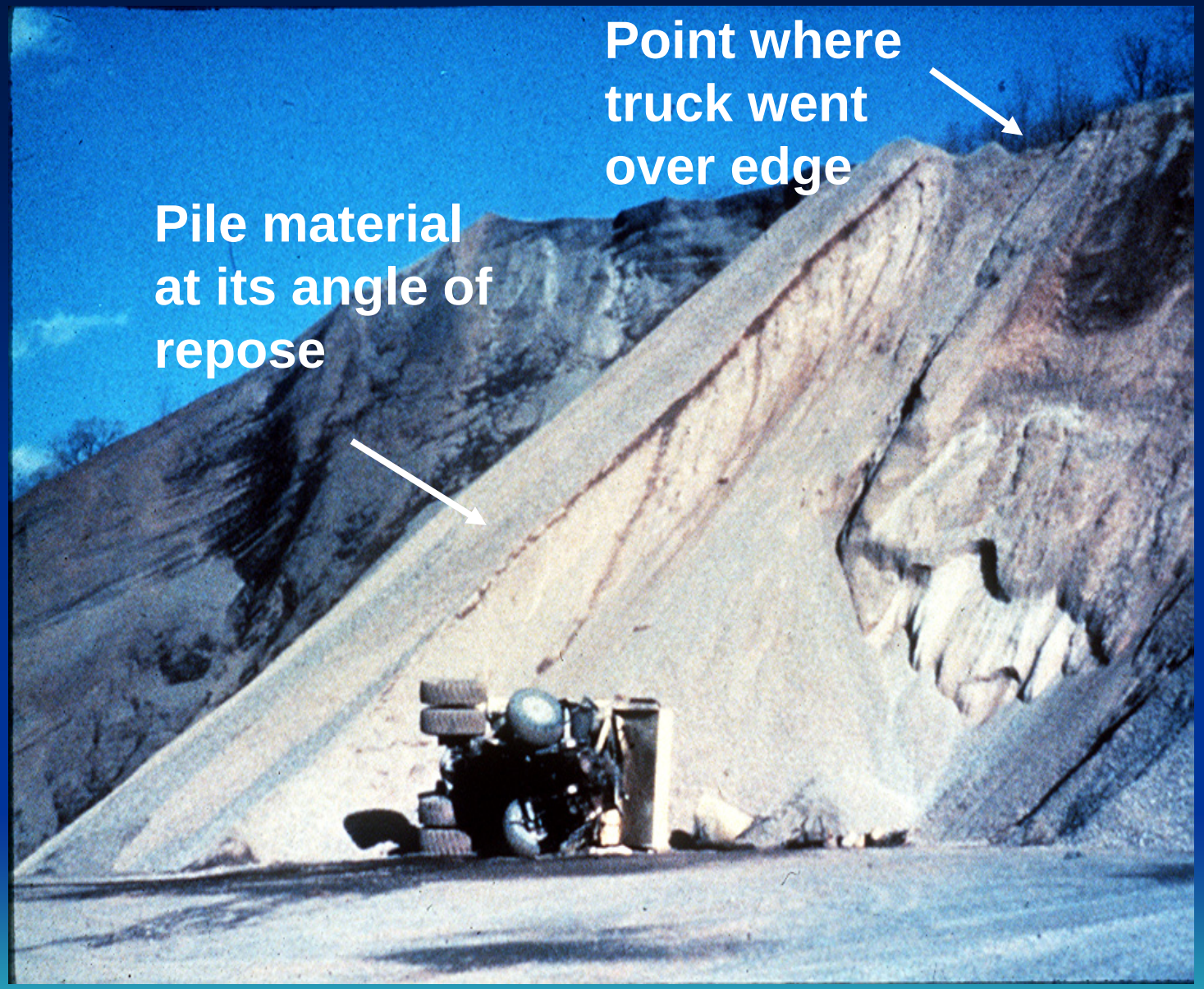
DUMP POINT SAFETY

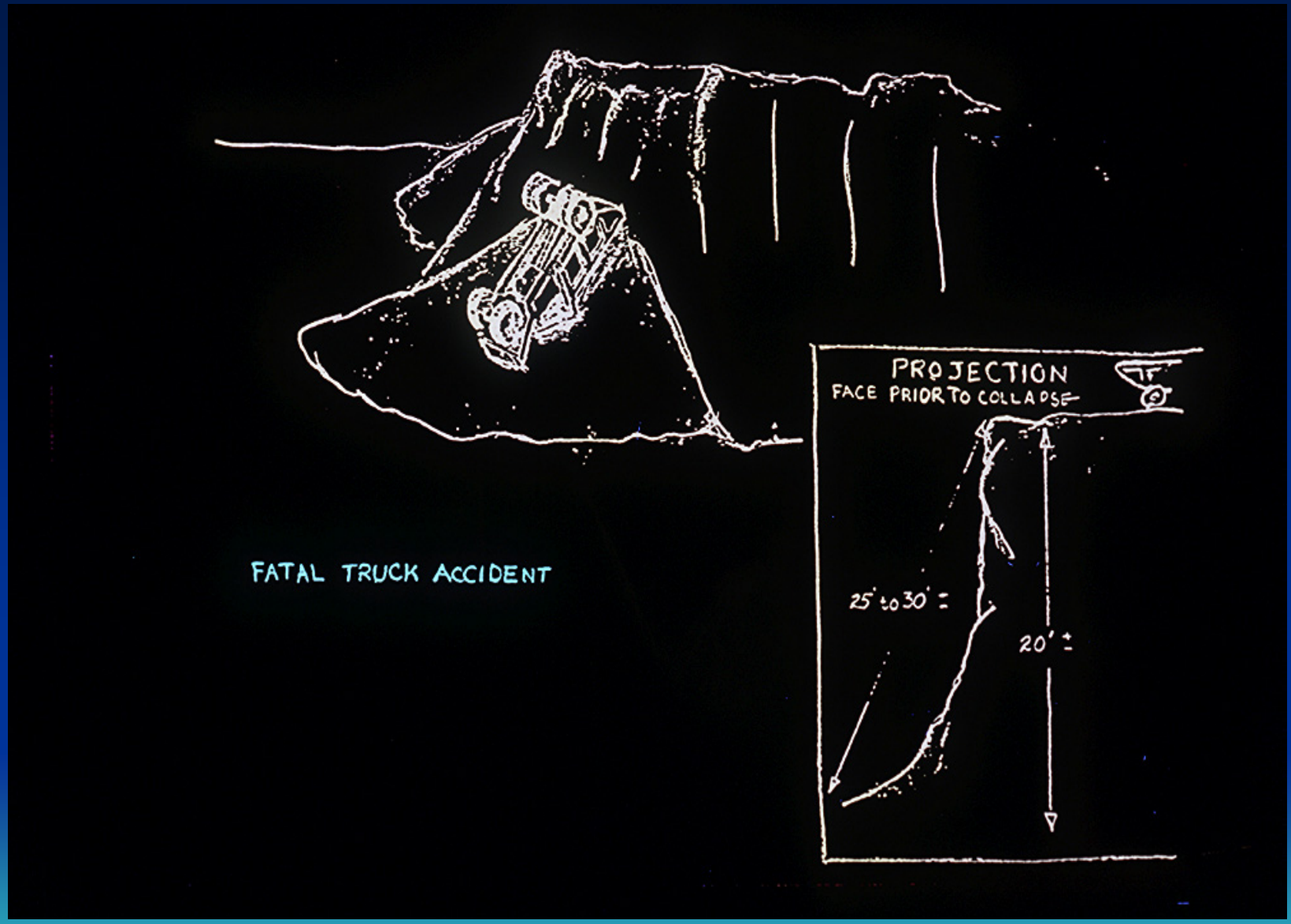
Trucks dump near the edges of stockpiles and spoil piles thousands of times a day in the mining industry.

Fatal accidents occur when trucks travel over the edge at dump points

In this accident, the pile was 70 feet high. Where the truck went over the edge, the pile had been loaded out and made steeper than the material's angle of repose. This is a common feature in many dump-point accidents.



In this fatal accident, the pile was only 20 feet high - so it’s not just the higher piles that you need to be concerned with.



