

Minerals to Metal

This publication is one of a set of five booklets: “A Mine”, “Finding Minerals”, “Mine Machines”, “When We Mine” and “Minerals to Metal”.

This booklet is produced in Tasmania for the Tasmanian Minerals Council.

The booklets are designed for use from Kindergarten to Year 4 (and beyond) and to assist student literacy, while at the same time exposing children to the Australian minerals industry.

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Design and Artwork: Clemenger Tasmania.

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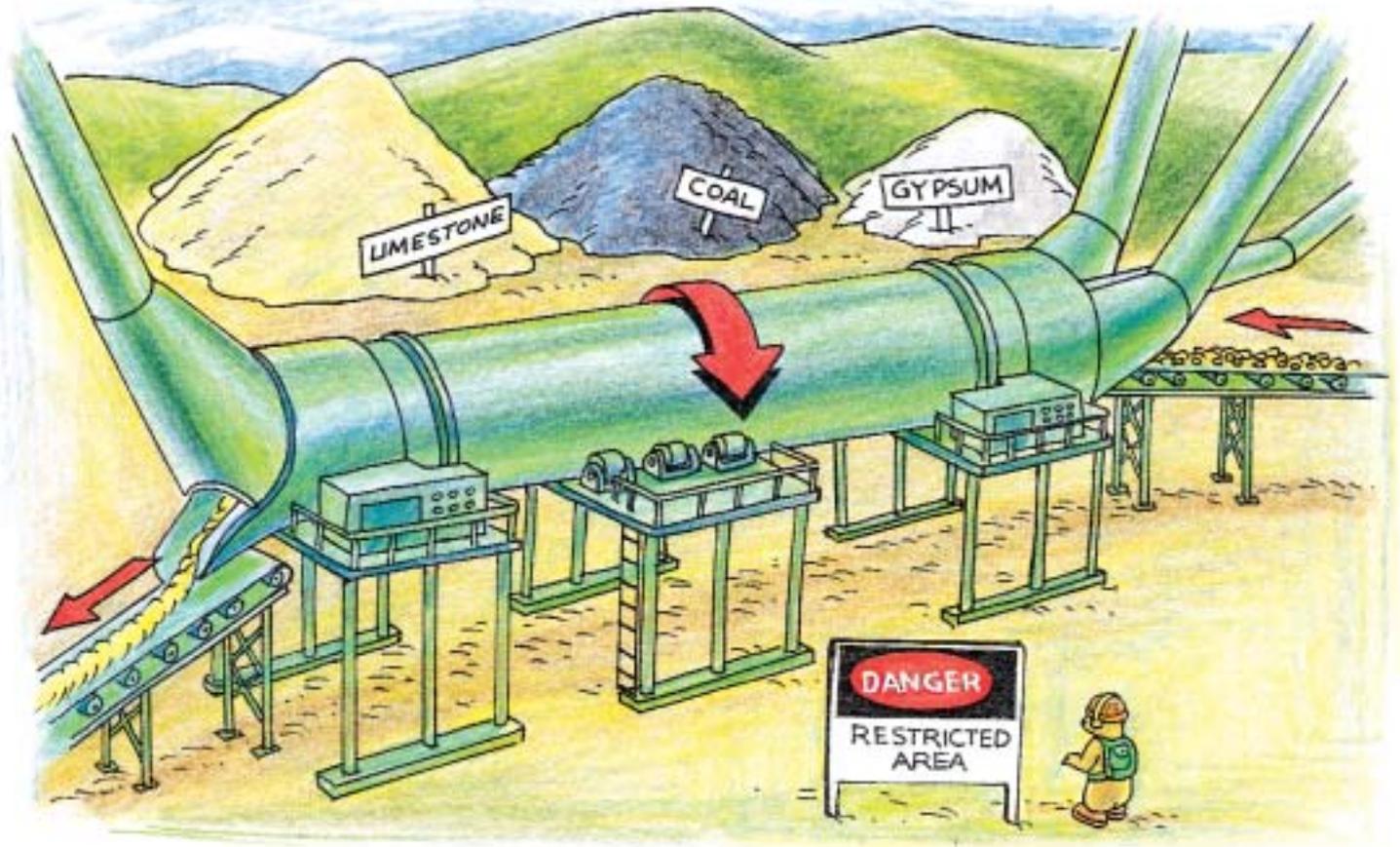


Minerals and rocks from the Earth make all sorts of useful things. We often change rocks and minerals that we mine and quarry to make them more useful. 3

