

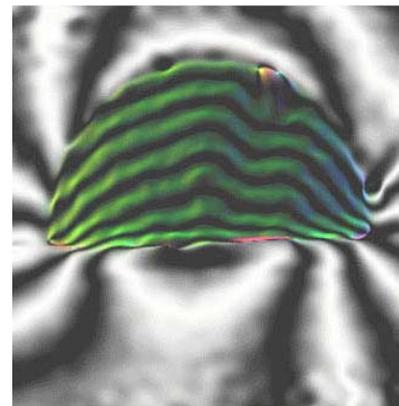
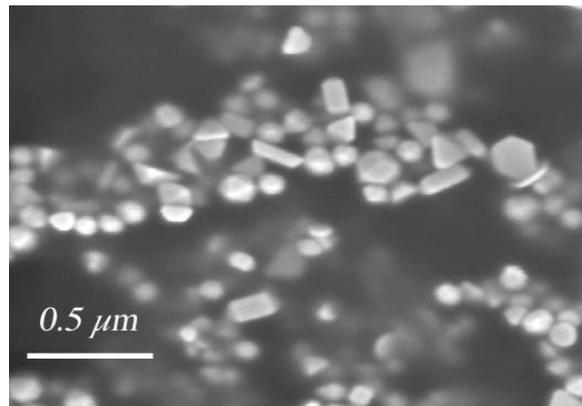


# EMC101

## Users Orientation Course

for the

## Electron Microscopy Center for Materials Research



A U.S. Department of Energy laboratory managed by UChicago Argonne, LLC

## 1. The Purposes of this Course

The purposes of this course are to ...

- ◆ Provide users of the Electron Microscopy Center for Materials Research (EMC) with specific safety-related information for the two buildings (212 and 216) in which the EMC resides.
- ◆ Inform users about EMC policies, procedures, and resources.
- ◆ Inform users of their obligations as users.

## 2. Emergency Information

### 2.1 In any emergency, call 911 (or 630-252-1911 from cell phones)

This topic is thoroughly discussed in course ESH100U.

### 2.2 Key safety people in buildings 212 and 216

The telephone numbers for the people in the following table are posted near each telephone.

Name	Title	Function
Urs Geiser	Materials Science Division Safety Coordinator	Responsible for the environmental, safety, and health policies of the EMC's parent division. EMC Users may call him with questions although it may be more efficient to ask EMC staff first.
John Herman	Area Emergency Supervisor (AES) & Building Manager	The AES is responsible for emergency planning in 212 and 216. Persons who identify themselves to the AES as requiring assistance during evacuation will be accommodated. The AES wears an orange ball cap during emergencies.
Loren Thompson Dan McGann	Alternate Area Emergency Supervisors	The Alternate AESs assists the AES.

### 2.3 Audible alarms

Two different audible emergency alarms may be activated in building 212 and 216 by an incident. The table below summarizes these audible emergency alarms and the actions to take in response to each alarm. These are in addition to the site-wide alarms that are discussed in course ESH100U.

Signal Type	Signal Sound	Cause	Action Required
Local Evacuation	Loud steady bell accompanied by strobe lights & perhaps a public announcement to evacuate.	Fire, explosion, or other emergency.	Leave the building using routes to the north and west. Do not enter other wings of the building. Go to the cafeteria, building 213. Report to EMC staff for personnel accountability.
High Gamma Radiation Field	Loud steady horn in building 212 F-wing.	Loss of radiation shielding in the Alpha Gamma Hot Cell Facility.	If you hear the alarm, move away from the sound and assemble in the E-Wing Filter Storage Room (E-107) for personnel accountability.

### 2.4 Local evacuations

In the event of a fire, a heat or smoke detector or a fire suppression system will activate and initiate the sounding of the local alarm bells and strobe lights. The Argonne Fire Department will be simultaneously alerted. The buildings have several fire zones and each zone can alarm separately or all zones can alarm together, as needed.

The alarms are used for all evacuations, not just fire-related evacuations. When the alarm bells and strobe lights are activated, or when a public-address system message instructs, occupants must proceed immediately to the relocation area in the cafeteria, building 213, so that personnel accountability can be conducted. Often, only one wing of the building will be required to evacuate. WHILE EVACUATING, DO NOT ENTER ANOTHER WING OF THE BUILDING.

