

SEMIS Seed Quality Assurance:

Overview of a Seed Laboratory

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Iowa State University Seed Science Center

Seed Enterprises Management Institute

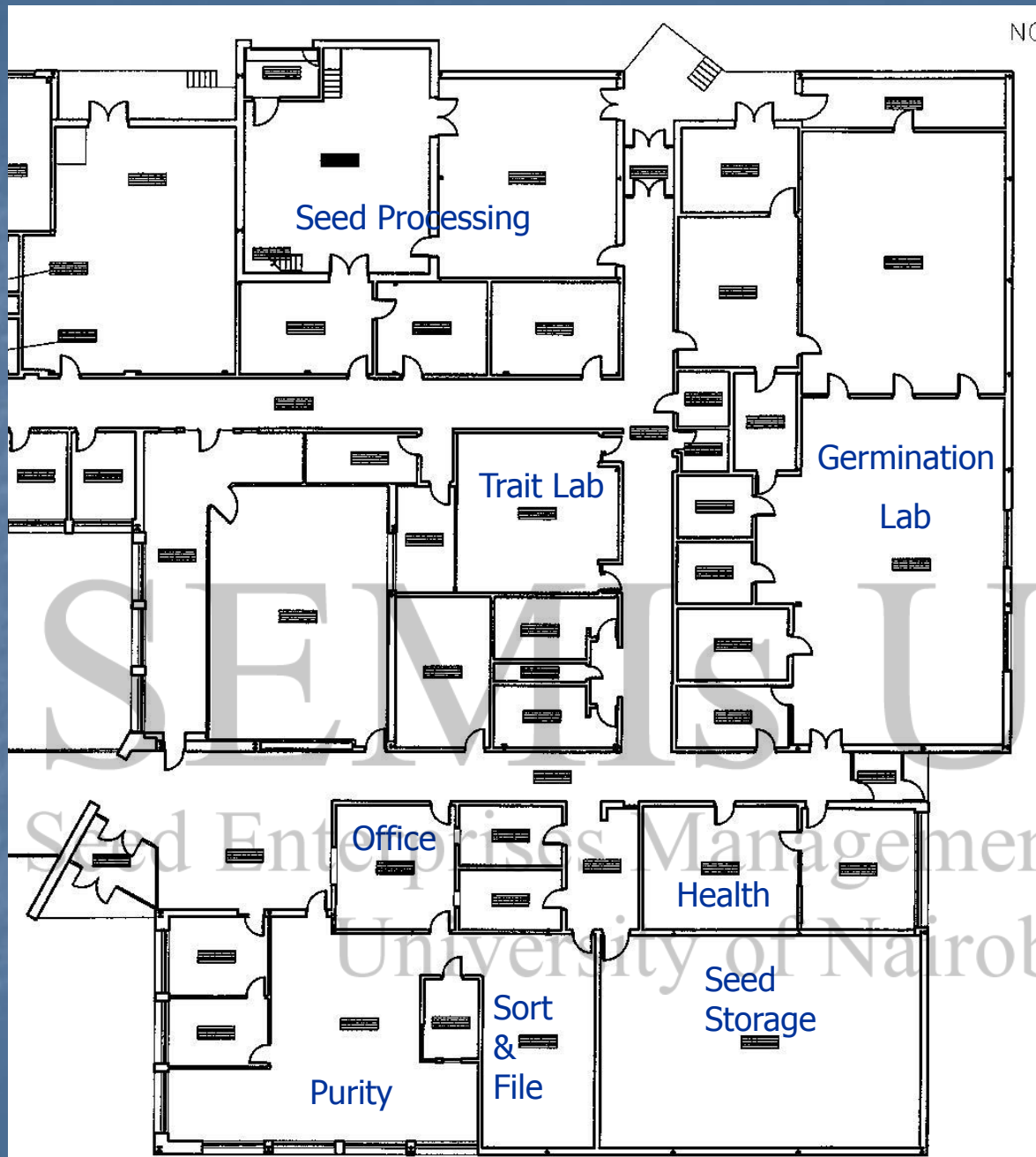
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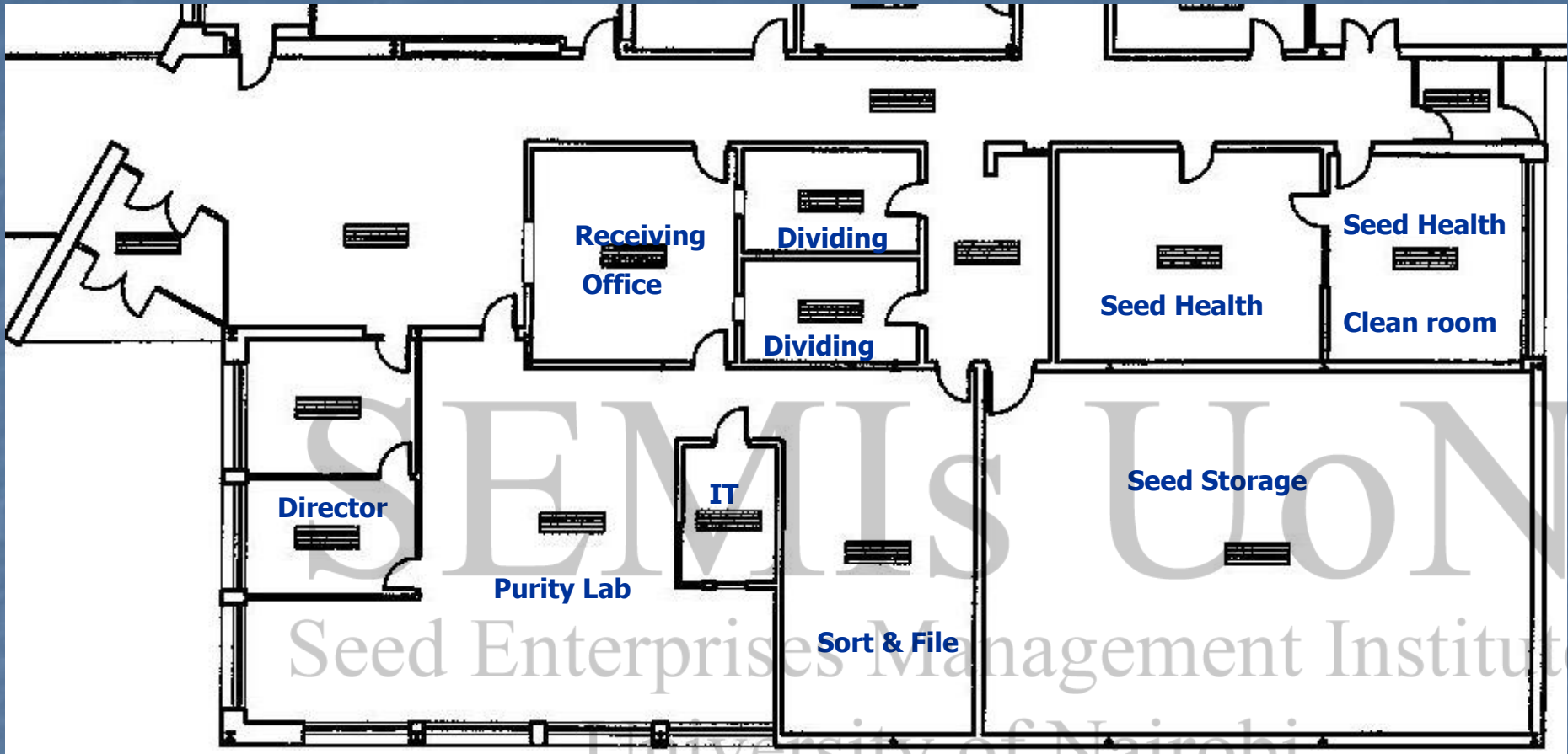
Michael G. Stahr