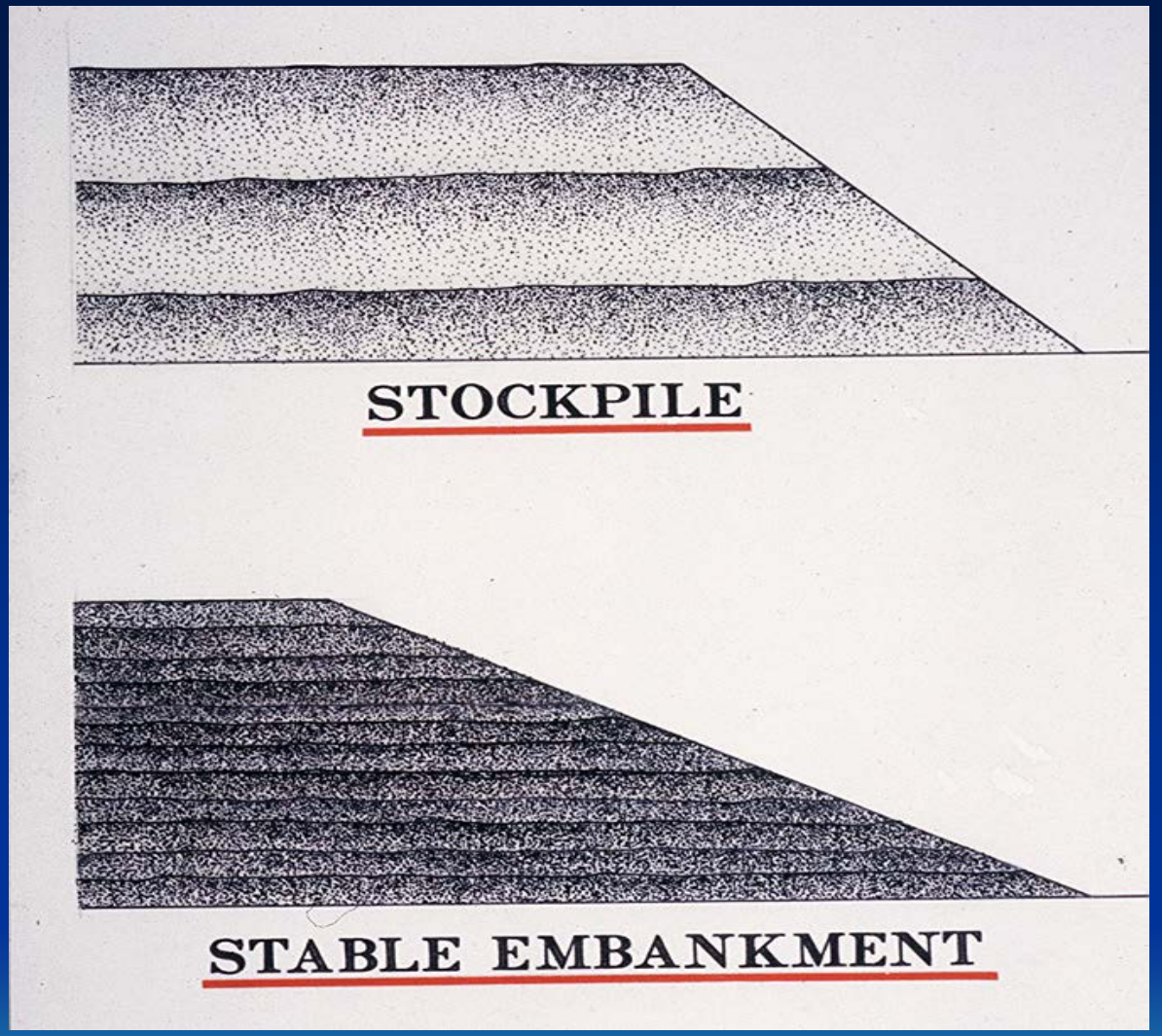
Typical spoil pile / stockpile

- The material is loosely placed in relatively thick layers and the outer slope is at the material's angle of repose.

Result: The edge of the pile is barely stable.

Typical highway/structure embankment

- Thin and well-compacted layers with a relatively flat and stable outer slope.



These differences illustrate why heavy equipment must be operated with great caution near the edge of a stockpile or spoil pile.

Note:

- Two-thirds of the loaded weight is on the rear axle. This weight is concentrated at the top of the slope when dumping.

