

Copper Flotation

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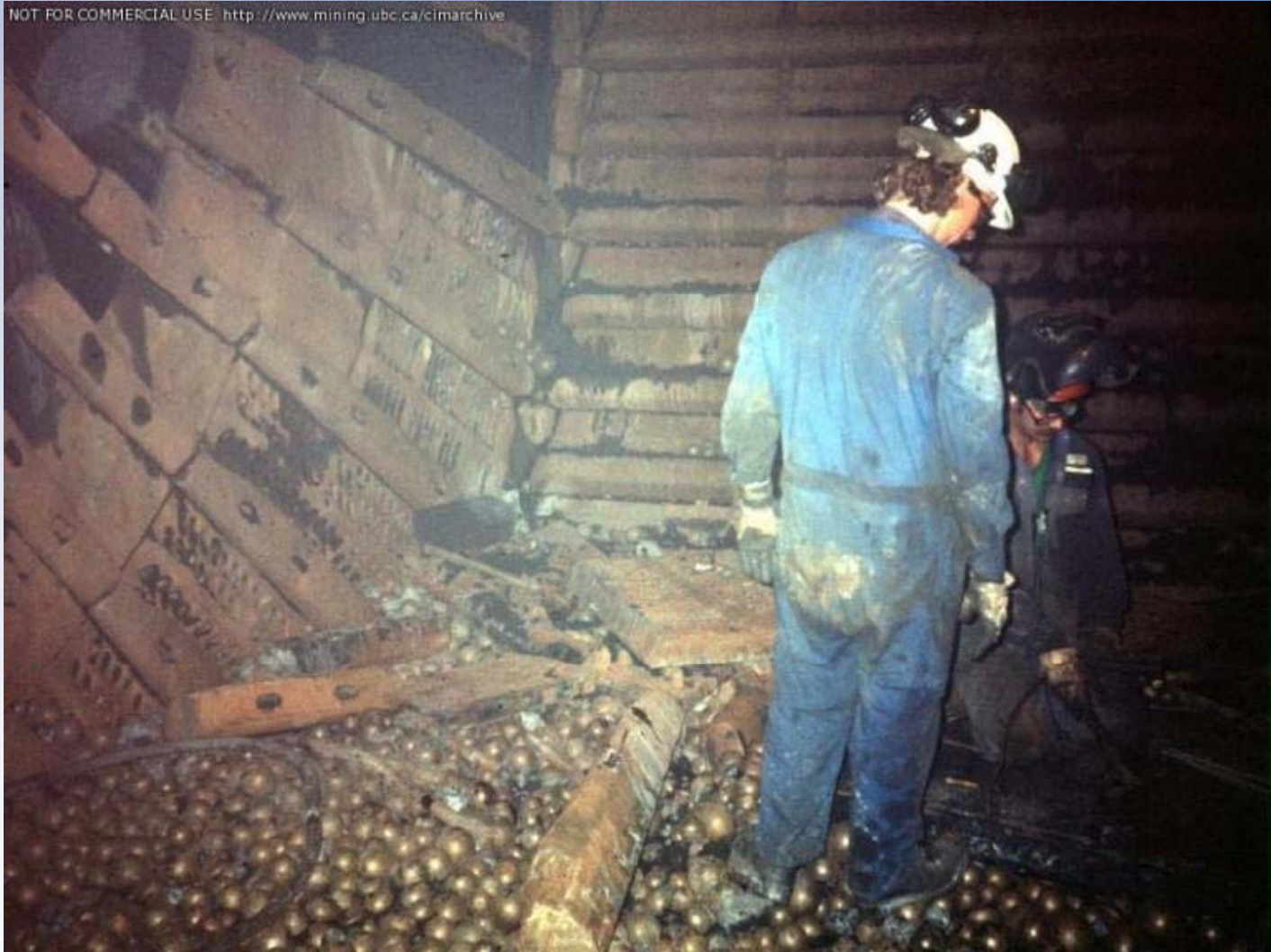
1. The mill complex is a major structure at an operating mine (dark grey building, centre right). Here coarse ore conveyed from the primary crusher and stockpiled nearby, is broken up further to fine particles and separated from waste rock sand. In the case of sulphide ore deposits, like those of copper, molybdenum, and lead, sulphide - **concentrate** is separated from the **tailings** in the mill.



