation must be maintained between the tracked dozer working on the dump and the Haul Truck discharging its load. Never operate behind a truck. Never remain parked beside a truck that is starting to dump its load.

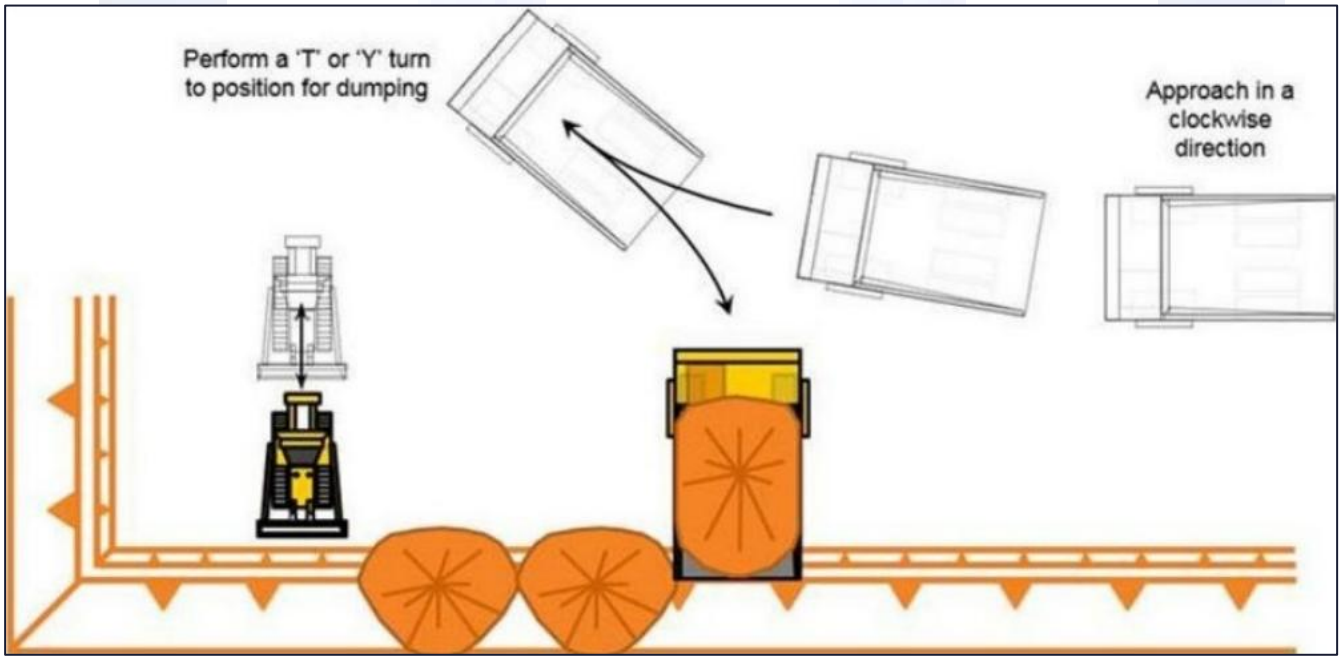


Figure 4 – 2 load separation.

3.11. Adequate lighting must be provided during hours of darkness, if there is only 1 lighting plant available ensure it is positioned on the on-side of the trucks. No light no dumping, it is not acceptable to spot trucks with equipment lights.

3.12. If the need to guide a Truck into a specific location arises, the following shall apply:

a) The Dozer operator is to communicate the need to deviate from the standard dumping sequence.
b) Truck must be positioned parallel to the Dozer's blade.
c) The Dozer must remain on the onside (cab side) of the Truck whilst it is guiding Truck into position.
d) A minimum of 5m separation must be maintained between the Dozer's blade and the onside of the Truck.
e) Positive communication must be established and maintained throughout the task.
f) Whilst the Truck is discharging its load the Dozer must have reverse gear engaged and remain clear of any spillage as the load is discharged