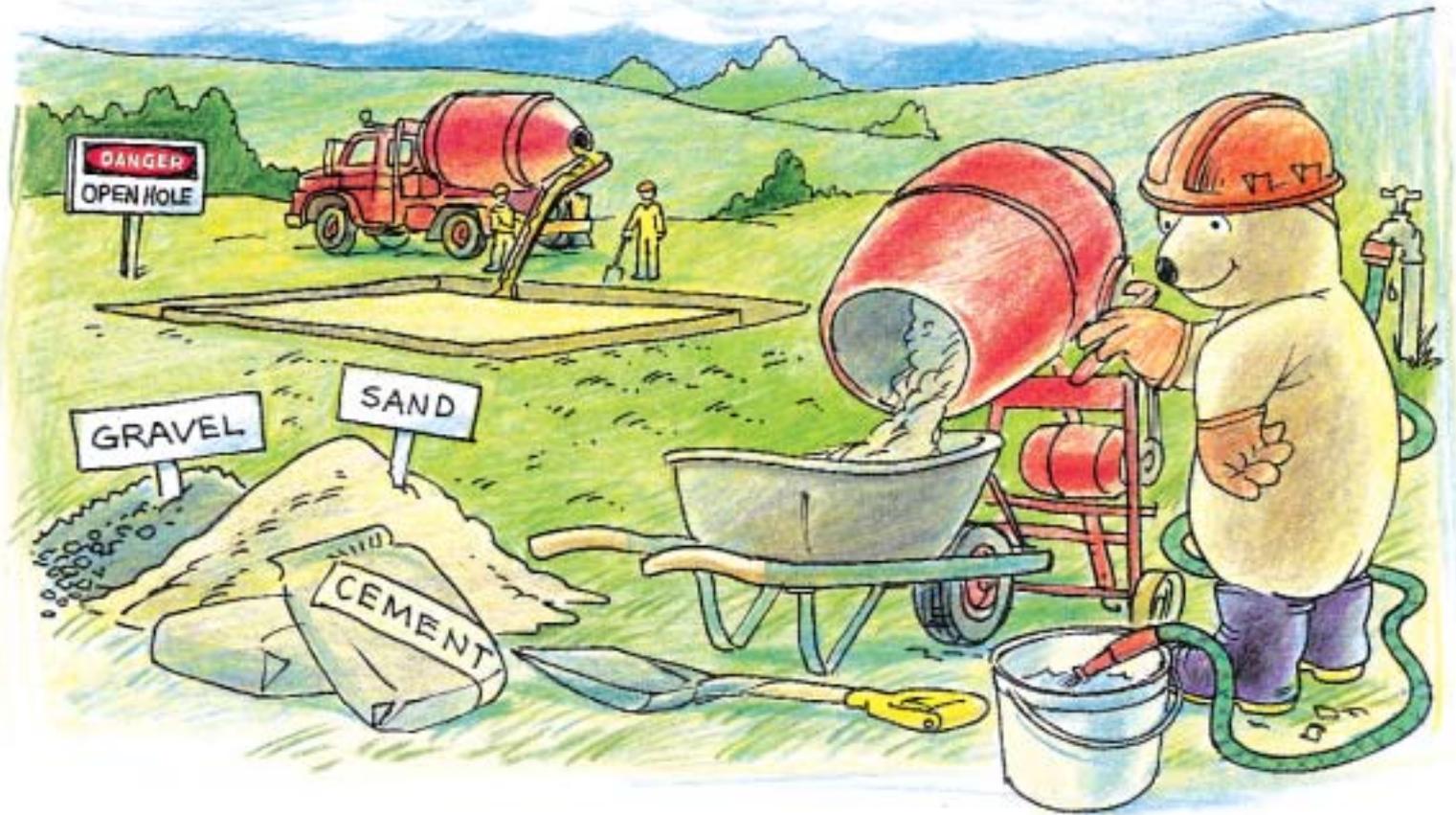


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Clay is a mineral. It is heated in large ovens called kilns to make bricks and pottery. We melt sand made of mineral quartz to make glass.



Limestone is heated to very high temperatures in a FURNACE to make CEMENT. Limestone is also burnt to make garden lime.