Labs

- When setting up a new testing lab, it is time well-spent to visit other labs.
- No two labs are exactly alike – big improvements in efficiency can be realized by learning from others' mistakes and successes.
- This applies even if a seed company does testing in-house (on a large or small scale) or if samples are sent out.

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Testing begins and “ends” with **Customer Care**:

- Reception of paperwork – electronic or hard copy
- Reception and processing of samples
 - accuracy of information
 - damaged samples



Necessary information:

- Customer (which unit?)
- Species
- Variety / Lot
- Requested tests

- Generate unique sample number
- Seed at least 98% pure?

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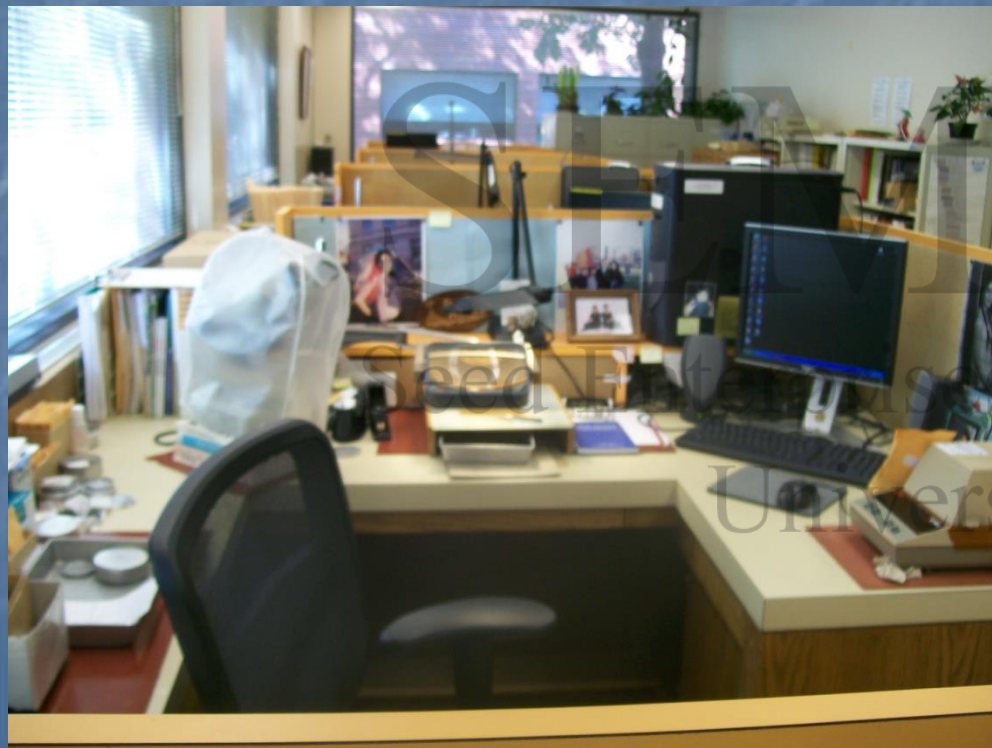
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Dividing Room

Purity Lab



Sort & File Room

Samples that may have been sent to one or more labs (Purity, Trait, etc.) are brought to Sort & File where they are arranged by the appropriate programs (SeedLab, AllCrop, Certified, Farmers).

