



OHIO UNIVERSITY

DESIGN AND CONSTRUCTION STANDARDS



Ohio University
Architecture, Design and Construction Standards
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Ohio University Architecture, Design and Construction Standards Introduction

This document has been compiled for use by design professionals, architects, engineers and University administrative personnel who are involved with the construction and renovation process at Ohio University. All construction projects must follow these design standards regardless of construction delivery method.

This document is divided into four main sections: 1) "Introduction" 2) "Consultant Requirements" 3) "Design Space Standards" and 4) "Building Standards". The building standards are organized by division based on the CSI Master Format.

Ohio University is interested in maintaining and further developing these standards as the industry continues to change. All parties are encouraged to submit the *Standards Revision Form* in Appendix I.2. This form must be submitted to the Director of Design & Construction.

All projects shall follow this document and adhere to its content. Exceptions to these standards will be considered by completing the *Variance Request Form* in Appendix I.1. This form must be completed and returned to the project manager for review and approval prior to proceeding with ANY deviation from this document at program, schematic design, design development, or construction document stages as the particular deviations are proposed.

The design professional will be required to submit the Design Compliance Form Appendix CR.1 at the submission of Design Development and submission of Construction Documents with approved variance forms. These signed forms will certify that the Ohio University Design and Construction Standards have been incorporated into the project by the design professional and the University Project Manager.

This manual is not intended to be a "master specification" and therefore, in most cases, the language in this manual will need modification before it is included in the Project Specifications by the Professional. Properly written specifications will be much broader in scope and more detailed. The intent has been made to establish "performance" rather than "specification" standards wherever this has been practical. The use and inclusion of these requirements in bid documents does not relieve the Design Professional of the responsibility and legal liability for any bid documents created from these requirements.



Ohio University
Architecture, Design and Construction Standards
Consultant Requirements

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

ARCHITECT/ENGINEER CONSULTANT REQUIREMENTS

1. The University's designated Project Manager is the central point of contact for the project. All communication between the design professional and the University shall be routed through the Project Manager. Open and complete communication between the University and the design professional is expected and required.
2. The design professional must be under contract prior to any work being performed. The owner must issue specific authorization prior to the design professional proceeding with any extra services.
3. The project design and implementation must adhere to Ohio University Design Standards and The Ohio Revised Code for all projects. Any conflicts between these various documents shall be brought to the attention of the Project Manager.
4. It is the design professional's responsibility to secure and understand the current edition of the Ohio University Design Standards as of the effective date of the design professional's contract. This edition of the standards shall be effective throughout the duration of the project, unless specific exceptions are made through the Project Manager. It is understood by the University that a designated change in the University Design Standards during the design process or construction phase may warrant additional fees to the Design Professional. It is the design professional's responsibility to communicate this requirement with their sub-consultant.
5. The design professional must document and verify existing conditions before the start of the design. This includes a review meeting of record drawings and requirements for site survey. (Verify all easements)
6. The expectation of the owner is that the design professional identifies one individual as their Project Manager, who is to be involved in all phases of the project. If the construction administration phase is administered or executed by someone other than the Project Manager, that person must also be involved in the entire design process.
7. **Before the design process begins, it is the responsibility of the University's Project Manager and the design professional to determine the expectations of the project and/or various project components. Design professionals are responsible for reviewing and administering ALL Division 00 Standard Requirements with Project Manager.**
8. The owner may require the services of specialty consultants. The owner may contract directly or assign the contract to the design professional.
9. The Ohio University design review and comment process does not limit the liability of the design professional for quality control and quality assurance for the project, nor does it relieve the design professional from adherence to all applicable building codes and regulatory requirements.
10. The university has identified certain items as sole source, unacceptable or preferred. Reference specific divisions for details.

