MACHINE TOOL & CNC FLEX LAB

SPACE DESCRIPTION

The Machine Tool and CNC FLEX Lab is an interconnected space where students design and craft machine parts for use in manufacturing processes.

Depending on Service Area needs, the following programs may be served by the FLEX Lab:

- Machine Tool Technology
- CNC Production

As all programs in the AMEAS field quickly evolve and expand, so too, must the space they occupy. The Lab, the site, and all infrastructure shall be planned with future expansion and reconfiguration in mind. Buildings housing FLEX Labs are most successful when located at the rear of campus property, outside the common path of travel, and with area for future building additions. Changes in programs, equipment, and technology are frequent, and these labs must be able to be reconfigured to meet the new demands. Designing ultra compact and efficient layouts for the current use may be a financially attractive option, but this will ultimately hinder the program from evolving as technology and demands change.

Outdoor facilities should include, at minimum, an overhead door for movement of large equipment. A fenced service yard may also be advantageous for delivery and storage of materials.

SUCCESS FACTORS

Safety: Due to the hazardous nature of this work, FLEX Labs must be designed with safety as a top priority. The Labs must be outfitted with safety equipment and must comply with all relevant safety regulations and standards.

Space: The Lab shall be designed to accommodate large manufacturing equipment.

Storage: Storage space is critical for FLEX Labs. The Storage room shall be large enough to provide maneuvering space for platform trucks and dollies.

Noise Control: FLEX Labs shall be designed to reduce noise levels, as they are loud spaces by nature and the sound levels can make instruction difficult. Sound absorption shall be provided on wall and ceiling surfaces, and walls shall be constructed to reduce sound transmission to adjacent spaces.

Flexibility: The space must be designed with flexible and reconfigurable infrastructure, to allow equipment to be changed or rearranged to teach new skills.

GENERAL

All perimeter walls shall be full height to deck.

ADJACENCIES

Separate but adjacent space is required for the following: **Metrology Lab, Metallurgy/ Non-Destructive Test Lab, Classrooms/ Computer Labs, Electrical Switchgear, Tool Crib and Central Storage.**

Ideally, Machine Tool & CNC FLEX Labs are located near Robotics FLEX Labs, Welding Labs, and Construction Technology FLEX Labs for movement and cross-training between programs.

ACOUSTICS

FLEX Labs are naturally very loud spaces due to the activities in the space. Provide absorbent panels on walls and ceilings for noise reduction and decreased sound transmission to adjacent spaces.

Where Machine Tool and CNC Labs border acoustically sensitive spaces, exterior walls should have a minimum STC rating of 50.

MECHANICAL

Electrical power shall be provided in overhead bus ducts to allow for future flexibility. Compressed Air, Gas, and Water are likely to be best distributed overhead to allow for reconfiguration. Distilled/ Reverse Osmosis water supply may be required by some equipment. Verify specific needs on a project-by-project basis while planning for flexibility in the future.

- Dedicated exhaust may be required for some equipment.
- Provide a sink and emergency shower with eye wash in each Lab.
- Provide floor drains.

ELECTRICAL & DATA

- High voltage service is required. Provide flexibility for 120/208V 3-Phase and 480/277V 3-Phase, standard. Verify required voltages with planned and future equipment.
- Provide twist-lock plugs for trainers, similar to Hubbell HBL2511 and HBL2513.
- Emergency shut-off switches are required.
- Duplex receptacles for general use.

Provide wall-mounted raceways as required for power and data for desktop computer workstations and/or lab equipment on perimeter walls.

LIGHTING

- In high-bay areas, provide LED lighting in warm, soft white color.
- Task lighting is required at individual workstations.

TECHNOLOGY

All utilities shall be provided overhead, including Internet.

- Provide Wireless capability throughout FLEX Labs with Wireless Access device.
- Provide telephone service.
- Provide high-speed internet throughout. Many machines will require a wired data connection from overhead (min. 13’ clear below). Depending on program, each machine may require its own IP address and tablet. Verify specific requirements.
- Coordinate with PSEP for cameras locations. Cameras may be required to monitor small but expensive tools, machines and parts.
- Provide card reader/ key fob at entry doors.