They are then placed in numerical order and moved to the seed storage (cold) room. Samples are available for retesting, etc.

After one year, Seed Lab samples are destroyed.

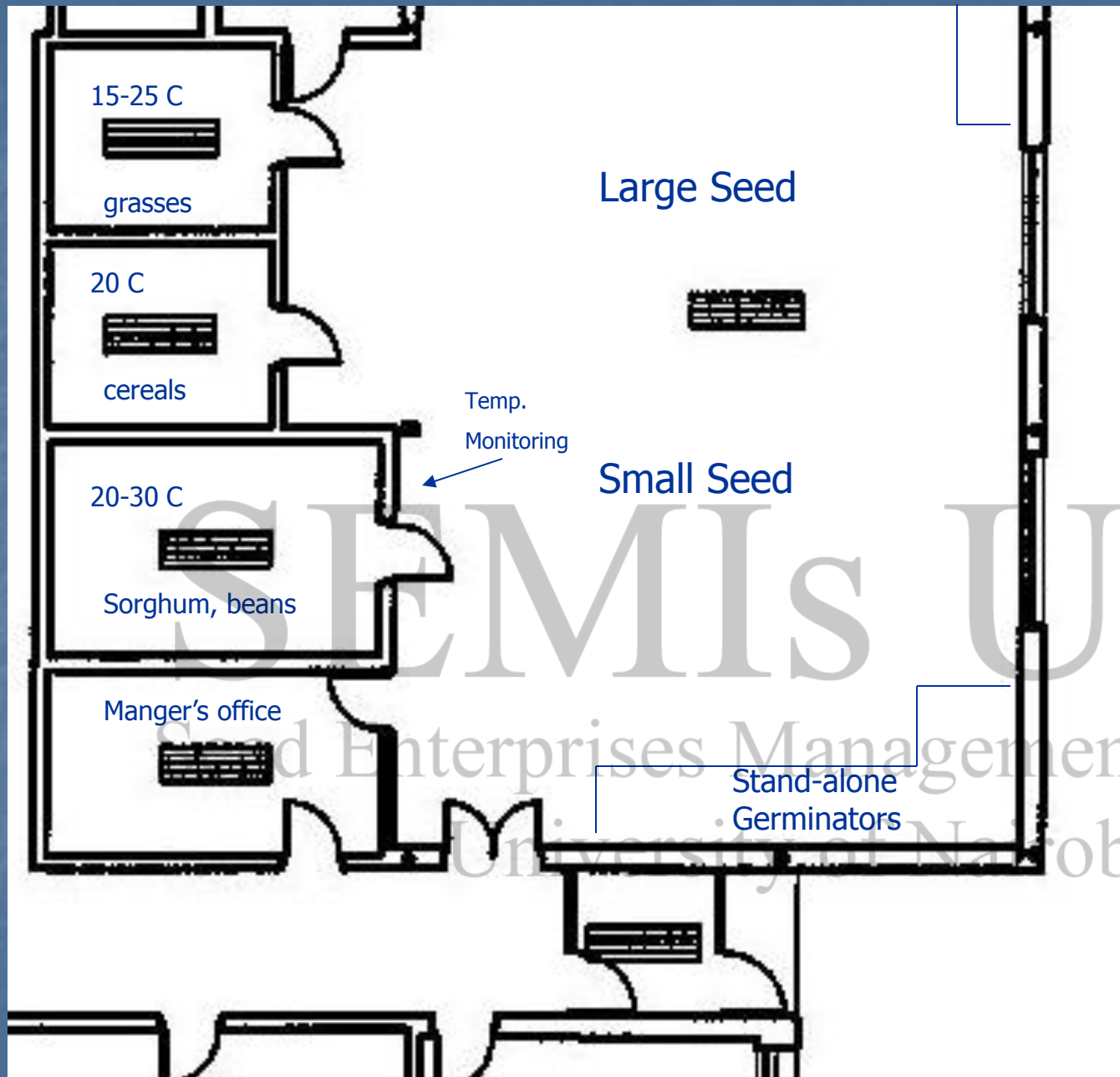


Seed Health Lab

- Majority of testing is for phytosanitary (export) purposes.
- Over 300 pathogens tested for by blotter and plate tests, wash tests, ELISA, PCR, and other methods.



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Germination Lab:

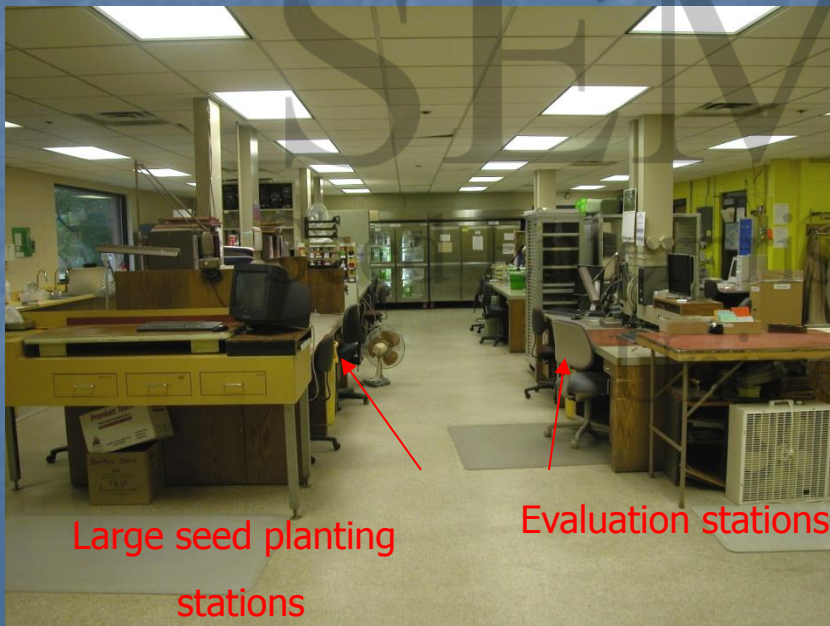
- “Small Seed” section tests pretty much all but maize, soybeans, and large-seeded vegetables.
- Seeds are planted on a variety of substrates (blotters, paper towels, CCP).
- Free standing germinators are mostly set to run at alternating temperatures to break dormancy that is common in many small-seeded species.
- Small-seeded species often have multiple intermediate evaluations (counts) as compared the single count of “large seeds”.



Vacuum planting stations for small seeds



Germination cart



Large seed planting stations

Evaluation stations

Germination Lab:

- Even with the ISU Seed Lab being one of the world's largest public labs, space is at a premium.
- Three doors lead into single 25°C walk-in germinator.
- Each bay holds 46 carts.



SIGN **ISU SEED TESTING LABORATORY**

Germination	Revision B		Page 1 of 1
SN-45	LARGE SEED GERMINATION TESTS		

TEST	PLANT	COVER	GERMINATION
WARM GERM 13 TRAYS/CART	1 SAMPLE/TRAY 400 SEEDS/TRAY	NO COVER	7 DAYS
SAND GERM 13 TRAYS/CART	1 SAMPLE/TRAY 400 SEEDS/TRAY	MOIST SAND ONLY	7, 9, OR 10 DAYS
COLD GERM 13 TRAYS/CART (SWEET CORN) 13 TRAYS/CART (SB) 20 TRAYS/CART (CORN) Prechilled	2 SAMPLES/TRAY 200 SEEDS/SAMPLE 400 TOTAL SEEDS/TRAY * CONTROL: 1 CONTROL (200 SEEDS)	SAND/SOIL MIX	2 WEEKS MOVE AFTER 1 st WEEK EVALUATE 2 nd WEEK
EXTENDED COLD GERM 20 TRAYS/CART (CORN) Prechilled	2 SAMPLES/TRAY 200 SEEDS/SAMPLE 400 TOTAL SEEDS/TRAY * CONTROL: 1 CONTROL (200 SEEDS)	SAND/SOIL MIX	3 WEEKS MOVE AFTER 1 st WEEK EVALUATE 3 rd WEEK
SATURATED COLD GERM 10 TRAYS/CART Prechilled	2-3 SAMPLES/TRAY *ASK FIRST* 200 SEEDS/SAMPLE 400-600 TOTAL SEEDS/TRAY * CONTROL: 1 CONTROL (200 SEEDS)	SOIL ONLY (SIEVED)	10 DAYS MOVE AFTER 7 DAYS EVALUATE 10 th DAY
ACCELERATED AGING 13 TRAYS/CART	2 SAMPLES/TRAY 200 SEEDS/SAMPLE 400 TOTAL SEEDS/TRAY * CONTROL: 1 CONTROL (200 SEEDS)	MOIST SAND ONLY	10 DAYS FROM 1 st DATE 7 DAYS FROM 2 nd DATE
GARDEN BEAN SAND GERM 4-6 TRAYS/CART	400 SEEDS/SAMPLE 200 SEEDS/TRAY, USING LARGER PLANTING BOARD	MOIST SAND ONLY	7 OR 8 DAYS
PEA SAND GERM 6 TRAYS/CART	400 SEEDS/SAMPLE 400 SEEDS/TRAY	MOIST SAND ONLY	8 DAYS @ 20°C

PLANTERS: Please note RUSH sample numbers on door tag!
EVALUATORS: Please evaluate RUSH samples/carts first!

Please check required tests; if two tests are up for evaluation on the same date, **DO NOT** send cards to the office.
Please place the cards on the appropriate cart or check the "missing cards" book if that cart has already been evaluated

Document Approval Date: 10/06/2009 Approved by: _____





- Most labs use rolled towels, while most corn and soybean samples are planted on CCP (in U.S.)
- Rolled towels cost less and take up less germinator space.
- Rolled towels provide friction to remove seed coats on soybeans and also hold seedlings in place.