2. From the stockpile crushed rock is fed by conveyor (right) into the mill.



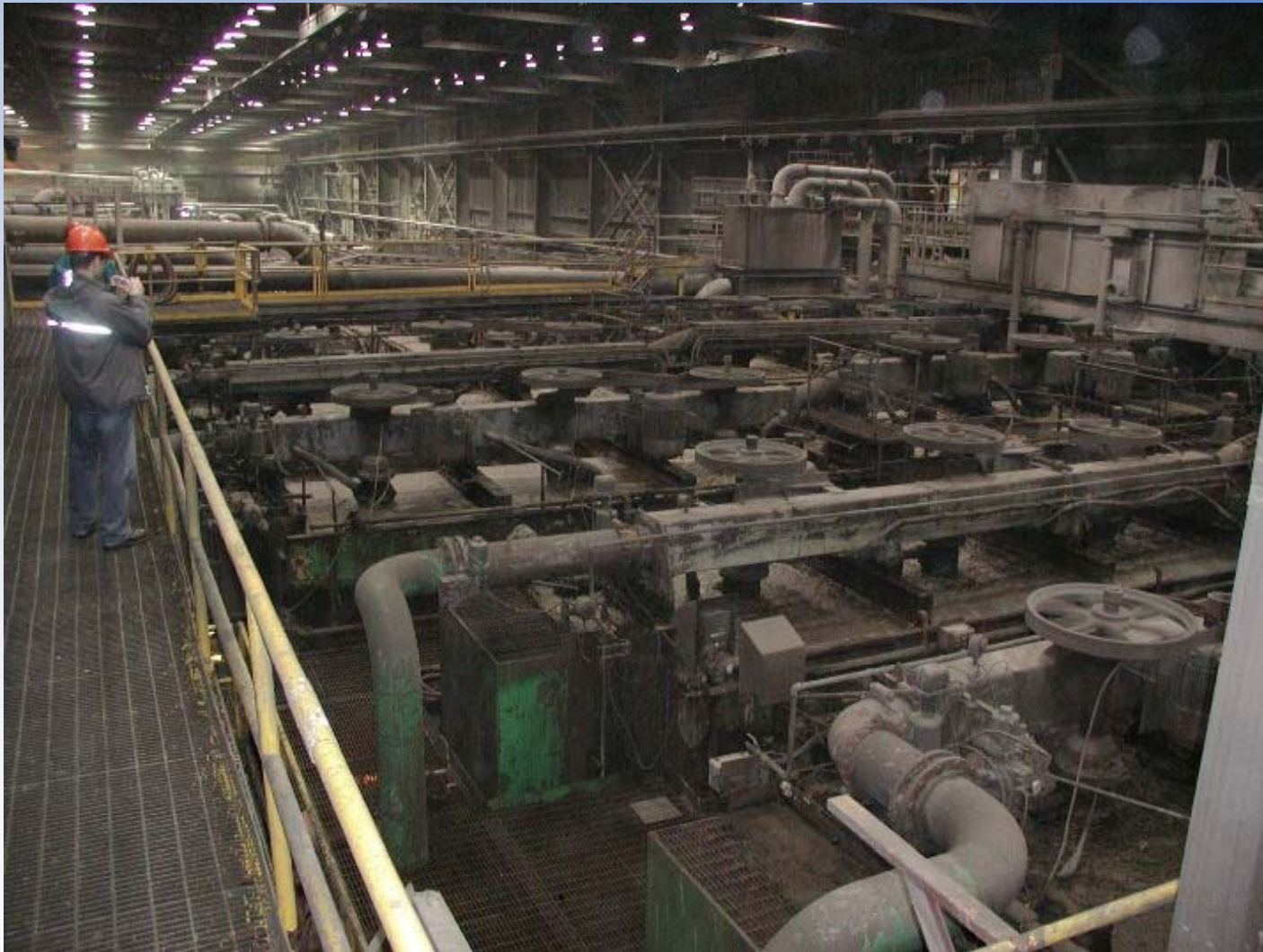
3. The ore is fed into one or a series of mills where it is mixed with water and tumbled continuously until the cobble size ore is reduced to the size of sand.



4. The mills may contain steel balls (ball mill) or steel rods (rod mill) or be loaded only with ore (autogenous mill).



5. The ore – water mixture, called *slurry*, leaves the mill and is directed via troughs to a bank of flotation cells.



6. In the flotation cell (tank) the slurry is mixed with a reagent and a frothing agent. An aerator in the centre of the cell (next slide) injects air bubbles into the slurry creating frothy metallic mixture.



7. Aerator – steel device that sits in the middle of a flotation cell, agitates like a washing machine and feeds air into the slurry.