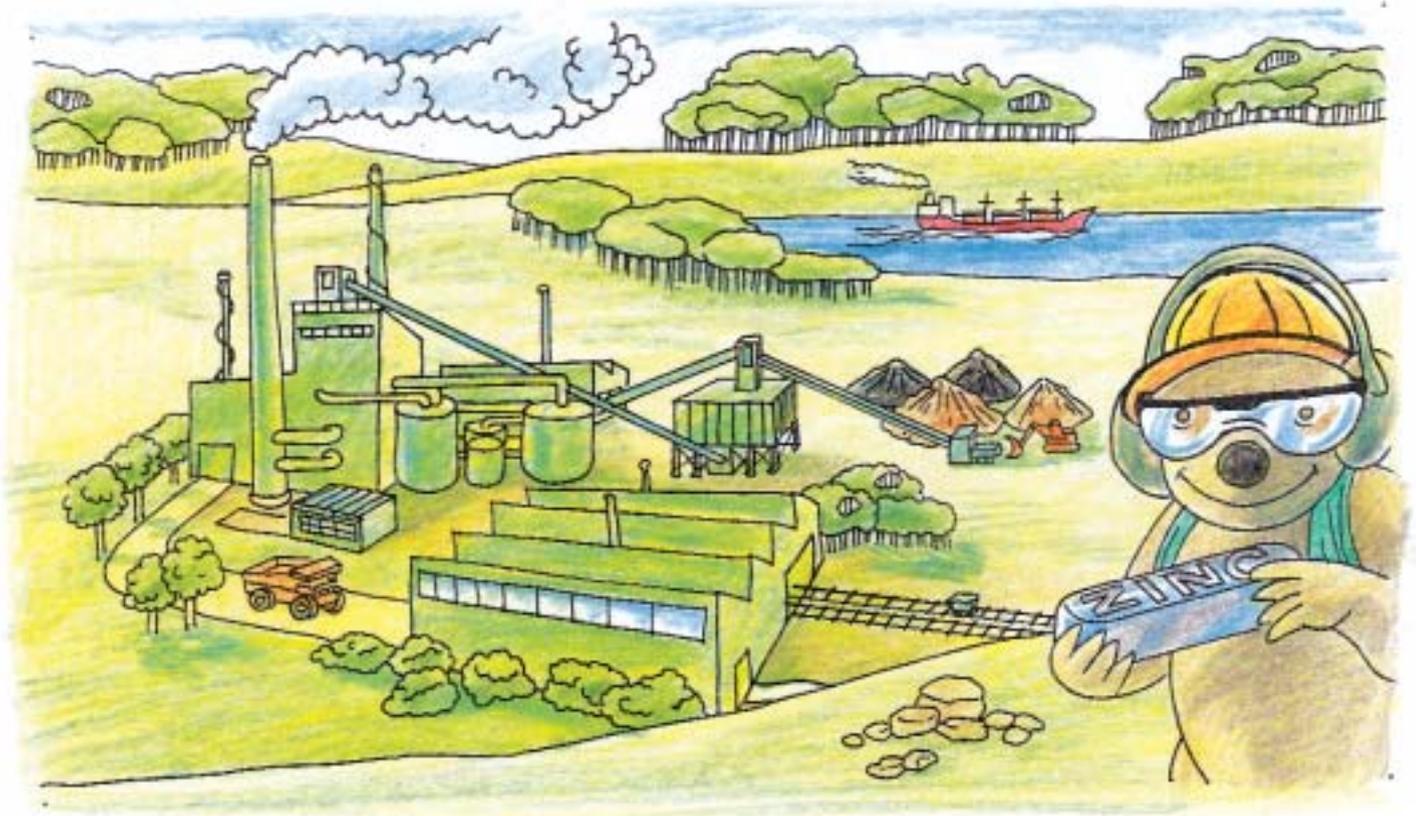


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Cement is mixed with sand, gravel and water to make CONCRETE.
How many things can you think of that are made from concrete?



A rock that contains important minerals is called ORE. Ore is dug out of the ground at a MINE. Minerals are extracted from the ore in a MILL.



Metals form an important part of minerals. Copper, gold, iron, lead, nickel, silver and zinc are examples of metals that we use. They are extracted from minerals in a factory called a SMELTER.

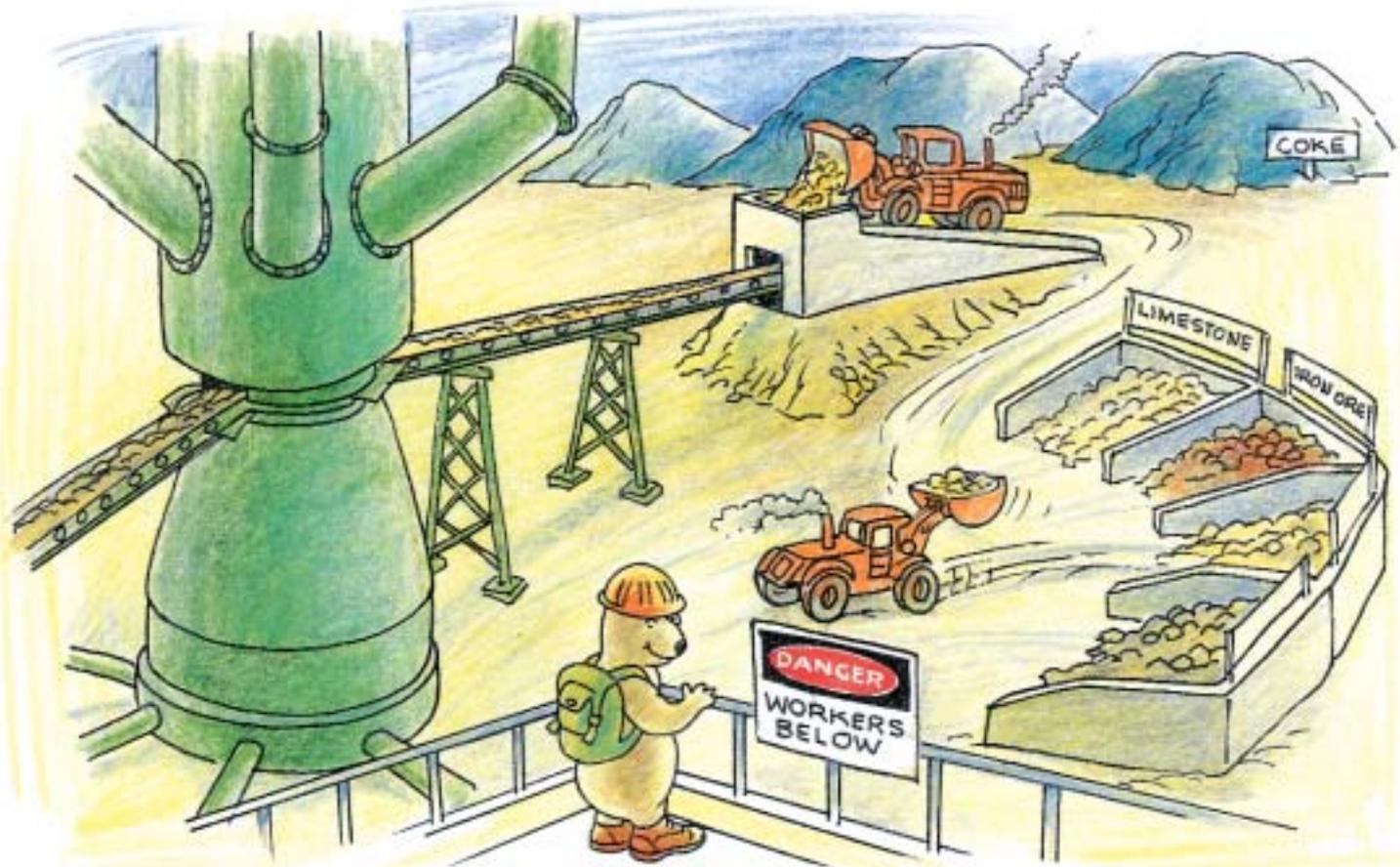


If the smelter is a long way from the mine
the minerals are carried to it in ships or by train.