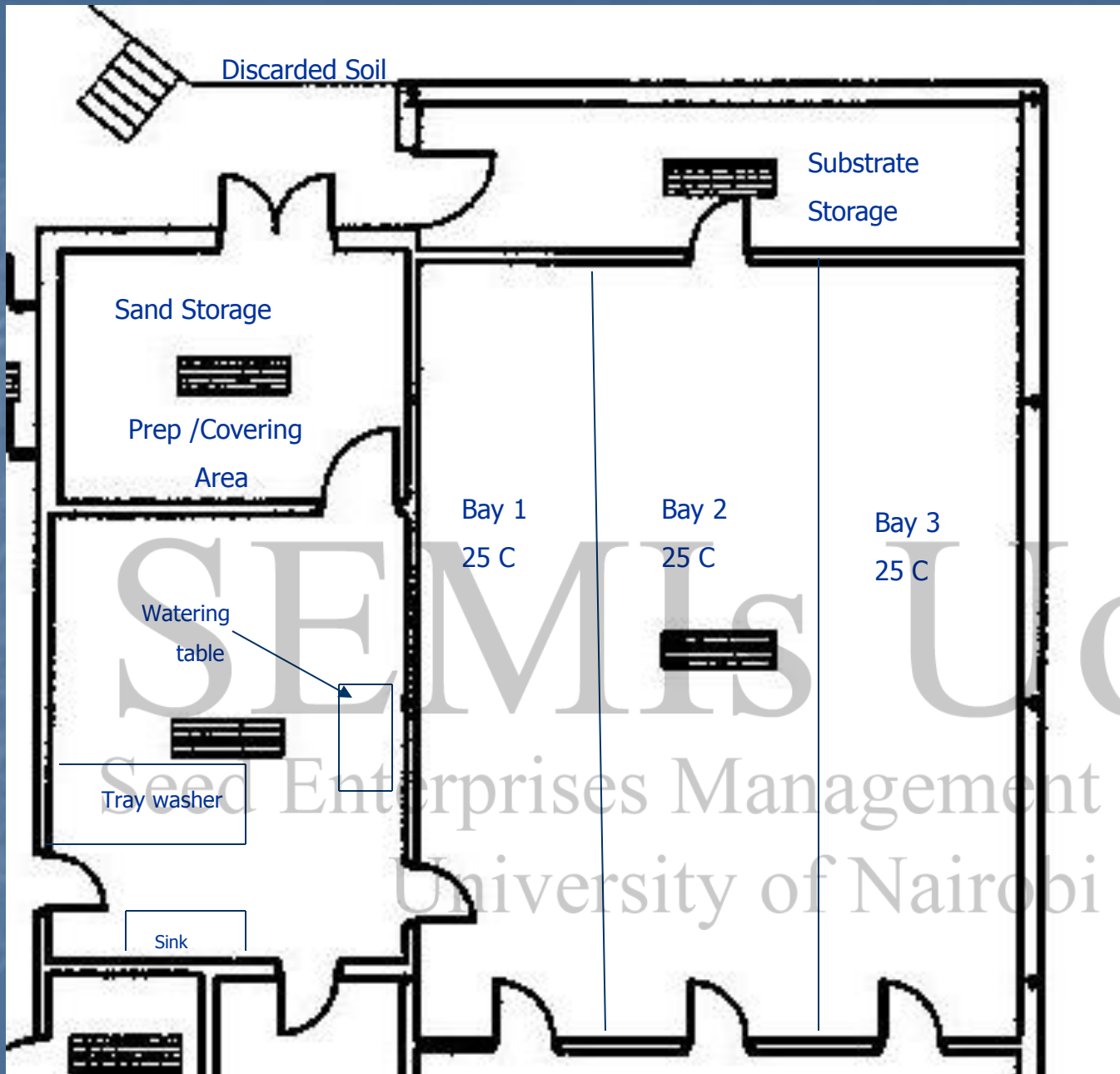
Watering Table:

Versa-Pak™ (a type of crepe cellulose paper) is moistened using this watering table which has a movable belt and two sprayer nozzles. Some watering tables don't have a belt and a sprayer arm moves the length of the tray.

Soybean planting station:

- Larger version of small seed stations.
- Location isn't ideal due to being a high traffic area.





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25°C Walk-in Germinator

- 23 carts fit on each side of the bay.
- Germination carts usually hold 13 trays (germ tests) or 20 trays (tray cold tests).
- Each cart's door opening is weather-stripped to maintain moisture throughout seven to fourteen day test.

- Carts also have acrylic back panels. Moisture is maintained within the cart, instead of the more difficult method of humidifiers in the germinator.
- Vertical lights are six feet (183 cm) tall and are cool white fluorescent.
- A system has been set up to signal when trays and carts are clean or dirty (upside down trays and carts turned around with back facing out are clean).



Cold Room

- The Seed Lab has two cold rooms designed for chilling carts and one large room for storing seed samples.
- Temperatures are not to vary more than 1°C, so proper thermostats and adequate cooling units are a must.
- Temperatures are checked twice each week day.



Automatic Tray washer:

- Trays and carts are cleaned between each use.
- Carts are sprayed and scrubbed with bleach/water solution, then washed.
- Trays are washed and rinsed at high temperatures to kill disease organisms.