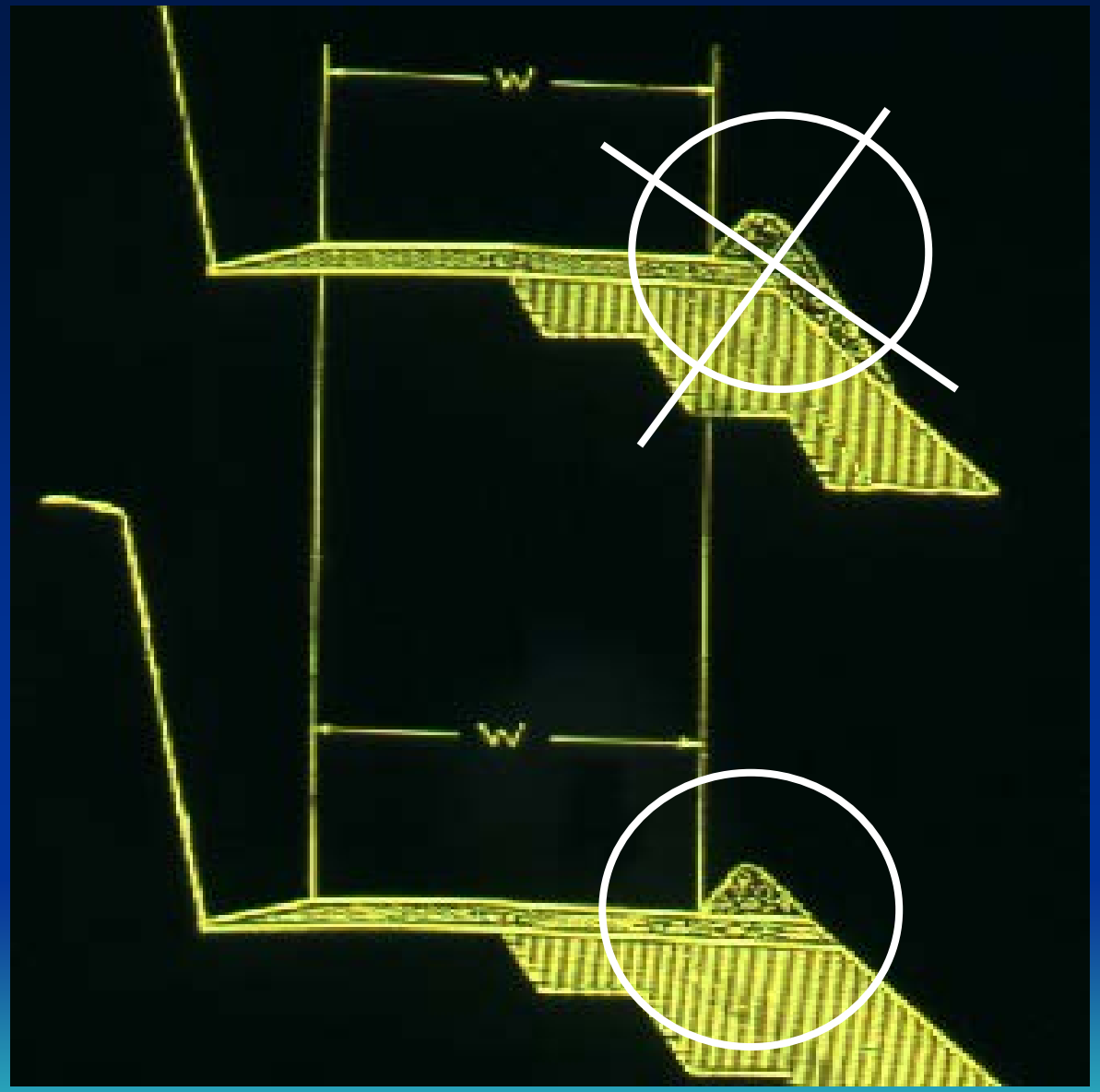
Dump-Point Best Practices

- <u>Maintain Adequate Berms</u>

- Provides a good visual indicator for the operator

- Separates rear tire from top of the slope.

Berms should be founded on firm crest of the pad – not on the slope.



Dump-Point Best Practices

Prior to dumping, check the dump area for cracks and other potential problems.

Dump short when cracks are present or the berm is not adequate. Dump at least 1 truck length from crack.

Mark or barricade areas to prevent others from being exposed to hazardous conditions.

Use a track-mount dozer to push the piles over the edge of the slope.

Some operations “drive left” on piles.

The driver is in a better position to check for cracks and to check the size and condition of the berm.

Dump-Point Best Practices

Loading out from the toe of the Stockpile:

- Removes material supporting the slope = steeper and less stable
- Can undercut the berm at the top of the slope.

Example of a stockpile where the toe was removed and the berm was undercut.

Top section will eventually fail to its angle of repose = highly dangerous for any equipment at the top of the slope.

Toe had been loaded out and the material failed to its angle of repose, taking the berm at the top.