### 2.5 High gamma radiation field alarm in the Alpha Gamma Hot Cell Facility

The Alpha Gamma Hot Cell Facility (AGHCF) is a kilocurie hot-cell complex located in F-Wing of building 212. It is used for storing irradiated reactor fuel and other radioactive materials, for waste management activities, and for decontamination and decommissioning activities. The AGHCF is a Category 2 Hazard Nuclear Facility and it is governed by very specific and strict DOE Orders and Federal Regulations. Access to and work in the AGHCF is limited to those who have a specific purpose or need and must be pre-approved by the Facility Manager.

The AGHCF has a specific High Gamma Radiation Field alarm that would only be initiated by a loss of shielding in the facility. The alarm is a very loud steady horn and will sound only in the affected area. If the alarm goes off, move away from the sound and assemble in the E-Wing Filter Storage Room (E-107) for personnel accountability.

## 2.6 Tornado sheltering

When a tornado warning is announced via the site-wide alarms, all occupants should follow the nearest route using corridors and stairways – not the elevator – to the designated tornado shelters on the first/ground floor (see green-colored areas in the building floor plans that accompany this course). Those areas are identified by signs labeled Tornado Shelter and are located in ...

- ◆ corridor C10
- ◆ room DS101A (control point for personnel accountability; telephone 2-6348)
- ◆ room G166
- ◆ room H100
- ◆ room A106 in building 216

In building 212, report to EMC staff near room DS101A or in room G166 for personnel accountability.

In building 216, call the Area Emergency Supervisor at 2-6348 for personnel accountability.

## 2.7 Site-wide emergencies during off-hours

When site-wide emergencies occur off-hours, information pertinent to employees can be found online via the Emergency Information link ([http://www.anl.gov/Emergency\\_Information.html](http://www.anl.gov/Emergency_Information.html)) on the left side of the Argonne home web page or on the Info Line at 630-252-4636 (630-252-INFO).

## 2.8 Emergency exercises

Tornado drills and evacuation drills are required annually. Tornado drills are conducted in the spring and evacuation drills are conducted in the fall. If you are present in the buildings at the time of the drills, you must participate. All actions should mimic actual emergencies.

# 3. Hazards and Experiment Safety Reviews in the EMC

Each laboratory in the EMC is posted with a list of the hazards that are in that particular room.

Experiment Safety Reviews have been done for most work that occurs in the EMC. Users will be required to read one or more of the Safety Analysis Forms (SAF) that pertain to those reviews. The EMC will send copies of the SAFs to users after their proposals are approved. SAFs contain the following information:

- ◆ the scope of work that is allowed in the EMC
- ◆ a detailed analysis of the hazards
- ◆ a section describing how the hazards are controlled
- ◆ training requirements
- ◆ a list of work procedures
- ◆ reporting requirements

EMC users will be expected to work within the scope of the SAFs. If proposed work falls outside the scope of any SAF, EMC users must initiate a separate Experiment Safety Review in consultation with EMC staff.

Attached to each SAF are project participant lists that EMC users must sign before they will be allowed to work in the EMC. At the top of each list are the following statements to which you are subscribing when you sign a project participant list: “I have read the Project Safety Review Documentation listed above and will obey all requirements stated in the document, its accompanying procedures, and in the relevant portions of the ANL safety manuals. I have received the required training, and my Job Hazards Questionnaire (JHQ) accurately reflects my work as a participant in this project.”

A Job Hazards Questionnaire (JHQ) is automatically generated after people register with the Argonne User Facilities On-Line Registration System ([http://www.anl.gov/Science\\_and\\_Technology/userreg.html](http://www.anl.gov/Science_and_Technology/userreg.html)). As long as people indicate on the registration form that they want to be EMC users, the JHQ will have the correct information.

The required training for the EMC consists of these Argonne courses:

- ◆ EMC101, EMC Users Orientation (this course)
- ◆ ESH100U, ANL User Facility Orientation (or ESH100 for Argonne employees)
- ◆ ESH223U, Cyber Security Program Training (or ESH223 for Argonne employees)
- ◆ ESH377, Electrical Safety Awareness
- ◆ ESH574, Chemical Waste Generator (only for those generating hazardous wastes or waste oils)

#### **4. Other Hazards in Building 212**

Several Argonne divisions occupy building 212. Therefore the range of hazards present in the building is very broad. EMC users should minimize their potential exposure to hazards by limiting their activities to the EMC areas, the main corridors, and general access areas. Do not enter non-EMC laboratories unless you are escorted by the supervisors of those laboratories.

A comprehensive list of hazards in building 212 will not be presented here. Instead, the following four paragraphs provide details about particular hazards that you will likely encounter in areas outside the EMC.

