

BRUCE FURNACE CERTIFICATION CHECKLIST

How can a user hurt themselves? How can a user hurt the tool?

A qualified user should be able to:

- Identify personal safety hazards associated with the tool and what precautions are taken to prevent an accident from occurring.
- Identify hazards to the tool and what precautions are taken to prevent an accident from occurring.
- Operate the tool safely and proficiently.
- Recover from simple errors.
- Demonstrate knowledge of the processes performed with the tool.

BRUCE FURNACE

- Personal Safety Hazards
 - High temperatures – Temperatures of up to 1100 °C are used in the Bruce furnace tubes. Potential exists for severe burns if a user comes in contact with hot equipment. No part of the tube should be touched when above room temperature. When loading and unloading wafers in a hot tube, use a boat fork to place wafers on the cantilever. Allow hot wafers to cool before use.
 - Compressed gases – The Bruce furnace uses several compressed gases: oxygen, hydrogen, nitrogen, argon, and forming gas (H₂N₂). Do not attempt to defeat protective interlock systems. If a malfunction of any sort is suspected, a SMFL staff member should be contacted immediately. Users should have read and be familiar with material safety data sheets for all gases.
 - Hydrogen is an immediate explosion hazard (lower explosive limit = 4%; autoignition temp = 565 °C; hydrogen burns with an invisible flame) and an acute health hazard (inhalation can lead to asphyxiation without warning).
- Hazards to the Tool
 - Cross Contamination – It is imperative that the Bruce tubes not become cross-contaminated by wafers or by boats. Failure to do so may ruin wafers and the tubes. Each tube is dedicated for specific processes:
 - Tube 1 – Wet Oxides
 - Tube 2 – P-type dopants
 - Tube 3 – N-type dopants
 - Tube 4 – Gate/Dry oxidesEach tube also has a dedicated 4" boat and a dedicated 6" boat.
 - No resist or metals are allowed in any tube in the Bruce Furnace

R·I·T SEMICONDUCTOR AND MICROSYSTEMS FABRICATION LABORATORY

- Operating Tool
 - Users should be able to:
 - Load and unload wafers safely.
 - Load, end and abort a recipe.
 - Execute a furnace run.
 - Acknowledge inhibits.
 - Use the Graphical Analyzer to follow process parameters
 - FILL OUT LOG SHEETS CORRECTLY!
 - Store boats correctly.
 - Reservations – If not present at stated start time, tool is reserved for 15 minutes and is then considered open for general use.
- Simple Errors
 - Inhibits
 - Failure to turn on gases
 - Profile Temp Incoherent – Follow directions in back of operation manual to clear the thermocouple table
- Processes
 - A qualified user should be familiar with:
 - Warm-up recipe and typical recipe steps.
 - Typical gas flows, times, temperatures associated with recipes.
 - Which process is dedicated to which tube
- Appropriate Uses of the Tool
 - Each tube is labeled to show its appropriate use. Make sure that you have the correct process in the correct tube.
 - Never process metals or photoresist in the Bruce Furnaces.