ACCESSORIES AND EQUIPMENT

Verify specific equipment needs on a project-by-project basis while planning for flexibility in the future.

See space descriptions.

FURNITURE

Provide the following standard furnishings for FLEX Labs:

- Work benches and job boxes on rollers for flexibility and mobility.
- Stationary computer workstations with integral power and data connections.
- Wall shelving and storage racks on perimeter walls.

FINISHES

Ceilings

Recommended Height: 20’ clear with exposed structure. Provide Unistrut system to support utility bus lines. Provide acoustic panels for sound absorption.

Floors

Polished, sealed concrete slab (6” min. thickness). Verify specific needs on a project-by-project basis while planning for flexibility in the future.

- Some programs and equipment may require thicker slabs. 8” thickness and/or 12” footings may be required.
- Some machines may require isolated footbeds to reduce vibration.

DOORS AND WINDOWS

Overhead coiling doors for access to the Loading Dock. 10’W x 12’H, min.

FLEX Lab doors shall be minimum STC 30 with 6” x 30” Window Lite preferred. Entry doors shall be equipped with card reader/ key fob.

Clerestory windows with E/W exposure, preferred. Place windows above 6’-0” high to reduce damage; or provide reinforced glazing/ window film.

MACHINE TOOL TECHNOLOGY LAB

SPACE DESCRIPTION

The Machine Tool Technology Lab requires open floor space for large equipment (mills and lathes) at the center of the room, with surface grinders along perimeter walls.

Overhead bus lines shall provide all utilities as required by the program; at minimum, Power, Data and Compressed air. Provide individual air separators at machines.

The Machine Tool Lab shall have direct access to a Metallurgy / Non-Destructive Test Lab.

ACCESSORIES AND EQUIPMENT

- Mills, lathes and granite surface plates for grinders with individual air separation at the machine
- Power Fluid Training equipment
- Work benches and Tool Carts
- Air compressors
- Fire extinguishers
- Wall-mounted tack boards and marker boards

CNC LAB

SPACE DESCRIPTION

The CNC Lab shall provide open floor space for large equipment at the center of the room, as well as computer workstations at the endcap of each row. Provide one computer workstation for every 4 CNC machines. Provide granite surface plates along perimeter walls.

Overhead lines shall provide all utilities as required by the program; at minimum, Power, Data and Compressed air.

Thickened concrete floor slab is required in the CNC Lab. 8" thickness and/or 12" footings may be required, with some machines on isolated footbeds for reduced vibration. Verify with equipment and plan for flexibility in the future.

ACCESSORIES AND EQUIPMENT

- CMM mills, CNC mills, CNC vertical mills (Haas UMC-750)
- EDM with electrical trainers and band saws
- Work benches and Tool Carts
- Air compressors
- Fire extinguishers
- Wall-mounted tack boards and marker boards

METROLOGY LAB

SPACE DESCRIPTION

The Metrology Lab is a separate Lab space for precision measurement of fabricated parts. The Metrology Lab shall be located between and with direct access to both the Machine Tool Lab and CNC Lab.

Extend overhead bus lines from the FLEX Lab. Provide all utilities as required by the program; at minimum, Power, Data and Compressed air.

Provide a dedicated mechanical system to maintain equipment-specific climate (68-70 degrees, 45-55% humidity).

ACCESSORIES AND EQUIPMENT

- Granite surface plates for grinding
- Coordinate measuring machines (CMMs)
- Drying equipment for CMMs compressed air
- Main air compressor with dryer, as well as separate lines with dryers

TOOL CRIB

SPACE DESCRIPTION

Directly adjacent to the FLEX Lab, the Tool Crib provides a secure location for the storage of tools and supplies. A workstation with power and data shall be provided for use by a lab tech.

Additional equipment includes tool chests, shelves and cabinets.

Provide double doors with key fob access.

If space is lacking and a Tool Crib is not possible, a Tool Vending Machine may be used. Basis of design is Guhring TM326.