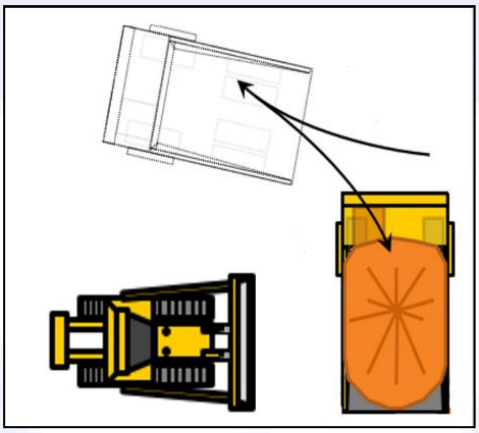


Figure 5 – Spotting

4. Clean up for Excavator

4.1. Avoid interrupting the load and haul cycle unless absolutely necessary, only conduct cleanup in the loading bay when spillage or material build up impedes the loading cycle or where there is the potential for tyre damage to occur.

4.2. Maintain the floor to a standard that is at the required RL, smooth and free of debris which allows trucks to leave the loading bay under full continuous acceleration. Excess material should be pushed into the excavator where practical.

4.3. Communicate intentions with other equipment prior to commencing cleanup in the loading area.

4.4. Positive communication must be established with the Excavator operator before conducting cleanup in the loading bay.

4.5. If the Dozer is required to enter the swing radius of an Excavator, the bucket must be grounded and machine stationary before the Dozer can enter the zone.

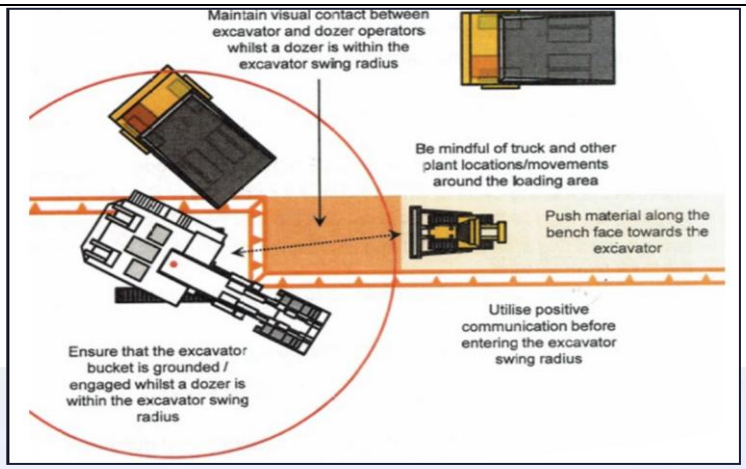


Figure 6 - Example of good floor clean up.

4.6. Dozer must not work directly behind a Truck waiting to reverse into loading bay. If there is a reason to clean up the loading bay the Truck must cycle out before the cleanup can commence.

4.7. Always maintain positive communications if working within 50m of other equipment, avoid working on the offside of trucks where possible.

4.8. Avoid parking on the offside of trucks or near the loading bay when waiting to conduct floor cleanup. This has the potential to distract truck operators spotting into the loading bay. Always maintain visual contact and remain aware of equipment locations and movements.

Figure 7 - Example of good position for dozer to wait.

4.9. Ensure all required bunds are maintained as described in VUL-MOP-128-Design and Construction of Mine Roads.

Figure 8 – Dump bunding.

5. Pushing over a Highwall or Open Face

5.1. Pushing over highwalls or open faces greater than 10m must only be conducted during daylight hours unless angle of repose has been achieved.
5.2. If less than 10m high or angle of response has been achieved adequate lighting must be provided during hours of darkness with consideration of glare, shadows and providing clear visibility to dozer operators.
5.3. Prior to operations commencing the OCE must inspect the highwall or open face for stability.
5.4. If bodies water or other liquids deeper than 1m are present a JHA must be conducted prior to commencing the task.
5.5. At a minimum the dozer operator must conduct a Take 5 for the task or a JHA may be required if requested by the OCE.
5.6. The dozer operator must not commence operations until the Supervisor or OCE communicates to the operator that the area below is secured, and a hard barrier is in place to prevent entry to the drop zone.
5.7. The dozer operator must push at 90 degrees to the crest at all times.
5.8. In the case of bulk push, material is to be pushed off the edge with a load leaving a full blade of material at the crest until angle of repose has been achieved or as described in VUL-MOP-128-Design and Construction of Mine Roads.
5.9. In the case of drill prep, the crest bund is to be reduced to 1m. This must be done in a manner that does not expose any HME to be able to enter the area with reduced bunding except for the drills or small loader used as part of the drill and blast process.