Similar conditions can occur in spoil piles where a slope failure occurs below the dump point.

If there is uncertainty about the safety of a dump point for any reason --

Dump short and push the material over, or

Dump at the base of the pile, or

Dump and load-out in separate areas.

Example of dumping short where the toe is being loaded out.

A good rule-of-thumb is to dump one truck-length back from the toe of the berm.

Dozer pushing short-dumped loads while the toe of the pile is being loaded out.

DUMPING AT BASE OF A STOCKPILE.

Keeps the truck drivers from being exposed to the unsafe area at the top of the pile.

When loading a customer, a good practice used at some operations is to use the first bucket of material to block the stockpile's access ramp. This prevents trucks from going to the top of the pile until the loader operator ensures that over-steepened material has been pushed down and an adequate berm is in place.

SEPARATE DUMPING AND LOADING.

Here, the dumping and loading activities are separated. Once the top surface had been covered, the piles will be struck and another layer added.

Dump-Point Practices

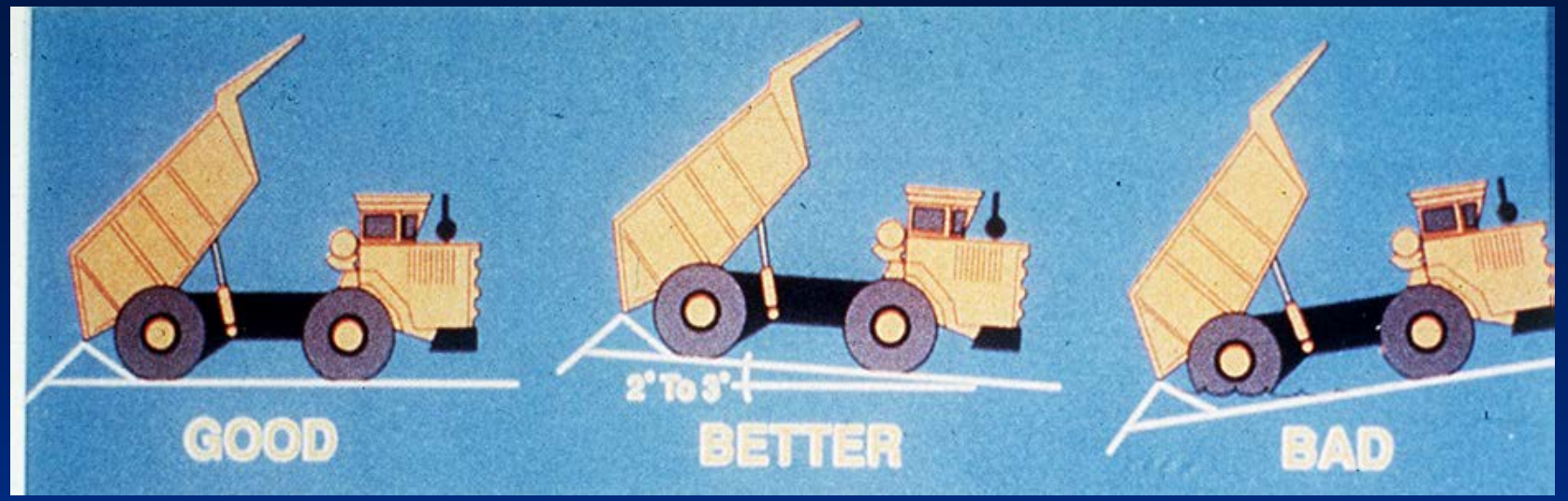
Use the berm as a visual indicator only, do not routinely use it, or rely on it, to help stop the truck.