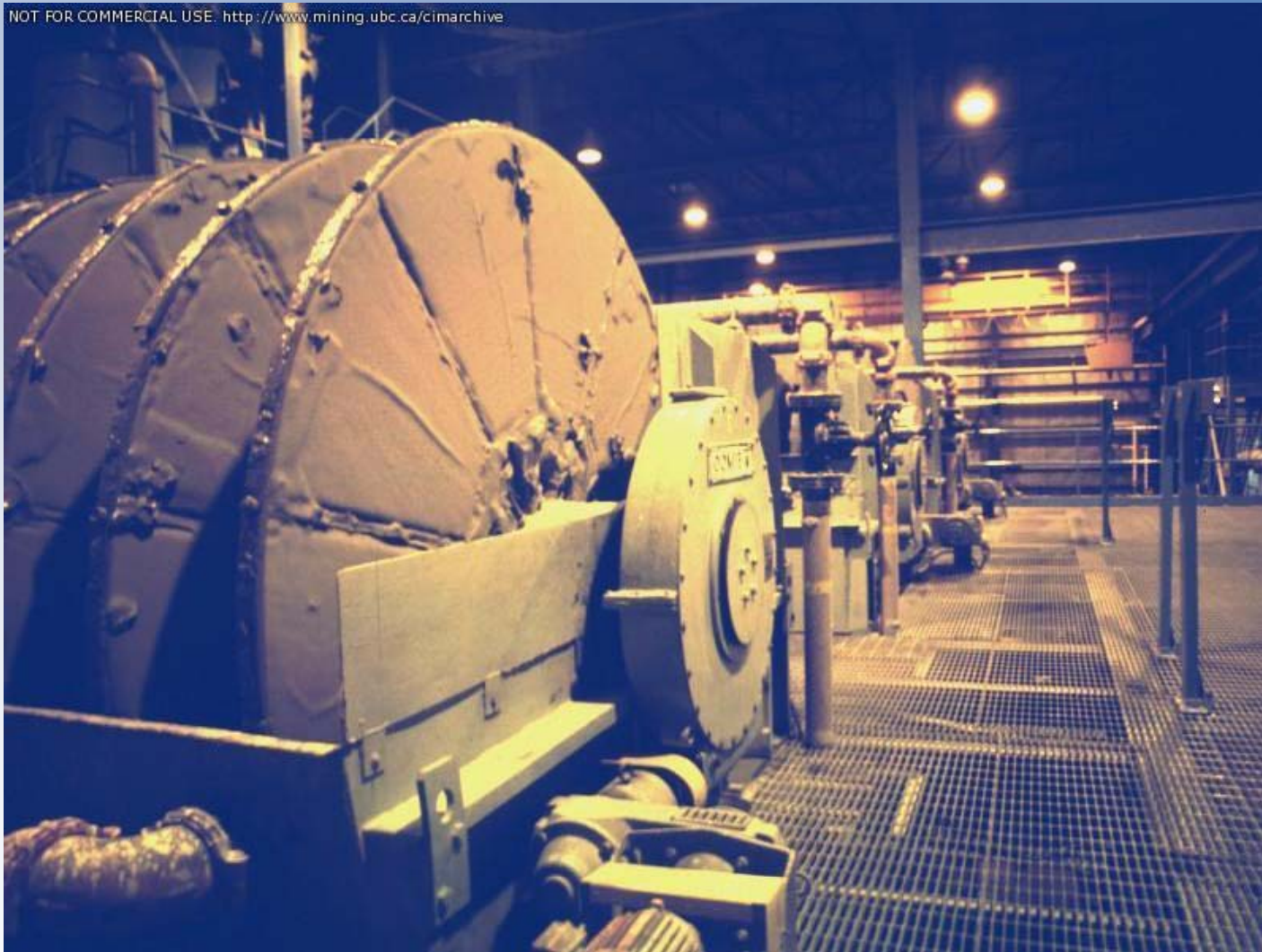
8. The reagent added causes the air bubbles rising through the slurry to collect or attract the fine ore particles, while the waste rock sand sinks to the bottom of the cell. (Tailings from the flotation cells are commonly directed by pipe to a nearby man-made tailings pond.)



9. The frothy ore concentrate overflows the top of the cell and is collected and directed to other series of flotation cells that separate the different sulphide minerals that may be present in the deposit.



10. Collected frothy concentrates next enter thickening tanks where the concentrate settles and water content is reduced. At many operations this tank is enclosed in the mill.



11. Thicken concentrate has more water removed by running through either a vacuum-pumped disc filters (above) or multi-level filter press (next slide) to remove most of the water.



12. Multi-level filter press squeezes out water from the concentrate. From there the moist concentrate enters a gas-fired drier that heats the concentrate and lowers the water content to ~7%.



13. Dry concentrate is stockpiled in a shed before being shipped to market, here via covered truck, then to a railway.