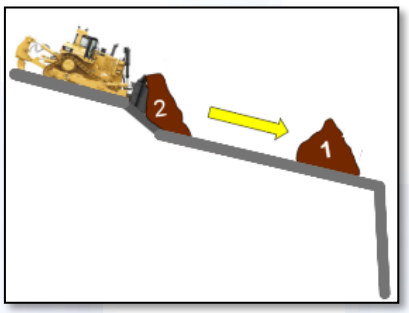


Figure 9 –Pushing downgrade.

6. Bulk Dozer Push

6.1. Bulk dozer push operations are defined as operations that are aiming to achieve a design RL utilizing slot pushing methodology which may be performed by single or multiple dozers.

Figure 10 – Bulk push operation.

6.2. Prior to commencing the task, the following must be in place:
   a) OCE inspection of the area.
   b) Plan for the task.
   c) Work area setup with suitable access and park up areas.
   d) Emergency access.

6.3. A plan must be made available to operators performing the task. The plan must contain information such as but not be limited to:
   a) High Wall crests, Primary standoffs, Geotechnical hazards
   b) Emergency access and suitable recovery points
   c) Access point, park up and refueling area
   d) Any other relevant information required to safely execute the task.

6.4. Suitable plans are preferably a designed plan from Tech Services or may be a Mud-map utilising the latest photo of the area with steps to describe the task execution and identify known hazards.

6.5. Prior to commencement of the task the Supervisor must discuss the plan with all persons involved and ensure there is a clear understanding of the work required and potential hazards.

6.6. Suitable emergency access point/s must always be maintained to enable access to equipment in the event of an incident. The intent of the emergency accesses is to quickly access a machine that has become disabled, and which may require the safe extraction of a person.

6.7. For operations near Bodies of Water or Other Liquids deeper than 1m a JHA must be conducted prior to commencing any work.

6.8. Access roads must comply with VUL-MOP-128-Design and Construction of Mine Roads.

6.9. All bunds must comply with VUL-MOP-128-Design and Construction of Mine Roads.

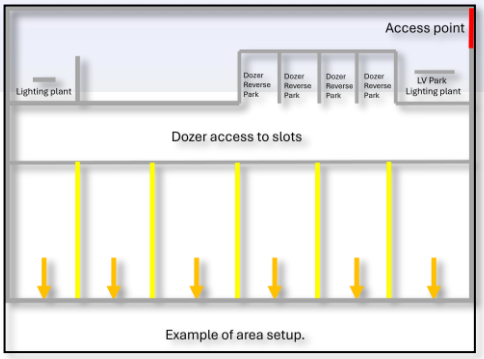


Figure 11 – Bulk push set-up.

6.10. Dozer push area must be segregated from other activities with earth bunding.
6.11. A segregated park up area for Light Vehicles and Dozers must be maintained.
6.12. Adequate lighting must have regard to shadow, contrast and glare in the work area to carry out the task safely. VUL-SOP-144-Lighting & VUP-SWP-144(1)-Setup Lighting Plant.
6.13. Bulk Dozer Push uses the following principles:
6.14. Keep the overall average push length as short as possible. (short dirt pushed long, long dirt pushed short)
6.15. Push the maximum load possible without track spin. (push dirt in slots, keep average push angle as steep as possible throughout push, double push)
6.16. Minimising rehandle. (at start of push, toe out just before pivot line at correct RL, push all dirt past pivot line, don't overfill pivot line)

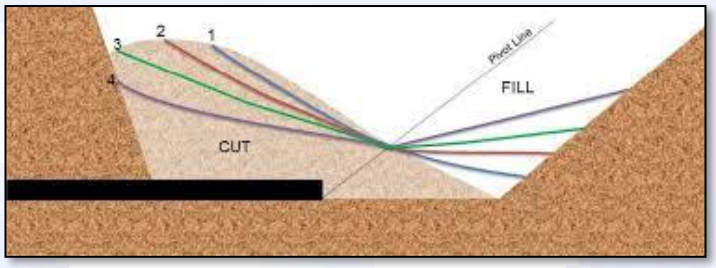


Figure 12 – Pivot line.

