March News to Use provided general design criteria and specific criteria for Electron Microscopes. This News to Use will provide specific criteria for temperature and humidity control, airflow across the column, control of air pressure changes, vibration considerations and acoustic noise.

Temperature and Humidity Control and Airflow across the Column
- Keep temperature changes to less than 0.1 degree Celsius per hour.
- Keep airflow across the column to less than 20 feet per minute. The airflow across the column may vary depending on the type and sensitivity of the equipment. Perform a risk assessment and set the airflow rate based on the results.
  - A rough estimate of the heat output of a microscope (power supply and electronics rack) is 5kW. Confirm the thermal load from the vendor before the design.
  - Separate (and cool independently of the column and microscope) cooling for power supply and electronics racks.
  - Construct a shelter surrounding three sides of the column to prevent drafts blowing across the column.
  - Wrap column in bubble wrap or neoprene to dampen thermal fluctuations.
  - Radiant cooling system to control temperature is recommended and is an inexpensive retrofit used in conjunction with a forced air A/C system to control humidity.
  - To retrofit a forced air cooling system:
    - Add a reheat coil with feedback from the thermo-coupler near the column to reduce temperature fluctuations.
    - Place the inlets away from the column to avoid unacceptable currents.
    - Diffuse the air flow by installing a perforated ceiling tile with hundreds of small holes across the tile (but with none directly above the column) and arrange tiles to produce laminar flow.
    - A less expensive solution is to add a duct sock that is tightly sealed to the air inlet.
    - Minimize the cycling of cooling.
    - Minimize air supply to the instrument room to avoid sudden fluctuations in temperature.
    - Use the most accurate temperature probes.

To maintain pressure stability, recommend air pressure changes to less than a few Pascal per minute.

Vibration Considerations
Vibrations in a floor supporting the microscope may be caused by traffic on roads, rails or nearby machinery or movement of the building itself.
- The vibration criterion (VC) will be based on VC-D with the maximum vibration of 6 micrometers/sec, RMS, as measured in one-third octave bands of frequency over the frequency range 8 to 100 Hz.
- In order to reduce vibration to a minimum, support sensitive equipment on an isolated high mass platform designed to have a resonant frequency far below any internal resonance characteristics of the equipment itself.
- Surrounding background vibrational noise, or the “natural frequency” of a facility, should lie well above the resonance frequency of the high mass platform.
- Recommend the installation of the microscope on an isolated high-mass concrete slab on bedrock or appropriate engineered fill, with a gap between the concrete slab and the surrounding structure. The gap may be filled with a closed cell neoprene rubber gasket which does not transmit vibrations.
- The walls should be isolated from roof and the floor slab.

Acoustic Noise
In order to reduce the entrance of noise and to dampen noise in the room recommend the following:
- Achieve Noise Criteria NC-35 rating;
- Remove noisy microscope equipment (such as pumps, power racks, and compressors) to a different room or to a dedicated room;
- Another option for noise reduction is to install acoustically "dead" walls, which may be achieved through curtains or cloth covered fiberglass sound absorbent tiles with a sound absorbent factor of 1.15.

Room Layout and Architectural Features
High resolution instrument room layout will vary depending on the type and sensitivity of equipment specified and site constraints.
The electron microscope suite should include at a minimum:
- Separate room for heat, vibration or noise generating equipment associated with the electron microscope.
- Vibration isolation slab on grade for electron microscope.
- Appropriate shielding. Electromagnetic (EM) interference cancellation may require EM cancelling systems or shielding depending on the requirements of the microscope and building conditions.
- Dual pane windows for better sound isolation.
- Physical separation from busy corridors and other sound and vibration generating areas.
Other systems to consider include: Cooling Water (supply and return); House Vacuum; Dry N2 gas; Fire Alarms; Fire Sprinklers; Emergency Light; Oxygen Sensor; Telephone; Internet; and Instrument (ground) Shielding.