##### **4.1 Elevator gate**

The building has a freight elevator in E-wing that is used quite extensively. The elevator gate will close automatically, from the top. A warning alarm will sound beforehand; but you want to make sure you are not in the way. The gate closes rather rapidly. It has a pressure sensing strip at the bottom to reverse direction; but that is the safety barrier of last resort. **DO NOT STAND STILL IN THE DOOR OPENING. NEVER TRY TO “BEAT” THE DOOR ONCE THE WARNING ALARM SOUNDS.**

##### **4.2 Cryogenic liquids**

Cryogenic hazards in this building include liquid nitrogen that is located in large tanks outside H-Wing and the E-wing loading dock. There are three liquid nitrogen filling stations in E107A. Portable dewars ( $\leq 150$  liters each) of liquid nitrogen and liquid helium may be found throughout the building.

##### **4.3 Compressed gas cylinders**

Compressed gas cylinders are located on the E-wing loading dock and throughout the building.

##### **4.4 Controlled areas**

Controlled areas include – but are not limited to – the AGHCF, E109, and DL114. The topic of controlled areas is covered in the ESH100U course.

## 5. General EMC User Information

### 5.1 Categories of users

*Trainees* (people being trained to operate electron microscopes) and *Assisted Users* (people who will need others to operate a microscope) work under the direct supervision of an EMC staff member, an *Operator*, or an EMC-approved *User*. *Operators* may use instruments during all hours, including nights and weekends, and may serve as supervisors to *Trainees*. *Operator* status requires demonstration of a high degree of proficiency and authorization from the responsible EMC staff member. Requirements for attaining *Operator* status will be made available upon request. Other instrument-specific privileges of *Users* and *Operators* can be found on the [Lists of Qualified Operators & Users](#) that are posted on the microscope laboratory doors. Additional information is available on the EMC's website at:

[http://www.msd.anl.gov/groups/emc/users/user\\_status.html](http://www.msd.anl.gov/groups/emc/users/user_status.html).

### 5.2 Instrument training procedures

Prospective users must complete the courses listed at the end of section 3 and sign the SAF(s) that are pertinent to their work prior to any instrument training. Each prospective TEM/SEM user must participate in an initial instrument-specific training session given by an EMC staff member. The prospective user thus becomes a *Trainee* and may operate the instrument only under the supervision of an *Operator* or an EMC-approved *User* while gaining proficiency. When the supervising *Operator* or *User* is satisfied that the *Trainee* could pass a qualifying examination, an appointment should be made with the responsible EMC staff member to observe the *Trainee*. If the EMC staff member is satisfied that the *Trainee* demonstrates adequate proficiency, the person is granted *User* status. Each instrument has different requirements concerning what "proficiency" means. Those requirements will be made clear to *Trainees*.

### 5.3 Standard Operating Procedures & other instructions

The EMC will provide users with the appropriate written Standard Operating Procedures (SOPs) for each instrument or process. Users must follow those SOPs at all times. If a user wishes to deviate from a SOP, he/she must submit for review and approval a Safety Analysis Form and/or SOP that documents the suggested procedure and its associated hazards.

Users agree to follow all written User Guides, Standard Operating Procedures, posted notices, and verbal instructions of EMC staff regarding laboratory practices and instrument operation. In any situation that a user feels uncertain about the safe and appropriate operation of an instrument, the user must consult with EMC staff. Failure to follow appropriate procedures and instructions may result in termination of user privileges. Users may be charged for costs associated with repair or replacement of equipment resulting from misuse and/or abuse.

### 5.4 Reserving time on instrument calendars

*Users* and *Operators* of particular instruments are allowed to login to the EMC's on-line instrument calendars (excepting the IVEM calendar) for the purpose of reserving time on those instruments.

### 5.5 Computing Facilities

The EMC Computing Laboratory (building 212, room DL238) provides resources for image processing and analysis. The center includes computers and workstations with commercial software for image simulation, modeling, manipulation and analysis together with input and output devices for image handling.

## **5.6 Specimen Preparation Facilities**

The EMC maintains an array of specimen preparation capabilities that are available to all users. While individuals are generally expected to carry out their own specimen preparation, expertise and guidance is provided by EMC staff. The EMC Specimen Preparation Laboratory (room DL126) is for the preparation of specimens for FIB, TEM, SEM, and light microscopy within the EMC. Before starting any specimen preparation work in DL126, everyone must read the *User's Guide to the EMC Specimen Preparation Laboratory* and consult with the laboratory supervisor (Jon Hiller). Those who propose to use G147 to prepare specimens by chemical means must read the *User's Guide* and consult with the G147 laboratory supervisor.