Ohio University
Architecture, Design and Construction Standards
Consultant Requirements

11. Design professionals are required to provide detailed minutes for all design meetings, pre-bid meeting, preconstruction meetings, along with all construction progress and pre-installation meetings. Design phase meeting minutes shall address all design issues, suggestions and decisions made by all members of the project team. A format has been developed for construction meeting minutes. See Appendix CR.2.
12. Constructability reviews are required for all projects. The number of constructability reviews will be determined by the Project Manager. An outside constructability review consultant may be required. This will be an owner's selection/expense unless administered by the OFCC.
13. The University Project Manager and the design professional are responsible for developing and maintaining a program of requirements, a budget, and a project schedule. The design professional's project manager and the University Project Manager must each commit the energy and resources necessary to develop a workable schedule and to achieve agreed upon milestone dates.
14. The design professional is responsible for developing a design and construction schedule. The schedule must identify all significant milestone dates for both design and construction phases, as determined by the design professional and University Project Manager, and approved by the University Project Manager. A few examples
 - a. Schematic design completion
 - b. Design development completion
 - c. Construction document completion
 - d. Temporary enclosure
 - e. Conditioned air
 - f. Pre-life safety/life safety inspection
 - g. Building dry-in
 - h. Building completion turn-over/move-in
 - i. Academic calendar/university event dates
15. It is the responsibility of the design professional to check with the Project Manager to determine if a scheduling consultant is required.
16. It is the responsibility of the design professional to check with the Project Manager to determine if the project is eligible for AEP incentives.
17. The design professional is responsible for providing hard copies of conformed documents at the pre-construction meeting, one set for each contractor, and two sets for the owner. Design professional is also to provide to the owner and all prime contractors, when requested, electronic copies of conformed documents at no cost to the contractor. Provision of hard or electronic copies of conformed documents to sub-contractors shall be at the expense of the prime contractor.

Ohio University
Architecture, Design and Construction Standards
Consultant Requirements

18. A design professional evaluation form will be completed at the end of each project per OFCC guidelines.

19. The design professional's contract will not be considered complete, nor will final payment to the design professional be made until all project close-out requirements are met.

CLOSE-OUT DOCUMENTS

- At the completion of the project the design professional shall submit the following:
 - Required information
 - a. AutoCAD and TIF files of as-built drawings and record drawings (x-references to be bound into drawings and purged of unreferenced objects), plus one hard copy of Record Drawings
 - b. In editable condition, not protected or locked
 - c. Compatible with AutoCAD release 2000 or higher format
 - d. BIM files (if applicable)
 - e. O&M Manuals; plus one hard copy
 - f. Completed commissioned equipment inventory spreadsheet (Appendix X)
 - g. Approved Shop Drawings/Submittals
 - h. Commissioning and Balancing Reports
 - i. Project Specifications(pdf and original working document)
 - j. Minutes of all project meetings – PDF

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

-----END OF SECTION-----

REVISION DATE: 03-20-12, 03-27-12, 12-13-13, 08-07-15



Ohio University Architecture, Design and Construction Standards Sustainability

The Ohio University campus will preserve and enhance the health of our community and the health of our environment while publicly signaling our institution's wider commitment to sustainability. Our buildings, infrastructure and grounds will support the University's prominence and long-term success by emphasizing quality, maintainability and efficiency in the use of human and natural resources. Ohio University's long-term resilience, prosperity and health depend on a physical campus which recognizes its dynamic interdependence on ecological systems.

The continual evolution of our physical environment will be guided by the goals of Vision Ohio, the Presidents' Climate Commitment and related efficiency and environmental initiatives. All major construction and renovation projects will be expected to have a LEED analysis evaluation. New construction and existing building's projects budgeted at or above \$2 million will meet or exceed LEED (Leadership in Energy and Environmental Design) Silver certification. Projects consisting only of infrastructure, equipment, furnishings and systems will be evaluated for LEED applicability. Projects budgeted under \$2 million will employ an equivalent LEED-based approach.

Beyond energy efficiency, sustainability as applied to our facilities and landscape is understood to include: optimizing the use of our current facilities, reducing greenhouse gas emissions, conserving water, enhancing walkability and the use of public transportation, addressing our local climate and ecological features, celebrating the local landscape, preserving our open spaces, minimizing use of toxic materials, respecting the limits of our utilities infrastructure, reducing, recovering and recycling waste, and nourishing our plants, animals and soils – while maintaining the historic and aesthetic character of our campus.