6.17. Back dirt is still long dirt. It should only be moved once the rest of the slot has been cut out so that there is a consistent grade from the high-wall to the pivot line, and should be stacked closest to the pivot line.

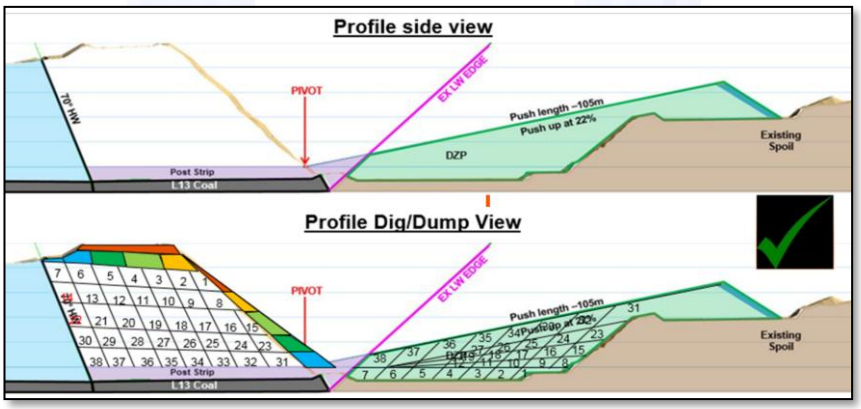


Figure 13 – Pivot point profile.

6.18. All Dozers start down one end and take 3 slots each. Once these 3 slots are completed the dozers will each leapfrog and the sequence will continue working across the block. This is the general sequence to follow for best dozer productivity.

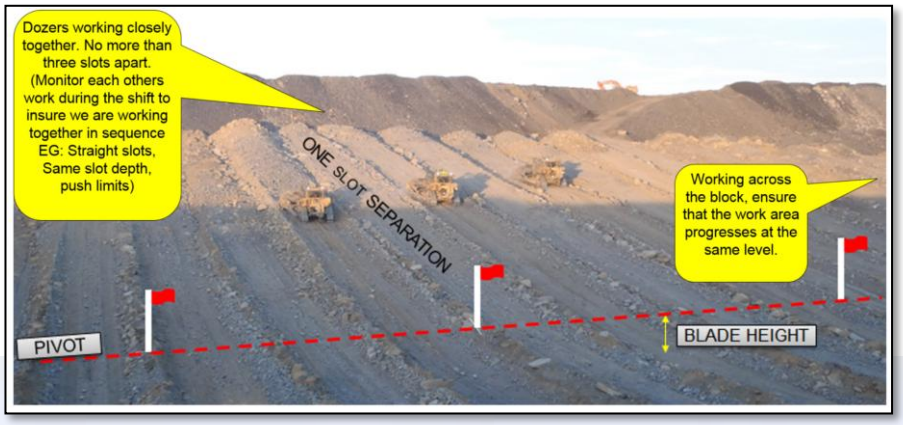


Figure 14 – Slot set up.

6.19. Always cut and carry a full blade of dirt in (1st gear) ensuring machine is working within its operational limitations. This will ensure the slot pushing process is productive and efficient, e.g. diesel burn rates, avoid over-heating engine, torque converter and hydraulics allowing for better machine component life, than a Dozer pushing a smaller blade of dirt faster over the same cycle distance. This is counterproductive.

6.20. When cutting to load up the blade, always try to get to the desired depth quickly rather than taking long shallow cuts. The weight of the dozer on a steep angle provides much greater breakout power – especially in rock.