Trucks should back slowly and come to a gradual stop at the top of the slope. Braking abruptly imposes an outward force that could help cause the edge to give way.

Drivers should use the berm as an indicator for where to stop.

Hitting into and riding up on the berm could cause the truck to go through the berm (especially if the berm has been undercut), or the extra force could cause the edge to give way.

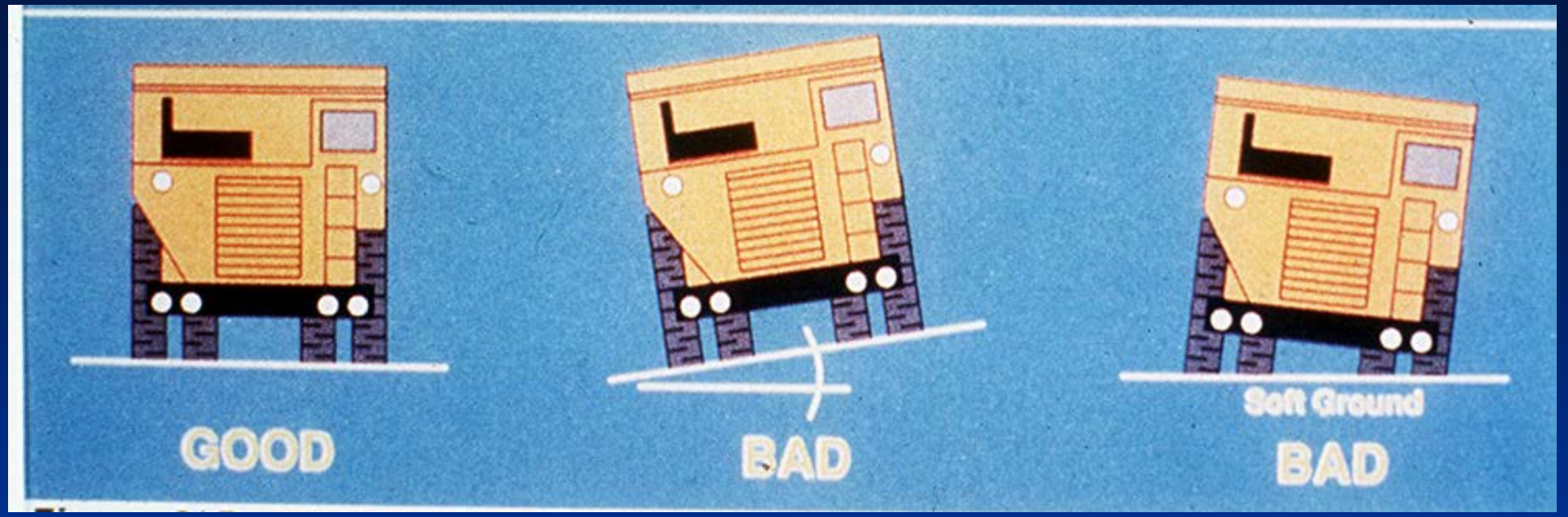
Dump-Point Practices



Keep the dump area properly graded.

Grade the dump area so that trucks are backing up a slight grade to dump.

- Provides the driver with better control as the truck is backed to the dump point;
- Places the truck in a better position to be move forward if a problem develops, and
- Keeps the dump area better drained.