The intelligent use of emerging technologies and practices which support our sustainability commitment will be encouraged when they are well-suited to the application, show promise for success and durability, and serve to enhance our academic curriculum and research. The quality of our mechanical systems will not be sacrificed for the sake of novelty or up-front affordability.

The original building block of our historic campus – the red clay brick – exemplifies the qualities associated with sustainable long-term planning and design: durable, locally sourced, non-toxic in manufacture, use and disposal, efficient, and beautiful.

REVISION DATE: 08-06-15



Ohio University Architecture, Design and Construction Standards Design Requirements

REQUIREMENTS:

- All projects over \$2 million, total project cost, must be LEED silver.
- All projects must be designed within the context of the site and adjacent structures.
- Building envelope design criteria is critical.
- The building design must be sensitive to the campus aesthetic, ease of maintenance and operation and energy efficiency.

ROOM NUMBERING

All room numbers must be established and approved by the Project Manager. Room Numbering is required as soon as the basic floor plan has been established, early in the Design Development phase, and must receive final approval before proceeding to construction documents. Each floor plan sheet must include a schedule that indicates room numbers, usage, and net assignable square feet. This is not a substitute for a complete room finish schedule. It is the design professional's responsibility to make sure that all room numbering and room numbering changes are coordinated with the sub-consultants.

1. Start at the main entrance and move clockwise through the building.
 2. Room numbers should be similar or stacked floor to floor.
 3. Use 001 series for ground floor rooms, 100 series for 1st floor, 200 for 2nd floor, etc/
 4. Stair s should be S-1, S-2, etc.
 5. Use A, B, C, D, etc. to identify rooms that are accessed from another room rather than a corridor.
 6. Use even numbers on right side of corridor and odd numbers on the left side.
 7. Corridors will use 6 digit numbers. Numbers are required at every change of direction in hallways and vestibules. Gr. fl 000001, 1st fl 100001, 2nd fl 200001, etc.
 8. Leave gaps in room numbering to allow for development of future rooms.
- For signage requirements see Appendix S.2: SIGNAGE.

MECHANICAL ROOMS

Ohio University Architecture, Design and Construction Standards Design Requirements

- The intent is to water-proof all mechanical rooms to prevent any spilled water from entering other parts of the building.
- ALL mechanical rooms must have water-proof floor with 4" curbs with drainage.
- Continuous Curbs at room perimeter, including doorways, and all floor penetrations. Coordinate detail at room entry with Project Manager.
- Provide adequate access areas for equipment maintenance and replacement of coil pulls.

ATTIC STOCK

- On new construction it's the University's desire to create rooms for attic stock. Do not utilize mechanical rooms.

GENERAL FUND RESTROOMS

- See Appendix DSG.1 TOILET ROOMS.
- Include single-use/unisex restroom.
- In large, multiple-use restrooms main entry should be without doors.
- Include minimum of 2 hand-dryers. Electric hand-dryers are required (High Speed).
- shelf
- Provide surface mount hose bib under sinks
- All floor surfaces must slope to floor drain. Verification test by Project Manager during construction before tile installation.

GENERAL FUND OFFICES

- Administrative/Faculty – 120 sf
- Assistant Director/Assistant Dean – 140 sf
- Director/Dean – 180 sf

RESIDENCE HALL RESTROOMS

- Provide surface mount hose bib under sinks

Ohio University
Architecture, Design and Construction Standards
Design Requirements

- All floor surfaces must be water-proofed and slope to floor drain. Verification test by Project Manager during construction before tile installation.
- Shower ceilings: Solid Surface required with fastening system/blocking
- Water-proofing method (meet Ohio Plumbing Code) for shower with details
- Provide clothes hook. In suite style one per person, common showers one per shower.
- All ADA shower must coordinate additional drains.
- Prefer solid base over tile floor for shower pan.

VENDING AREAS

- Coordinate location and number of units with Project Manager.
- Each vending unit will require one data drop and dedicated electrical circuit. Coordinate utility requirements with owner, including ventilation requirements.
- It is desired to have hard surface flooring in all vending areas. Coordinate flooring with Project Manager.