6.21. The maximum working push angle is 30%. This allows for additional 15-20% slope when cutting to load up the blade without having to reverse all the way back to the top of the slope.

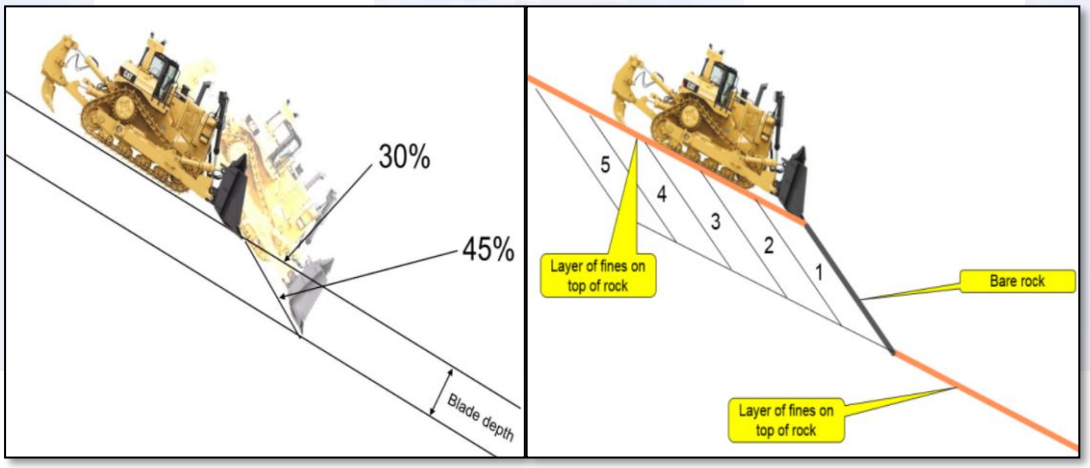


Figure 15 – Push angle.

6.22. At the beginning stages of a new push, the double pushing technique should be used. For example, where there is an edge or void to lose large volume of material on a downward slope.

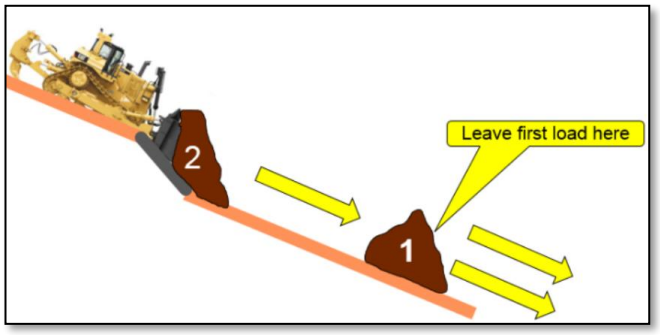


Figure 16 – Leave a blade full at the face.

6.23. Rills between slots not more than 1/3 blade width
6.24. Dozers to always maintain at least one slot separation
6.25. Leave full blade of dirt at end of push

Figure 17 – Slot set-up.

6.26. Slot shall not be deeper than 1 x blade height, once slot depth is full blade height stich the windrows into the slots and re-establish slot sequence.

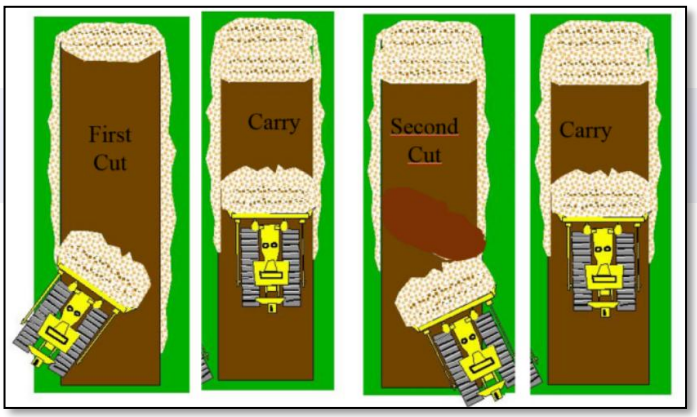


Figure 18 – Taking out rills between slots.