For discarding sand from trays



For adding sand/soil to proper level on tray

Sand Soil Handling

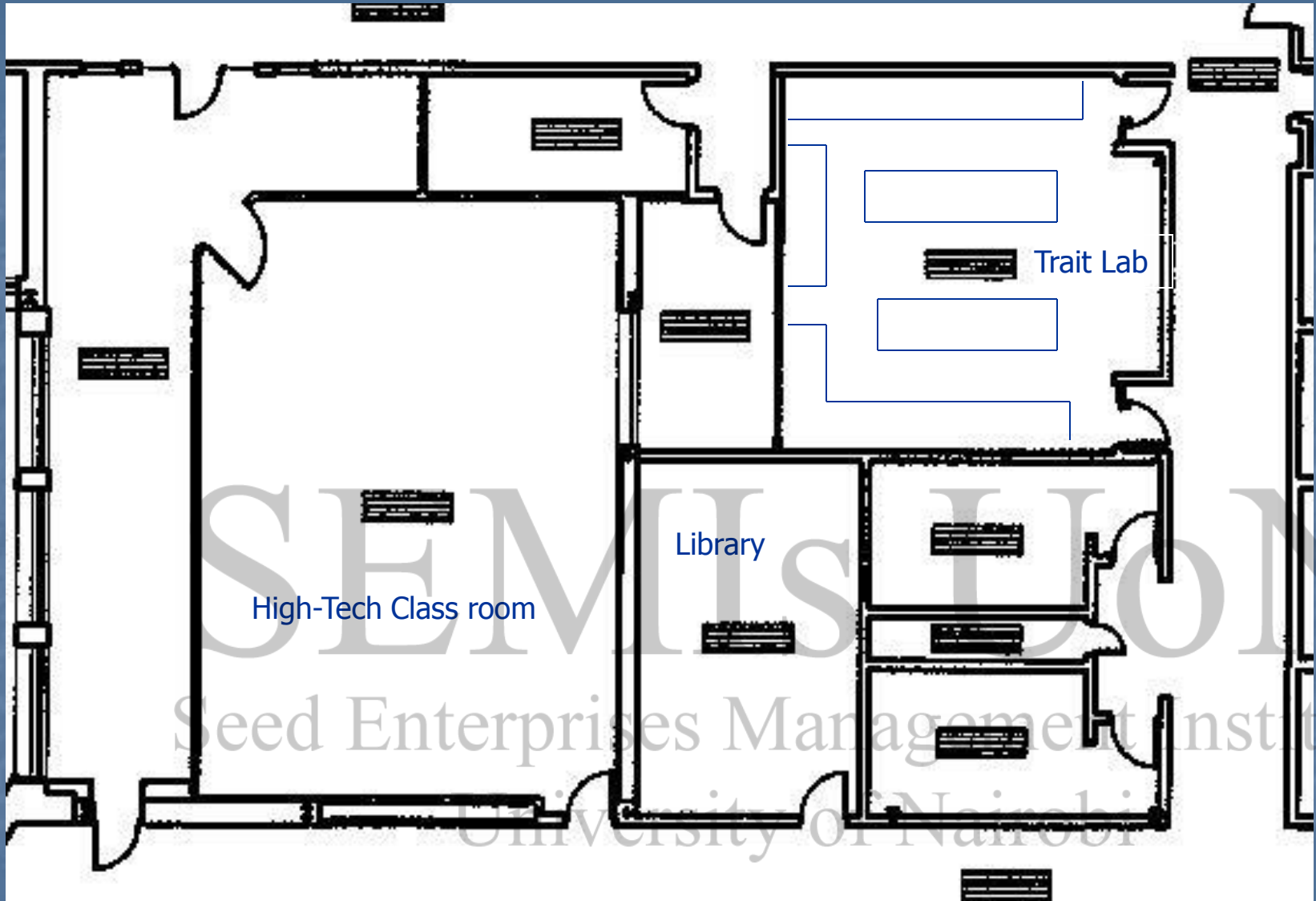
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Sand or Sand/Soil Preparation

- Moist sand is used on sand germs and on AA tests.
- A dry mixture of sand & soil is applied to Iowa Cold Test trays.



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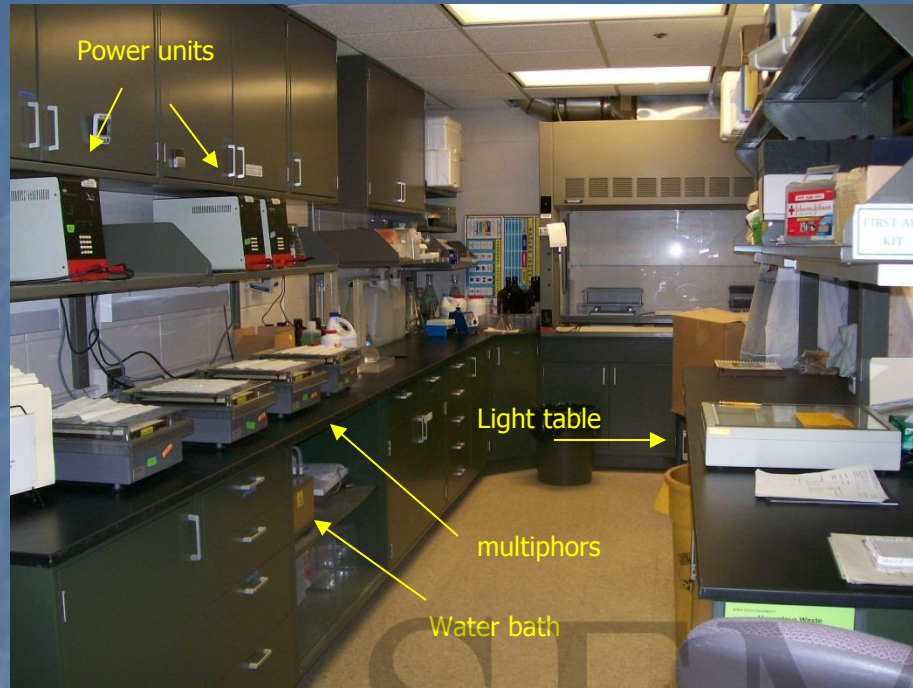