RESIDENTIAL LAUNDRY FACILITIES

- Coordinate washer/dryer requirements including networking/Bobcat cash with Project Manager.
- All washing machine areas to have curbs with positive sloping floors to drains.
- Review ventilation design with Project Manager.
- Coordinate dryer discharge with Project Manager.
- Flooring shall be hard surface.

PUBLIC AREAS

- Trash/Recycling containers shall be located near the primary entry/exit, but in a discrete location. Coordinate with Project Manager.

LOBBIES

Ohio University
Architecture, Design and Construction Standards
Design Requirements

- First floor lobby shall be hard surface. Terrazzo or porcelain tile is preferred.
- Natural stone or terrazzo base.
- Minimum 16 linear feet of Walk off carpet required from vestibule.

VESTIBULE

- Approach shall be sloped away from building for positive drainage
- Recessed Nomad manufactured by 3M walk-off mats (Exterior) with canopy.
- Recessed Pedimat Pedigrid wall to wall only. No base needed.
- ADA door operators, building mount preferred.
- Consider wind load on doors.
- Provide hose bib for clean-up at exterior
- High traffic areas consider use of air curtain.
- Walls shall be hard surface, easily maintained and water proof.

CUSTODIAL AREAS

- See Appendix DSG.2 PRIMARY CUSTODIAL ROOMS and Appendix DSG.3 SECONDARY CUSTODIAL ROOMS
- Doors swing out 180°.
- All lights shall be protected; no exposed lamps.
- Mop sinks shall be floor mounted in the corner with wall protection, show water proofing detail.
- Provide ¾" domestic cold-water line with threaded ball valve and plug 4' off finished floor, 3'x3' wall area for custodial cleaning dispenser is directly adjacent.(see appendix from custodial director)
- Coordinate required shelving with Project Manager. All shelving to be vinyl-coated metal.
- Floor drain

OIT ROOMS

- See Division 27: Communications and Appendix DSG.4 TR ROOM, Appendix DSG.5 MTR ROOM and 27.1 OIT SPECIFICATIONS

BUILDING ENTRANCE

- Coordinate electronic access with Project Manager
- Knox box located at an exterior entrance per Project Manager.
- Exterior hose bib at all exterior entrances.

DUMPSTER LOCATIONS

- Provide location and screening. Coordinate with Project Manager.
- Elevated platform
- Coordinate truck access
- Provide positive drainage for dumpster away from the approach.
- Minimum 8" concrete on approach and dumpster pad.
- Coordinate recycling container sizes, location and access
- Avoid gates or doors on dumpster enclosures.

RESIDENT COORDINATOR OFFICE

STAFF OFFICES

RESIDENCE HALL ELECTRONIC ACCESS

- All exterior doors must have card swipe access. See DIVISION 8: OPENINGS, CARD KEY ACCESS CONTROL HARDWARE
- All residence halls must have 2 levels of card swipe access. Level 1: Access to ground floor lobby, level 2: residential living areas
- Card Swipe to be ADA accessible



Ohio University Architecture, Design and Construction Standards Design Requirements

RESIDENTIAL SMOKING AREAS

- Coordinate with Project Manager smoking facilities.

SENIOR STAFF APARTMENT

- Locate apartment away from main traffic flow.
- Coordinate with Project Manager independent domestic water heater. Prefer tank-less instant water heater.
- Heat detector required over smoke detector in kitchen area.
- NO GARBAGE DISPOSALS.
- Recirculating exhaust range hoods preferred.
- Coordinate dining/eating area with Project Manager.
- Preferred one piece bath tub/shower combination with shower curtain.

RA ROOMS

- Coordinate with the Project Manager on the amount of RA rooms per floor.

TYPICAL STUDENT ROOM

- Prefer built-in cabinetry with lavatory and mirror/ built-in electrical outlet.
- No piggy-packed GFI's.
- Doors to be solid surface, lifetime warranty.
- 12"x12"resilient flooring, high quality pre-finished tiles preferred.
- No lay in ceiling tiles.
- Coordinate window treatment, size and bracket installation with window type with Project Manager. Roller shades preferred.