## **5.7 Acknowledge the EMC in publications & presentations**

You must acknowledge the EMC in all of your publications and presentations using the following words: "The electron microscopy was accomplished at the Electron Microscopy Center for Materials Research at Argonne National Laboratory, a U.S. Department of Energy Office of Science Laboratory operated under Contract No. DE-AC02-06CH11357 by UChicago Argonne, LLC."

## **5.8 Acknowledge EMC staff**

EMC staff frequently make major contributions to the research of EMC users through planning and execution of experiments, analysis and interpretation of data, or through collaboration and assistance in the research. It is expected that staff members will be appropriately acknowledged and/or included as co-authors.

## **5.9 Annual research summary & other materials**

Your research proposal remains active for one year from the approval date. At that time you must provide the following items to the EMC:

- ◆ A research summary in the form of a Department of Energy highlight. The highlight consists of one page of text and one viewgraph (templates provided by the EMC).
- ◆ Reprints of publications containing your EMC-related work.
- ◆ A list of publications and presentations containing your EMC-related work.

## **5.10 Annual DoE User Satisfaction Mini-Survey**

The EMC asks users each September to participate in the Department of Energy's User Satisfaction Mini-Survey.

## 6. Working-alone Policy for the Electron Microscopy Center

This policy states who may work alone in the EMC and under what circumstances. Although you may be authorized to work alone, it is a good idea to make sure that someone always knows where you are working.

### 6.1 Definition of "working alone"

Working alone is the performance of work by an individual who is out of visual and voice range of another person for more than a few minutes at a time. This situation may happen during normal working hours as well as off-hours. Persons who use the EMC Specimen Preparation Laboratory (room DL126) may be in this situation as well as those who use electron microscopes.

### 6.2 Forbidden activities while working alone in the EMC include ...

- ◆ Mixing corrosives (acids and bases) to form a working solution.
- ◆ Working with liquid helium.
- ◆ Working in the IVEM-Tandem facility off-hours if EMC Staff are not present.

### 6.3 Working alone during normal working hours (0730-1730, Monday-Friday)

Microscope Users and Operators don't need to fulfill any special conditions to work alone in the electron microscope rooms. Microscope Trainees may not work alone: a supervising User must be present. Persons who are authorized to work in the Specimen Preparation Laboratory (room DL126) may work alone as long as they work according to the written Standard Operating Procedures.

### 6.4 Working alone during off-hours (night & early morning, weekends, holidays)

To get access to the building for working after regular business hours (7 pm), you must complete this course, be authorized by the EMC staff to use the EMC off-hours, and then ask the building manager, John Herman (2-6348), to activate your badge for after-hours access. If you do not have a picture badge you also will need to ask the Building Manager for a building pass.

Microscope Users must qualify as Operators to work alone during off-hours. Microscope Operators don't need to fulfill any special conditions to work alone in the electron microscope rooms.

Persons who want to be authorized to work off-hours in the EMC Specimen Preparation Laboratory (room DL126) must be able to demonstrate safe laboratory practices to the Laboratory Supervisor (Jon Hiller) for each piece of equipment used before off-hour authorization is granted. They may then work alone as long as they work according to the written Standard Operating Procedures.

Off-hours workers in the AEM facility must record when they arrive and when they leave by signing the EMC Off-Hours Sign-In/Out Sheet. The sheet is located just inside the double entrance doors to D128, the lobby of the the AEM facility. The purpose of the sign-in/out sheet is to provide another level of safety for off-hours workers by providing emergency responders with the names and locations of persons who are working in the EMC.

### 6.5 Contact systems

According to section 1.6.7 of the *Argonne ES&H Manual*, "Measures to ensure the safety of those working alone may include regular contacts with the supervisor or other responsible person. All employees who work alone must have access to a telephone or radio in case of emergency, be trained in emergency reporting, and make sure that the phone or radio is working."

For off-hours work, the policy of the Electron Microscopy Center in this regard is the same as that of its parent division (MSD): "Notify others (family, coworkers) where you are and what you are doing. Have them check on you by telephone."

## **7. Floor Plans of Buildings 216 and 212**

This section contains floor plans for building 216, the ground floor of building 212, and the EMC facilities within building 212.