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Smelters extract the metals by melting minerals in a furnace. Furnaces use huge amounts of **ELECTRICAL** and **HEAT** energy.



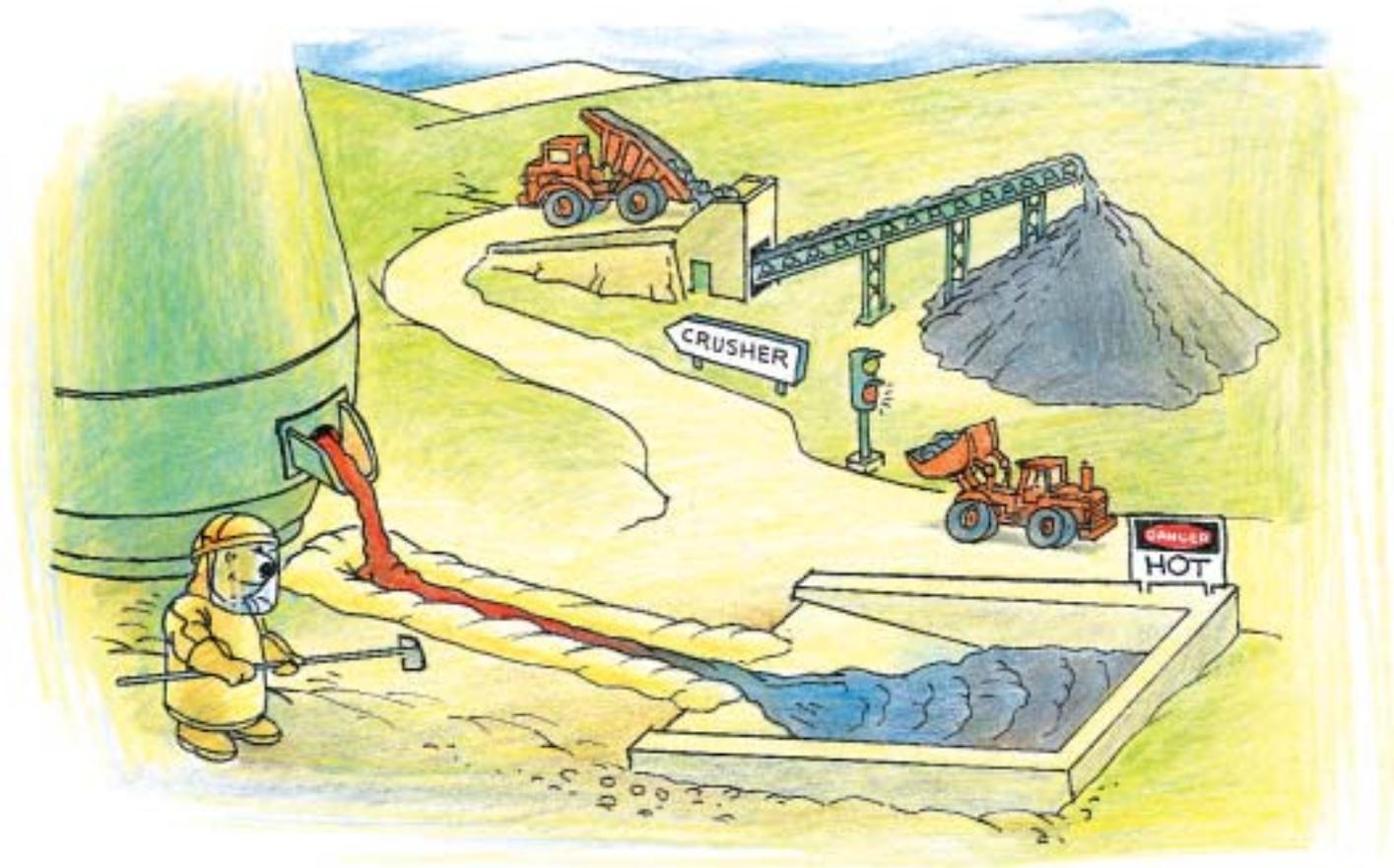
To extract the metal the mineral is mixed with other rocks and other minerals in the furnace. Then the mixture is heated.



