

Technical Bulletin

Foundry Workers place pieces of metal in a crucible to be heated.
Look at the page from the Technical Bulletin.

Task
1 What might happen if a crucible is only half full of metal when it is heated?

Task
2 How does a Foundry Worker add an ingot to the molten metal in a hot crucible?

Task
3 Why must there be spaces between pieces of metal in the crucible?



SHORT HEATS

Unless absolutely necessary, **NEVER** run a "short heat". A crucible that is only half full of metal means that the upper half is much hotter than the lower half. This sets up internal thermal stress which often results in cracking. Whenever possible, therefore, a full crucible of metal should be run. Low metal level in aluminum holding bowls exposes the hot surface of the inside of the crucible to severe oxidizing conditions and results in premature failures. An effort should be made to maintain a high metal level.

WEDGING METAL

Care should be taken to prevent charging too many ingots, gates, and risers into an empty crucible. Occasionally, a melter will fill the crucible carefully with ingots and scrap, fitting each piece in place like a brick layer, and then filling in each crevice with small pieces of scrap.

When the crucible is heated, the metal expands much faster than the crucible itself, hence the metal which has been wedged inside develops a very high internal thrust against the walls of the crucible. This, in turn, causes cracking, pinholes, etc. The same thing happens when a heel of metal is left in the bottom of a crucible and allowed to solidify. Even two or three inches in the bottom of a large aluminum dipout bowl has been known to cause cracking. Remove as much metal as possible before shutting down at night. If a small button remains, remove it before starting up the next morning.

Aluminum ingots longer than the inside diameter of the crucible or bowl, if allowed to sink horizontally in a vat of molten metal, may expand and push out the crucible wall. Charge such ingots vertically or cut them to shorter lengths.

CLEANING CRUCIBLES AFTER EACH HEAT

It only takes a minute or two to clean the crucible after each heat while it is still hot. This is especially important where the operator is using the larger tilting type crucibles. Aluminum Dipout bowls should also be cleaned at the end of each day while still hot. This prevents oxides from building up on the inside. If not removed, this layer of oxide acts as an insulator, resulting in longer melting time and higher fuel consumption on subsequent heats. This oxide buildup also causes cracking as the result of different thermal expansions between the crucible and the oxide.

AMERICAN REFRACTORIES REMINDERS:

DON'T DROP INGOTS INTO YOUR CRUCIBLES.

They should be inserted with regular pinch tongs after preheating. A dropped ingot means a cracked crucible 99% of the time. Introduction of cold metal (ingots, etc.) into the molten bath will cause "chill-back" and can result in cracking of the crucible . Smaller clay graphite or carbon bonded crucibles which are used only as a pouring ladle should be preheated carefully, either in a separate pre-heating furnace or a ladle preheater.

NEVER USE A CRACKED CRUCIBLE. Remove from service immediately if there is any sign of a fracture.

CRUCIBLES MUST BE PROPERLY SUPPORTED IN THE FURNACE.

The baseblock should be flat and the same diameter as the outside bottom of the crucible. The top of the baseblock should not be below the center-line of the burner.

Courtesy Morganite Crucible Inc.

Task **Answer Key** **Skill Level**


1

It might crack OR, internal stress which might cause cracking

To answer this question you located a section of text and made low-level inferences.

Reading Text

Level ②

 *to see one way to get this answer.*


2

Insert with regular pinch tongs. Also: preheat the ingot

To answer this question you located a section of text and made low-level inferences.

Reading Text

Level ②

 *to see one way to get this answer.*


3

to prevent *cracking, pinholes, etc.* in the crucible

To answer this question you integrated and synthesized information that without background knowledge, required inferences.

Reading Text

Level ④

 *to see one way to get this answer.*



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Task 1

What might happen if a crucible is only half full of metal when it is heated?

Answer **It might crack OR, internal stress which might cause cracking**

Steps

1. Scan the headings and paragraphs for key words, *half full* and similar words
2. Locate *SHORT HEATS* section.
3. Skim the paragraph to determine that *short* means not full.
4. Locate the explanation, *This sets up internal thermal stress which often results in cracking.*

Level Reading Text, Level 2



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Task
2 How does a Foundry Worker add an ingot to the molten metal in a hot crucible?

Answer **Insert with regular pinch tongs. Also: preheat the ingot**

Steps

1. Scan the headings for key words, *ingot*, *crucible*.
2. Locate the heading, *DON'T DROP INGOTS INTO YOUR CRUCIBLES*.
3. Read the first sentence, and decide on the answer.

Level Reading Text, Level 2



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Task

Why must there be spaces between pieces of metal in the crucible?

3**Answer**

to prevent *cracking, pinholes, etc.* in the crucible

Steps

1. Scan for key words, *spaces*, and opposites to key words, *too many, wedging, fitting, filling in each crevice*.
2. Locate heading, *WEDGING METAL*.
3. Locate paragraph that begins, *When the crucible is heated...*
4. Reread the first paragraph describing a crucible loaded with no spaces.
5. Determine *cracking, pinholes, etc.* will result when the metal does not have room to expand in the crucible.

Level

Reading Text, Level 4