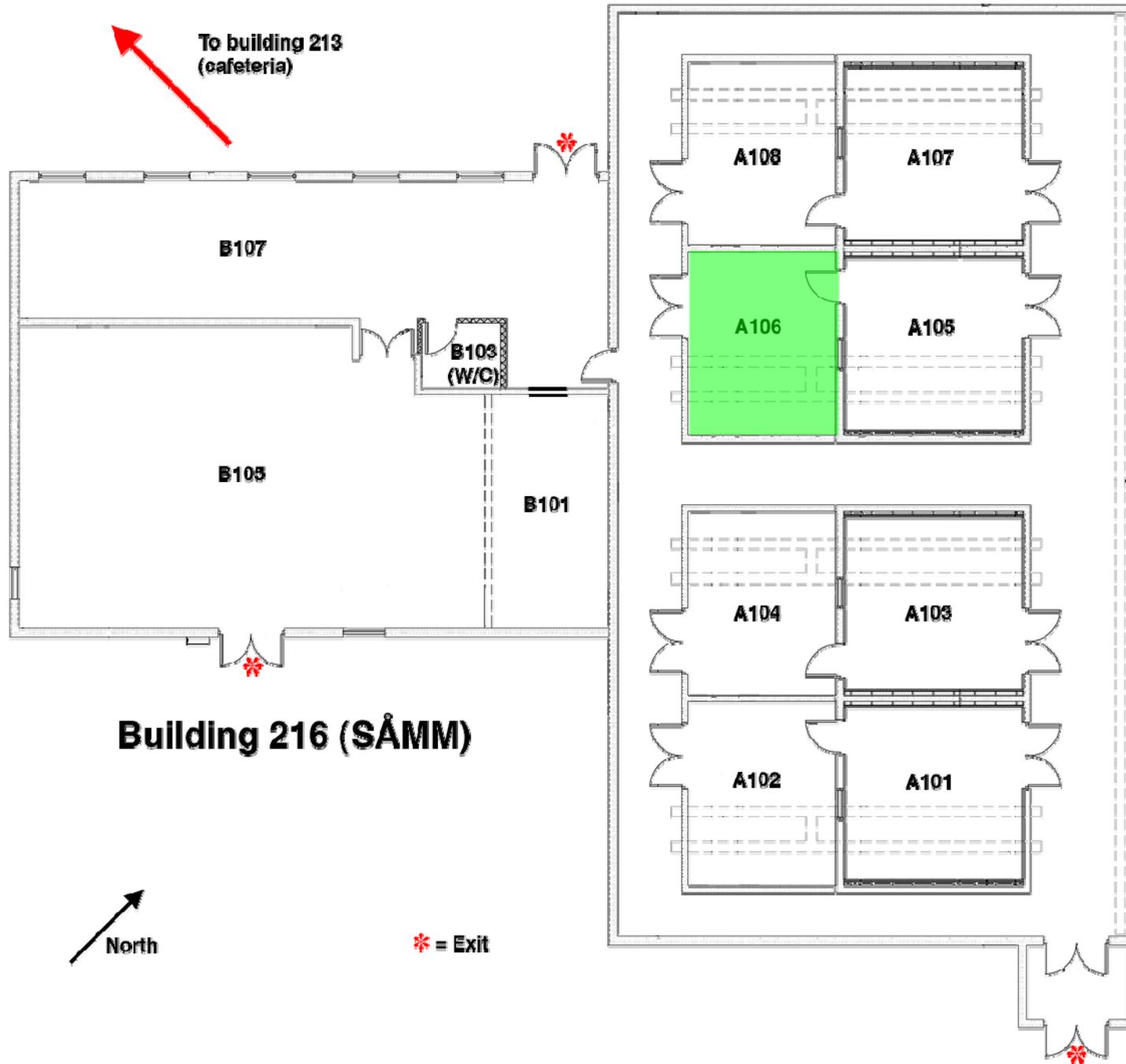
Please note these areas that are marked on the 216 and 212 floor plans:

- ◆ Building and facility exits are marked on the floor plans with red stars.
- ◆ The tornado shelter areas are colored green.