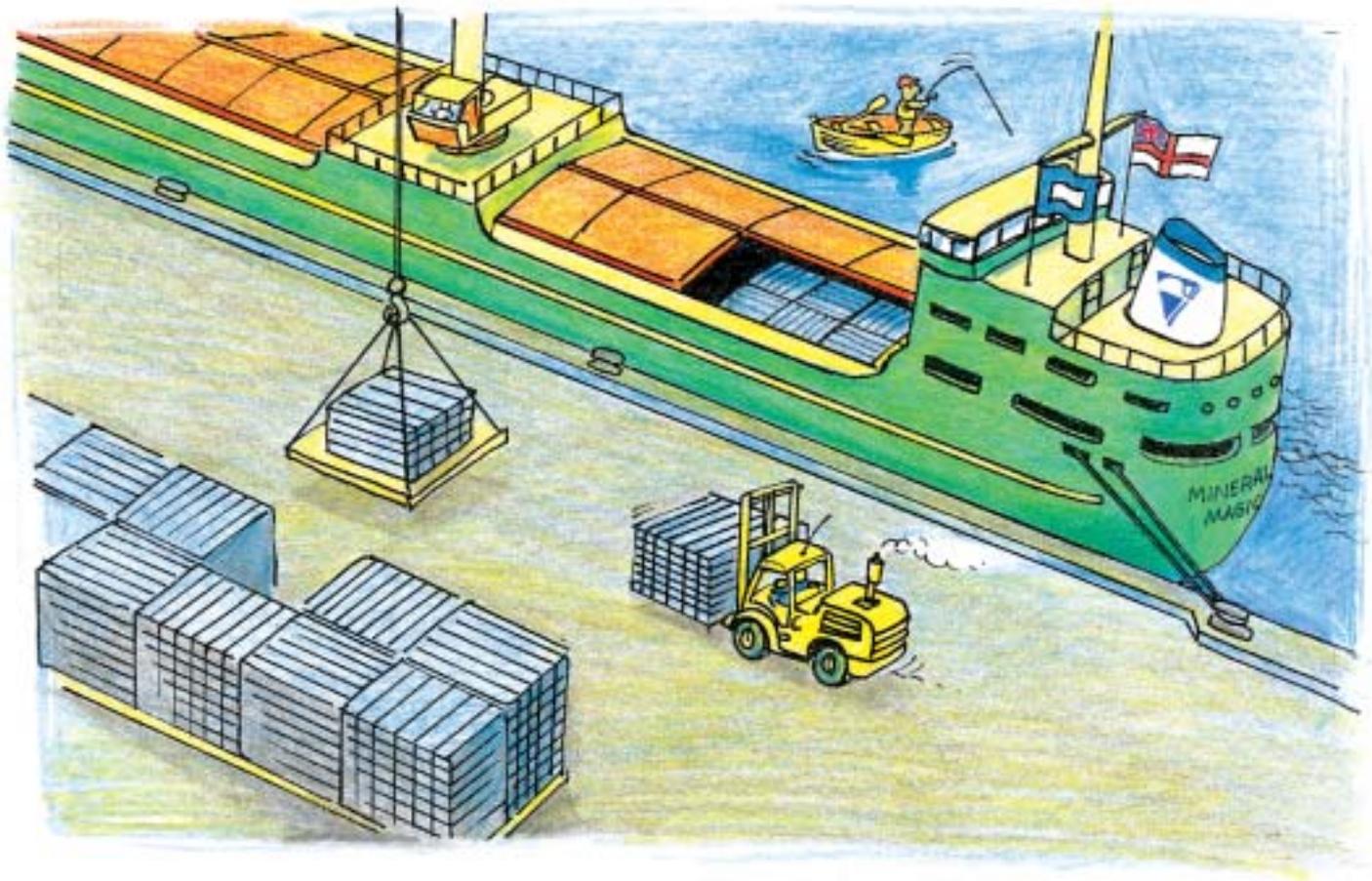
12 The mineral and other rocks and minerals melt to form metal and waste material called SLAG. The slag floats on top of the molten metal in the furnace.



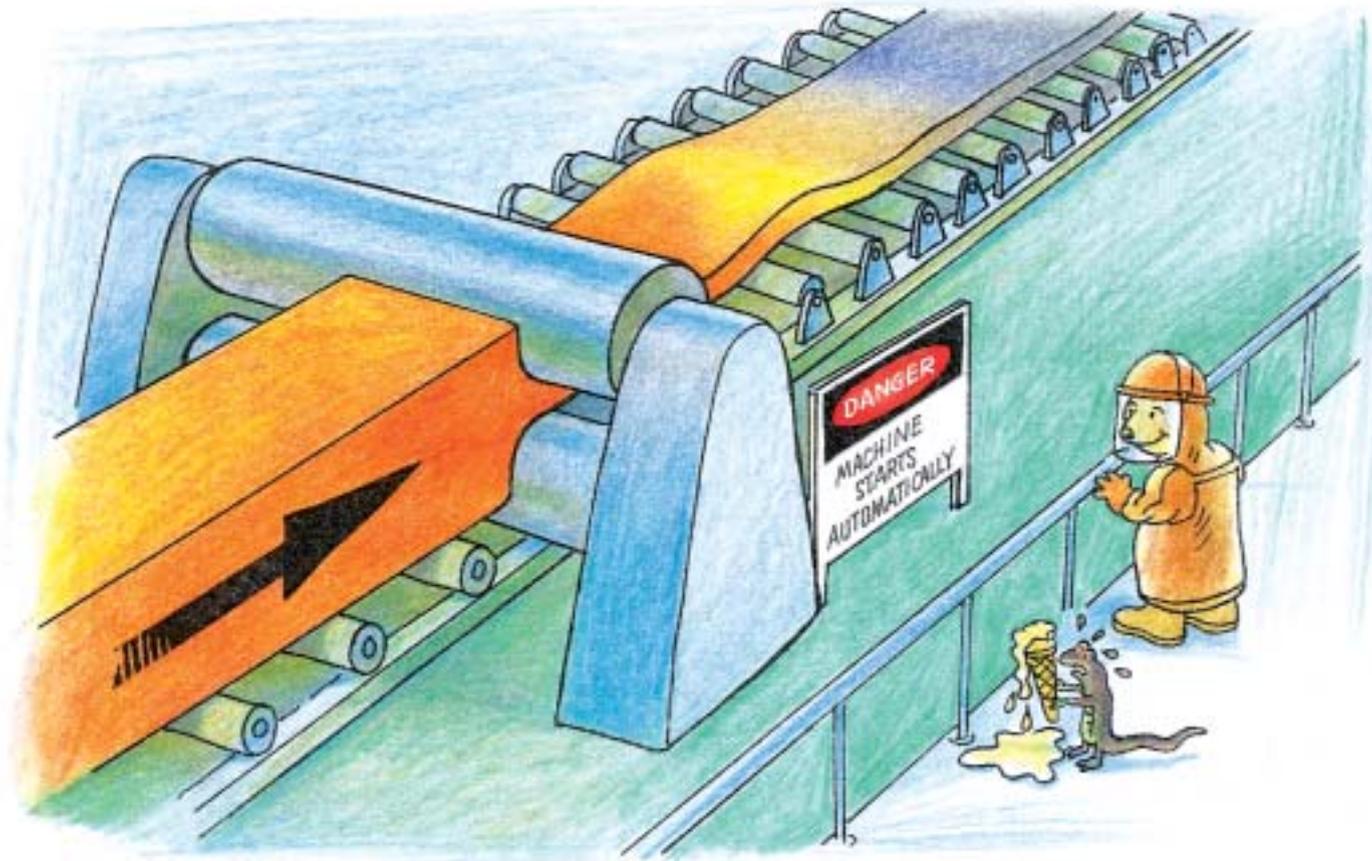
Several times a day the furnace is “tapped”. A hole is opened at the bottom of the furnace. Molten metal flows into a LADLE. The metal is then poured into special moulds. It cools to form solid INGOTS. 13