High-Tech Class room

Library

Trait Lab

Trait Lab

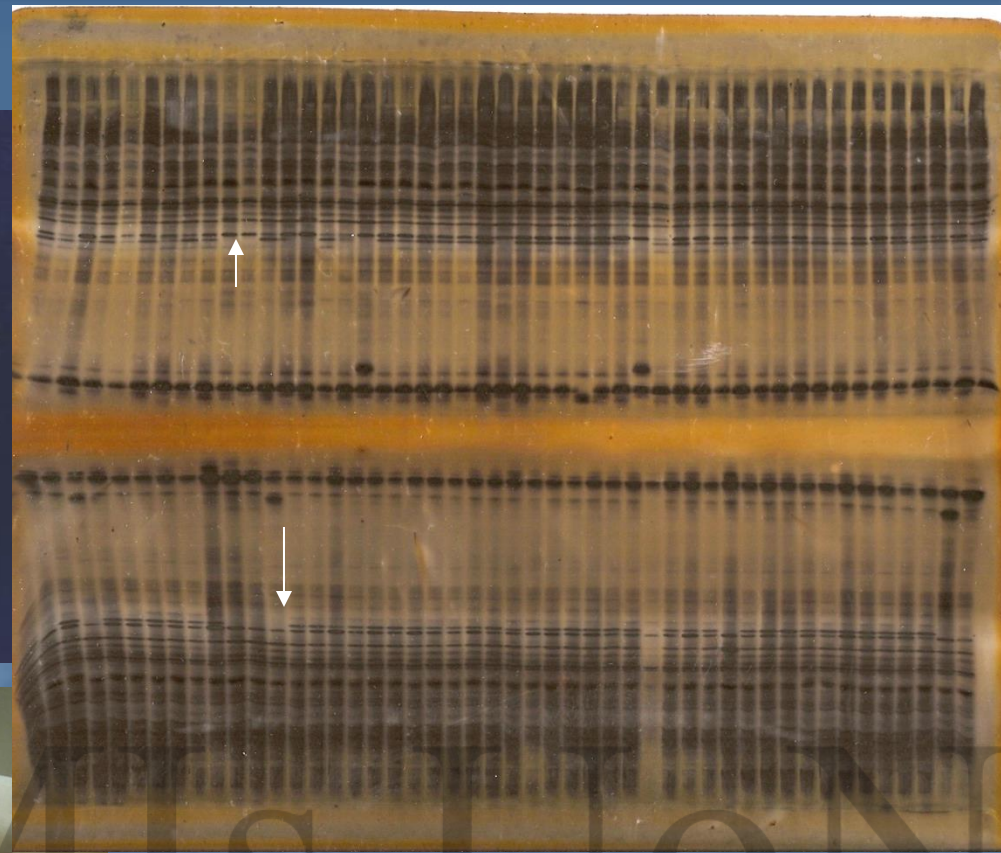


The Trait Lab is used for four types of testing:

- IEF
- Herbicide bioassay
- ELISA testing
- Lateral flow strips

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Trait

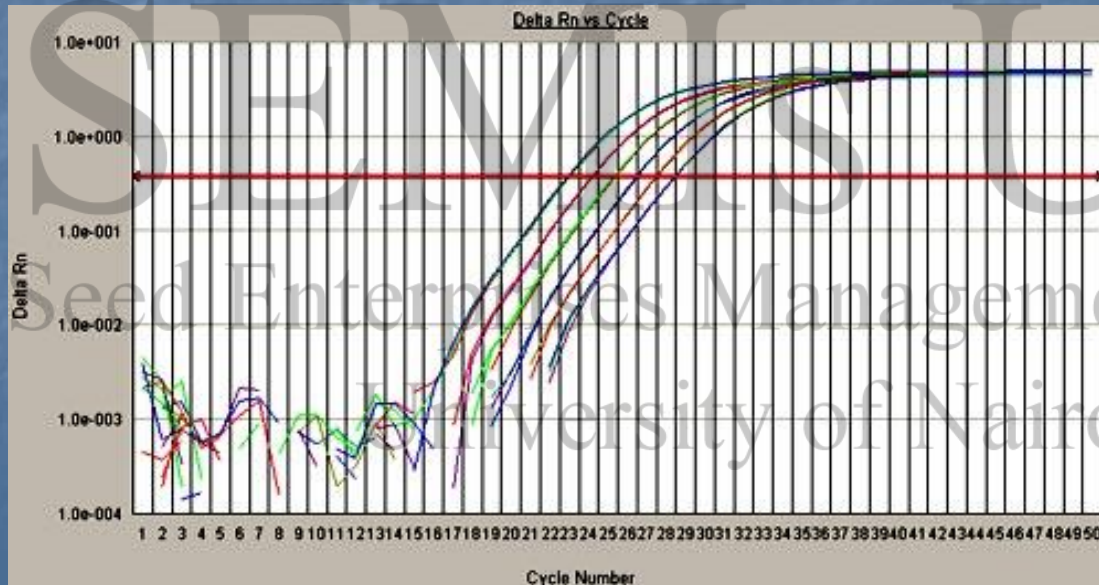


Low Level Presence

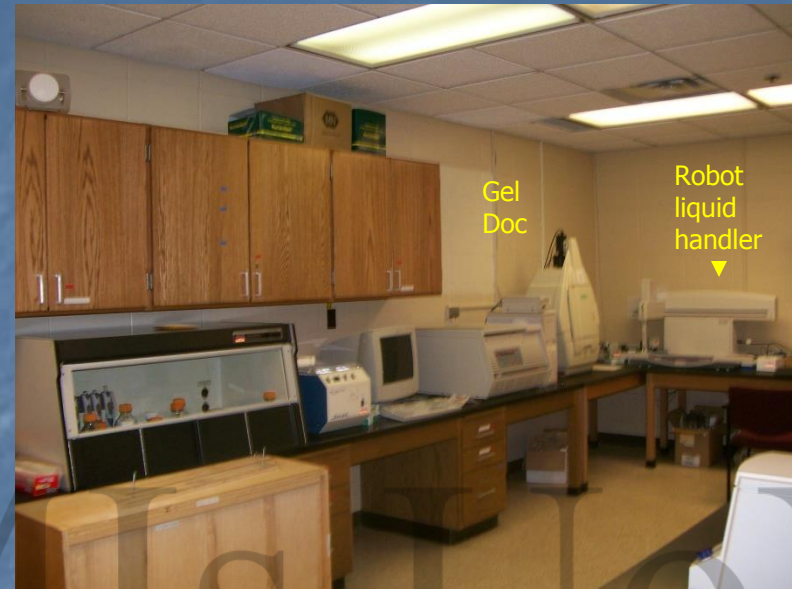
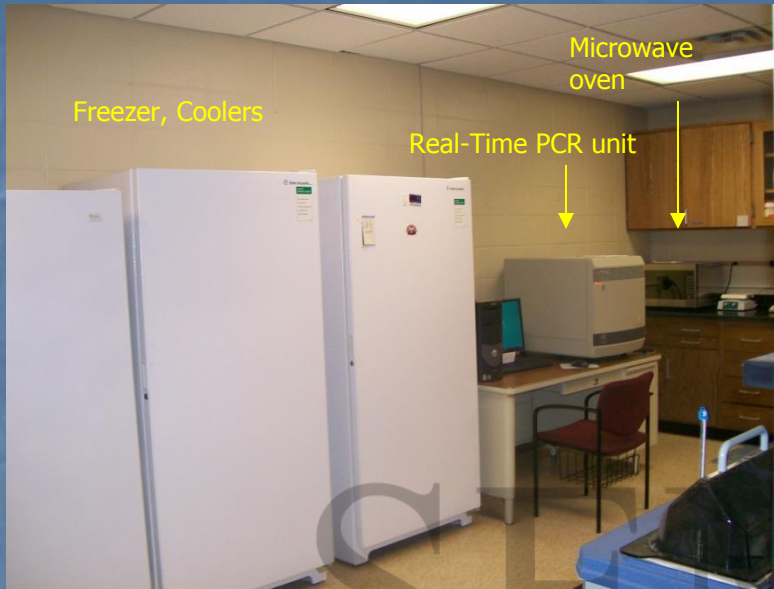


ELISA

Lateral Flow Strips



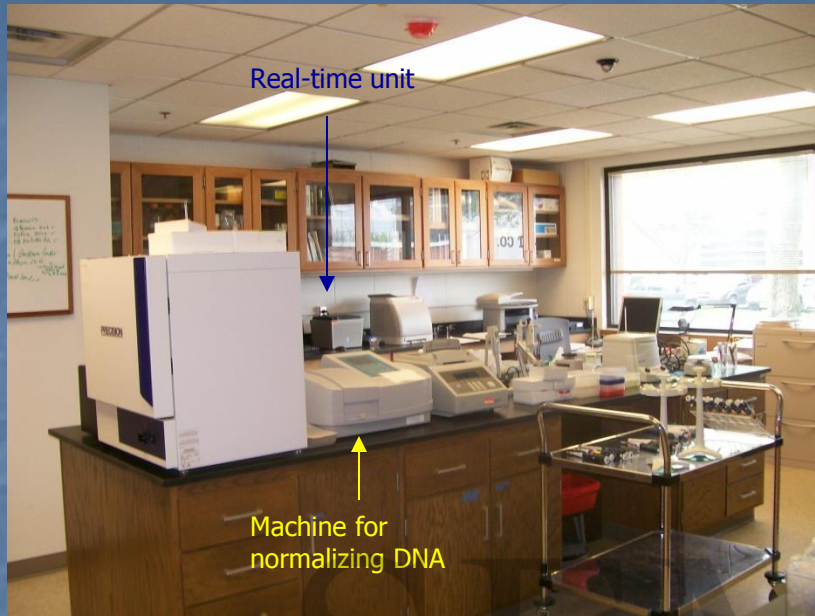
DNA Lab – Room 185



The Seed Lab has two PCR labs:

- originally one was meant for research and one for testing, but in practice equipment is used for both purposes.
- There are two real-time PCR units. On occasional gels are used instead of the output from the real-time machine. The Gel Doc is used to take photographs of the gels.

DNA Lab – Room 187



Room 187 has a room within that is used grinding seed. Grinding containers are not opened within room 187.

The transfer hood guards against contamination from dust from within the DNA labs or from the rest of building.

Additional Information:

- Iowa State University Seed Science Center: www.seeds.iastate.edu
- ISTA web site: www.seedtest.org

Project Seed Laboratory 2000-5000 (2ND ed.)

Handbook for Homemade Equipment (1st ed.)

- Association of Official Seed Analysts: www.aosa.com
- Society of Commercial Seed Technologists: www.seedtechnology.net
- Alliance for a Green Revolution in Africa (AGRA): www.agra-alliance.org