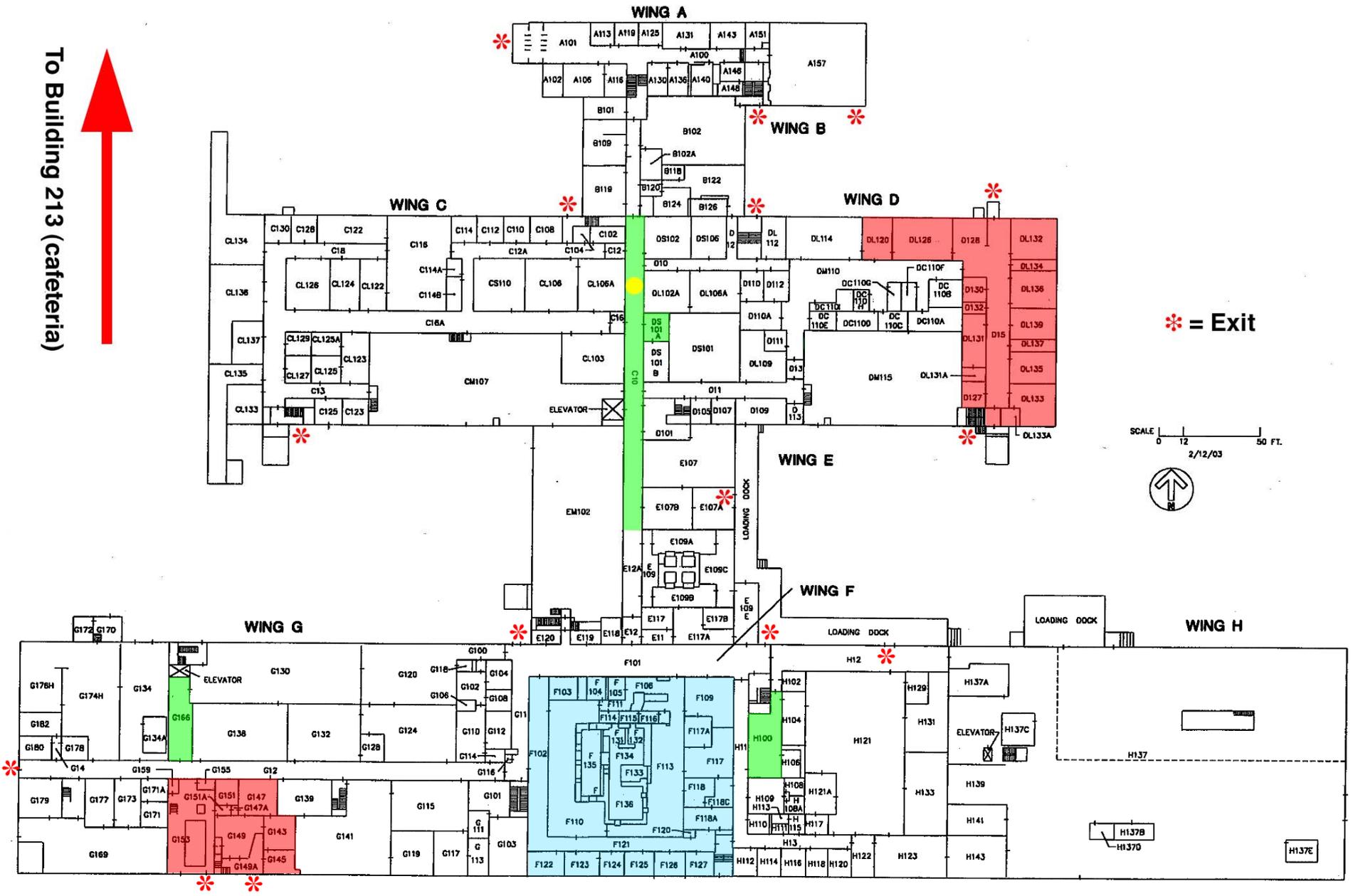
Please note these additional areas that are marked on the 212 floor plan:

- ◆ The yellow dot in the C10 corridor near room DS101A shows the most likely location of EMC personnel during a tornado.
- ◆ The Alpha Gamma Hot Cell Facility (AGHCF) is colored blue.
- ◆ The EMC facilities are colored red.

**Building 216 floor plan (Sub-Ångstrom Microscopy and Microanalysis facility)**



# Building 212 ground floor plan



To Building 213 (cafeteria)

\* = Exit

SCALE 0 12 50 FT.  
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## EMC facilities layout in building 212

The Analytical EM facility, including the specimen preparation laboratory and the computing lab, is in D-wing. The IVEM-Tandem facility is in G-wing.

### Computing facility:

The EMC's computing facility is located in DL238 above the Zeiss NVision. Capabilities include offline use of microscope programs, image processing, and image simulation.

### Color scheme:

1. "Major capability" instruments are in red.
2. Core instruments are in blue.
3. Support facilities are in green.

\* = Exits