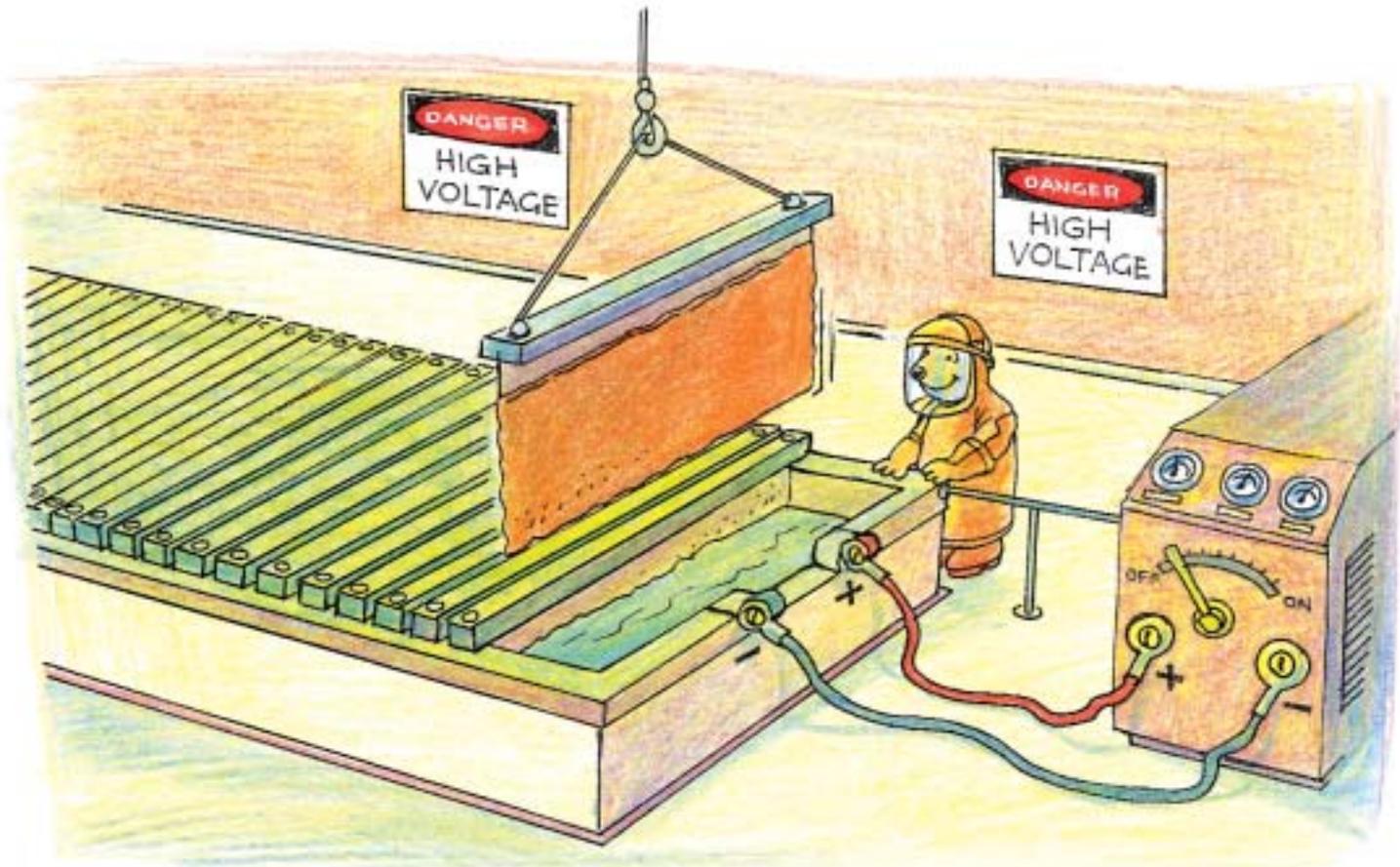
- 14 When all the metal has poured out, the slag flows into a special cooling area.
When the slag turns solid it is crushed and used for other useful things.