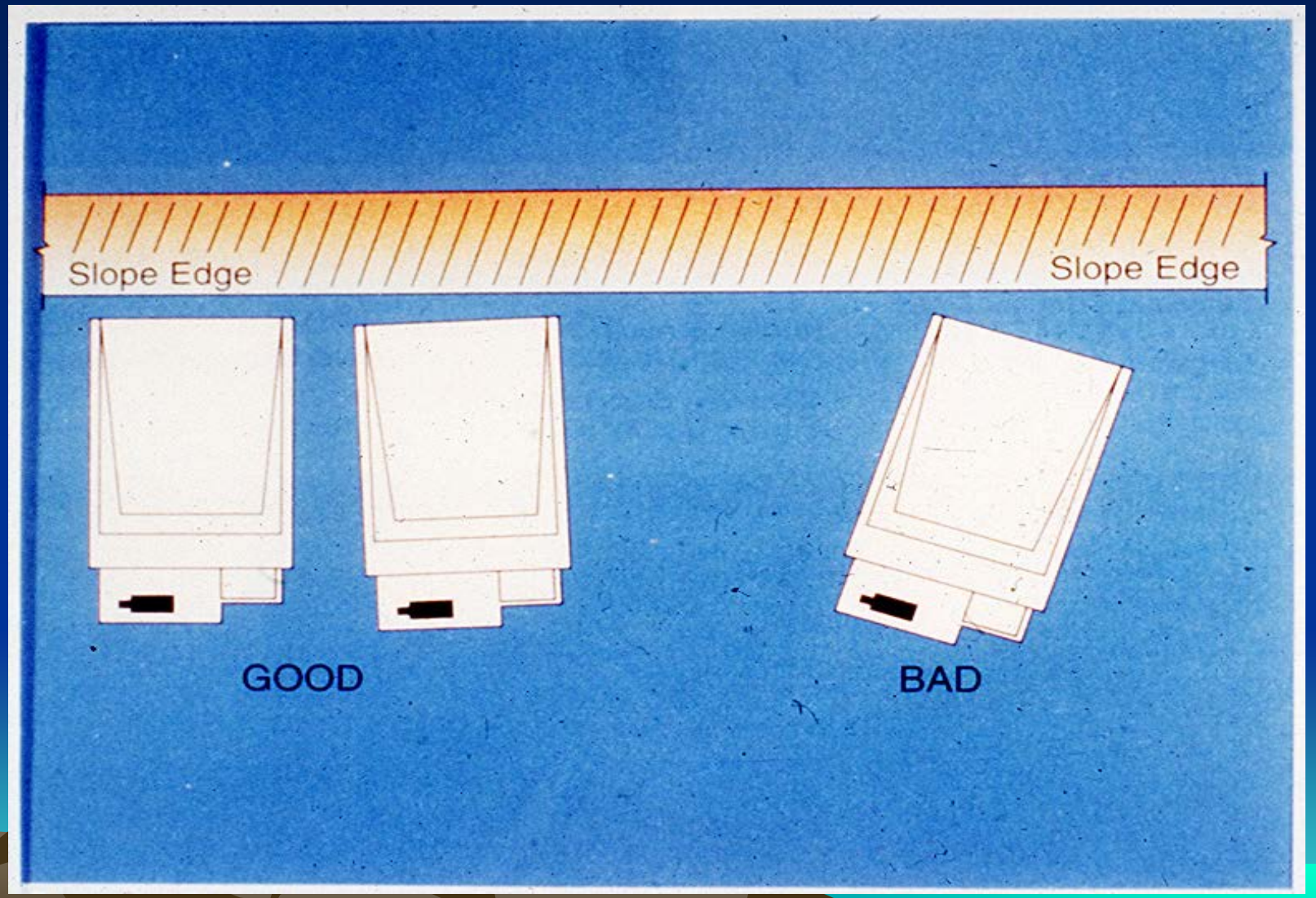


Keeping the dump area graded level from side-to-side, and free of soft spots, will help prevent trucks from tipping over as the bed is raised. This is particularly a concern in cases where material sticks in the truck bed.

Dump-Point Practices

Back perpendicular to the berm, or at slight angle where driver's side tires are closer to the berm.

In many dump-point accidents, it is found that the truck had been backed as shown on the right. In these cases, the longer distance to the berm on the driver's side may lead the driver to power the opposite-side rear tires through the berm.