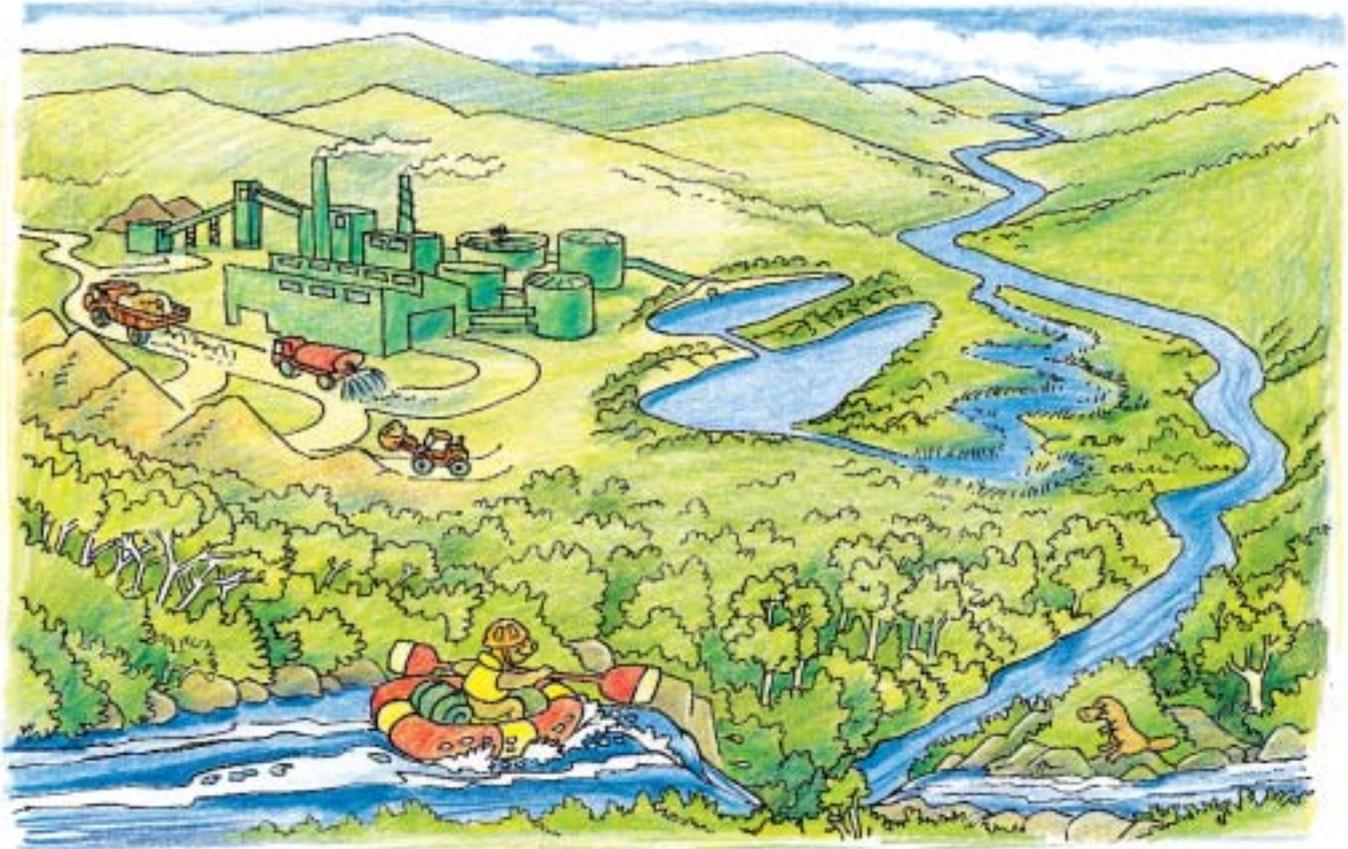
The ingots are stacked ready to carry to factories that make the things we use.



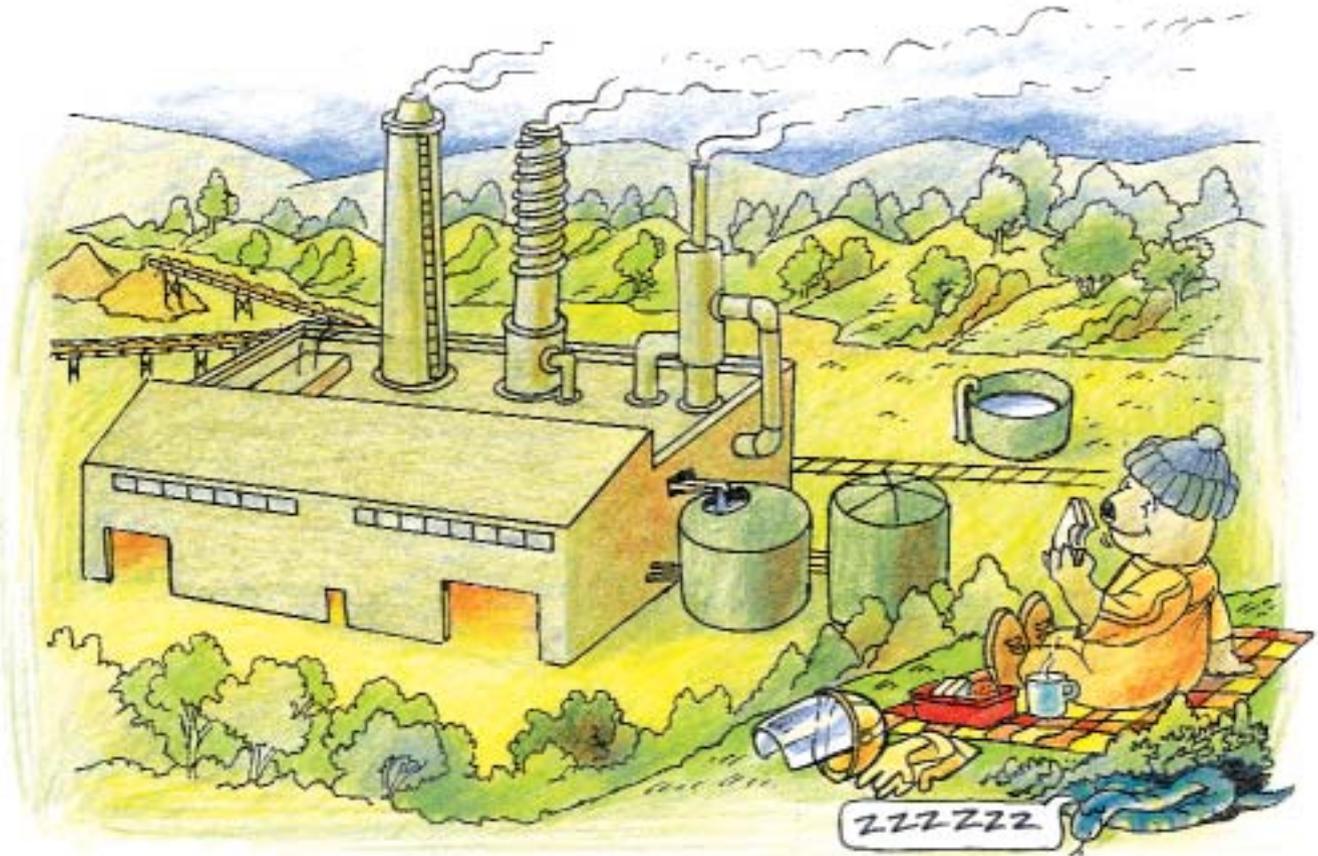
Sometimes very hot ingots are sent straight to a factory next door where they are rolled and pressed into useful shapes.



Some metals form ingots that are not pure. Electricity is used to purify the metals. The pure metal collects on special plates dipped in large baths of chemicals.



Smelters use lots of water to cool the hot furnace or to spray the area to stop dust. The water is re-used in the smelter. It is cleaned before returning it to the river or sea.



Smelter chimneys use cleaners that stop dust and waste gases escaping. Large mounds called BUNDS are built around smelters to contain the noise. Planting trees and shrubs also helps reduce the noise.

Teacher or parent guide

Activity – Separate a mixture of materials

This activity simulates the extraction of valuable minerals from the mined ore.

Make a mixture of two or more different “mineral sands” with properties that allow each to be separated out, e.g. sharp sand (quartz), table salt (halite), iron filings or magnetite, flour or coal dust, tin. Give the children a list of diagnostic properties for each “mineral”. Ask them to design a process and/or machine to separate the mixture into its component minerals. They may wish to weigh their extracted “minerals” to assay the composition of the original mixture.

Organise a visit to a local quarry or mining operation to view a real extraction process. Contact your local minerals association for details or directly contact a company. Company personnel may be available to come into a classroom and talk to students.

Brochures and videos that show mineral separation operations are available on loan.

Activity – Simulation of smelting and ingot production

Working with molten metal is potentially dangerous. Using molten metal is not recommended with a group of children.

Demonstration: Make toffee in a pot on a hotplate (Ingredients: ½ cup water, 2 cups sugar, 1 tablespoon vinegar, 2 tablespoons margarine; gently boil for 20 mins). When it is molten, pour it into prepared moulds and allow it to cool to form solid “ingots”. You get to eat the “ingots”!

This simulates a metal pour. It also simulates a lava eruption, with cooling to form solid rock.

Class activity: Ask each child to bring along a mould. Mix up a quantity of “molten” plaster of Paris and use food colouring

to dye it red. Have the children pour the plaster into the prepared moulds and allow it to solidify. They have produced their own individualised “ingots”. Then downstream process the “ingots” by painting or carving them.

Organise a visit to a local smelter or foundry to view a real molten metal “pour”. Contact your local minerals association for details or directly contact a company. Company personnel may be available to come into a classroom and talk to students.

Brochures and videos that show smelting, foundry operations and other metal pouring processes are available on loan.

Activity – Signs of safety

This booklet highlights aspects of safety in the workplace by appropriately dressing Wombat and using nationally-recognised safety signs. Similar signage exists in our everyday lives, even within the school.

Ask the children to investigate safety aspects of a particular environment (e.g. the school, the home, the classroom) and have them make suggestions about areas that are potentially unsafe. Ask them to design and produce a sign (or signs) that directs people to use the area safely.

Ask the children to examine the movement of students within the school and to produce a plan, with appropriate signage and line marking, which allows for more efficient and safer movement.

There are numerous safety equipment catalogues available that detail safety signage. Contact your local minerals or workplace standards association for details. Safety design and monitoring personnel may be available to come into a classroom and talk to students.

Brochures and videos that address safety issues are available on loan.