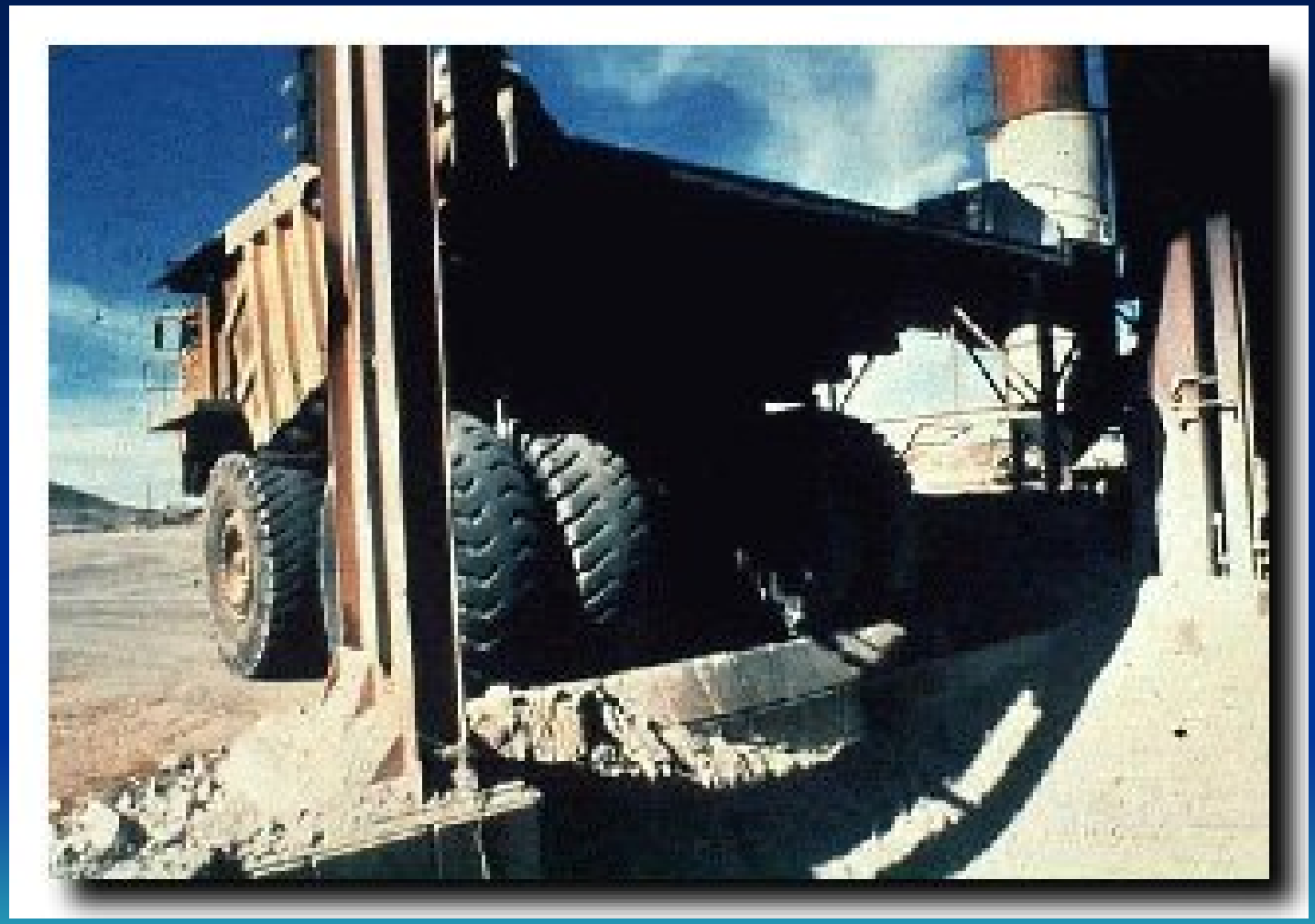


Accident where a truck went over the edge of this spoil pile and the tire tracks are at an angle to the edge of the pile.

This is where that truck ended up, with fatal injuries to the driver.

Dumping at a Hopper

A berm or bumper block is needed when dumping into a hopper. The bumper block does not have to be mid-axle height, but it needs to be substantial enough to provide some resistance to keep the vehicle from going over.



Dumping at a Hopper

Material building up in front of the bumper is a common problem (trucks pulling away before completely empty). This results in a ramp. The material has to be cleaned out so that the bumper functions as needed.

OTHER DUMP-POINT HAZARDS…

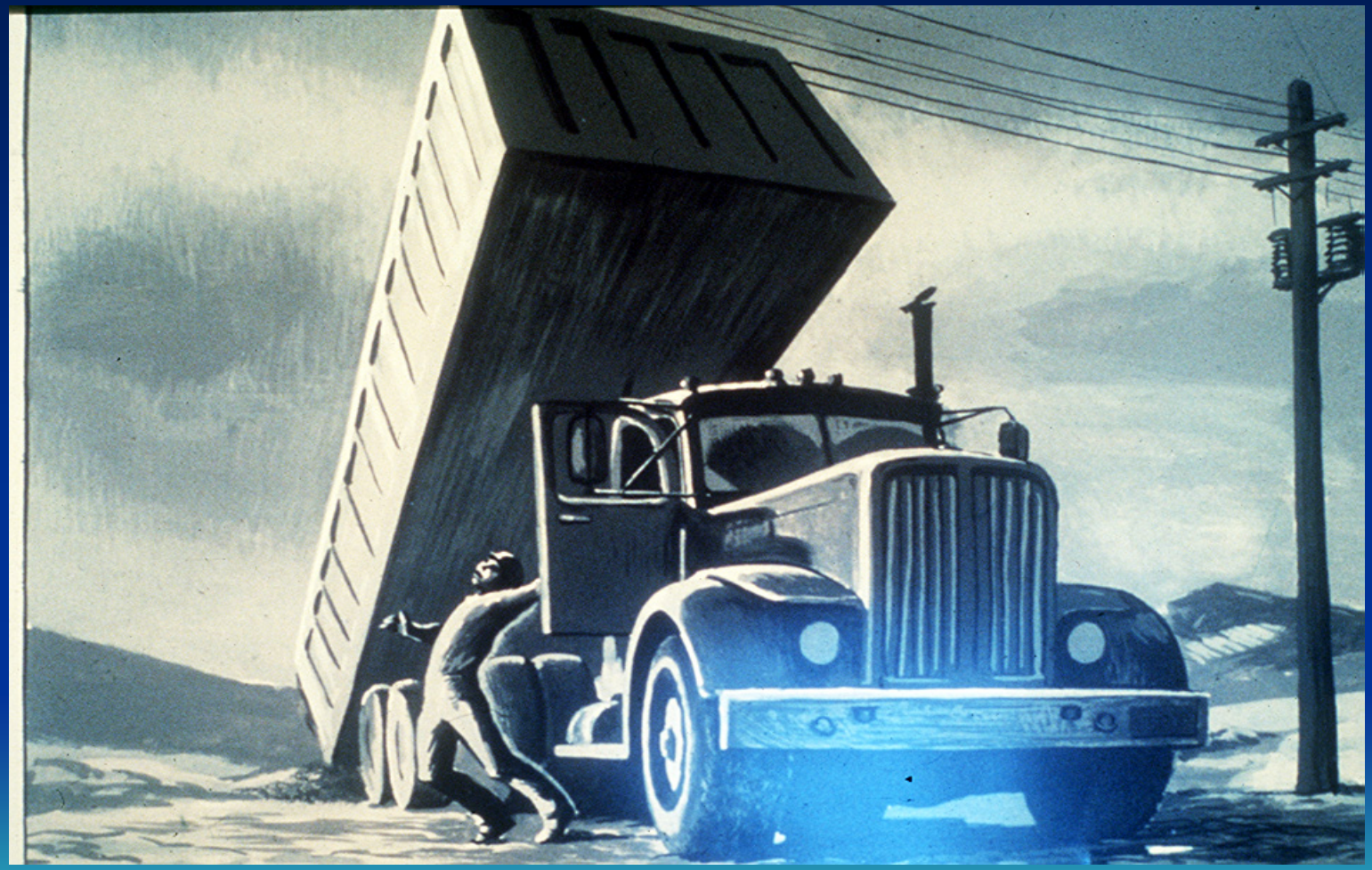
Working at night or in poor visibility conditions.

Adequate lighting increases visibility so that hazardous conditions, such as cracks or inadequate berms, can be detected. When visibility is poor, a good practice is to dump back from the edge.

Power lines.

OTHER DUMP-POINT HAZARDS…

Best Practice is to locate any type of dump point away from power lines or to have the power lines high enough that they are safely above the raised-bed height of the haul trucks. Power lines can also be marked/flagged to make them more conspicuous.



Summary of Dump-Point Best Practices

- Maintain Adequate Berms.
- Check Dump Area for Cracks and Other Potential Problems.
  - Drive Left to Get a Better View of the Dump Area.
- When in Doubt, Dump Short.
  - Use Track-Mounted Equipment to Push Loads Over the Edge.
- Do Not Dump in Areas Where the Toe has Been Loaded Out.
  - Block Access to Dump Area if Warranted.
- Dump at the Base of an Over-Steepened Slope of the Stock Pile.
- Grade Dump Area Flat (Side-to-Side) and Slightly Uphill to the Berm at the Top of the Slope.
- Back Slowly up to the Berm, not onto it.
- Back Perpendicular to Berm, not at an Angle.
- Provide Adequate Lighting.
- Avoid Power Lines at Dump Area.

By following the “Best Practices,” these dump-point accidents could have been prevented.

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Hanging material will eventually fail.

The material on the sides and at the top will eventually fail.

METAL/NONMETAL MINE FATALITY – A 50-year old supervisor with 27 years of experience was killed at a sand and gravel mine. The victim was at a backfill site and approached an 80-foot high bank when it failed, engulfing him.

Dump Point at Copper Mine

METAL/NONMETAL MINE FATALITY – An independent owner/operator truck driver, walked behind his raised end-dump trailer, while dumping his load and was engulfed by sand.

METAL/NONMETAL MINE FATALITY – A 62-year old Front-end Loader Operator with 6 years of mining experience was fatally injured at a sand and gravel surface mine. The victim was engulfed by sand when he entered a hopper to remove a blockage.

METAL/NONMETAL MINE FATALITY – A 64-year-old miner with 44 weeks experience was killed at a sand and gravel mine. The victim was operating a front-end loader, loading trucks from a stockpile, when he exited the loader. While outside the loader, the approximate 35-foot-high stockpile slope failed and engulfed the victim between the stockpile and the loader.

METAL/NONMETAL MINE FATALITY – A 65-year-old equipment operator with 19 years of experience was killed at a sand and gravel surface mine. The victim was operating a front-end loader and was removing material from a sand bank when the bank collapsed and engulfed the machine and entered the operator's cab causing the victim to be asphyxiated.

Recent Non-Fatal Accident

Fatality:
No berms, appears that material was loaded out of the pile, no seat belt

The victim was dumping overburden over the highwall when the accident occurred.

Best Practices:

- Dump Short
- Maintain adequate ground conditions, including berms

Frozen material in the bed caused the truck to tip over.

Victim jumped from the cab as it was overturning.

Rolled backwards over 90-foot highwall.

Best Practices

- Adequate Berms
- Maintain Braking and Steering Systems

Backed through berm and fell 60 feet.

Best Practices

- Berms at least mid-axle height of the largest piece of equipment.
- Visually inspect dump locations for changing conditions.
- Mark dump location with reflectors and/or markers.

Bank failed when truck was raising bed to dump.

Best Practices

- Adequate berms
- Examine dumping locations for stability.
- Dump short in situations where toe of the slope has been removed or ground conditions are suspect.
- Wear seat belts.

Backed over edge of dump point.

Best Practices

- Adequate berms
- Examine dump site
- Provide training
- Seat belts

Backed over crest of dump point

Best Practices

- Seat belts
- Berms
- Visually inspect dump area
- Dump short when toe of slope has been removed (loaded out)

Truck backed through the top of the slope and rolled approximately 140 feet.

Best Practices

- Adequate berms
- Adequate lighting
- Seat belts