-----END OF SECTION-----



Ohio University
Architecture, Design and Construction Standards
Design Requirements

REVISION DATE: 03-23-12, 08-10-15

REQUIREMENTS:

- Ohio University Risk Management & Safety (RMS) maintains the most current inventory of hazardous material contained on campus. Such as asbestos, lead, mercury and other known regulated materials.
- Coordinate all work involving hazardous materials with RMS.
- RMS maintains programs, procedures and manuals appropriate for all hazardous material concerns. See APPENDIX EHS.1 for a list of PPM's.
- In many situations the University desires systems in excess of minimum code requirements. Provide design services according to requirements provided by the Project Manager.
- Project specifications and/or drawings must include the statement: "If material is uncovered or detected that may contain any other regulated material, the contractor shall immediately notify the Project Manager."
- Coordinate the disposal of hazardous materials by EPA ID number zones on campus through Project Manager.
- The contractor, not the University, will be responsible for day to day onsite safety. The University may advise the contractor of obvious safety deficiency.
- It's the contractors' responsibility to provide all MSDS information to the Project Manager prior to the start of work. It's the consultant's responsibility to review with the University Project Manager all specified materials to be used. (VOC containing)

PAINT (LEAD)

- RMS will assist/coordinate the cost of hazardous material disposal based on estimated project size through the Project Manager.
- RMS will characterize all suspected hazardous material to determine proper disposal methods during construction as requested by the Project Manager. If the material is found to be hazardous the project will fund the appropriate disposal.
- RMS will coordinate with the Project Manager to determine responsible party for proper disposal.

ASBESTOS

- RMS will assist/coordinate the cost of hazardous material disposal based on estimated project size through the Project Manager.
- RMS will characterize all suspected hazardous material to determine proper disposal methods during construction as requested by the Project Manager. If the material is found to be hazardous the project will fund the appropriate disposal.
- RMS will coordinate with the Project Manager to determine responsible party for proper disposal.

OTHER HAZARDOUS MATERIAL

- i.e. ballasts, lights, oil transformers, mercury level switches
- RMS will assist/coordinate the cost of hazardous material disposal based on estimated project size through the Project Manager.
- RMS will characterize all suspected hazardous material to determine proper disposal methods during construction as requested by the Project Manager. If the material is found to be hazardous the project will fund the appropriate disposal.
- RMS will coordinate with the Project Manager to determine responsible party for proper disposal.

FIRE AND LIFE SAFETY

- Ownership and maintenance of Life Safety Systems shall be the responsibility of Ohio University Facilities Management at completion of project.
- Scheduling life safety inspections at the end of project
- Pre-purchase standardized fire panels with voice
- Stopper II in residence halls
- In many situations the University desires safety/fire protective signaling and/or fire suppression systems in excess of minimum code requirements. Provide design services according to requirements provided by the Project Manager.
- A pre-life safety test is required, conducted by RMS.

- Milestone is required, prior to completion date shall include two week duration for RMS pre-life safety and one week duration for State Fire Marshal (three week total duration).
- Refer to Division 28 for decibel level requirements.
- Upon completion of successful Pre-life test, RMS is responsible for scheduling State Fire Marshal. Minimum of one week notice required.
- Installing contractor is responsible for assisting with walk-thru and demonstrating all equipment and devices.

FIRE SYSTEM IMPAIRMENT

- Life Safety Systems Work Permit activities required prior to substantial completion shall be the responsibility of the project.
- Life Safety Systems Work Permit ([HYPERLINK](#))
- Contractor is responsible for contacting Project Manager one week prior to scheduled outage and as soon as possible for emergency outage. Any time fire protection/detection equipment is rendered out of service it is the Project Managers responsibility to contact RMS; A fire watch may be required.
- If a fire watch is required, the contractor is responsible for all associated costs in their bid. Refer to Risk Management & Safety website for appropriate documents.

HOT WORK PERMIT

- It is the responsibility of the contractor to provide to the project manager, all documentation required for hot work permits prior to work starting.
- [Hot Work Permit Form](#)

-----END OF SECTION-----

REVISION DATE: 08-10-15



Ohio University
Architecture, Design and Construction Standards
Division 01- General Requirements

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

SINGLE SOURCE PRODUCT

- N/A

NOT PERMITTED PRODUCTS

- N/A

REQUIREMENTS:

BUILDING TURNOVER

- Utility cost structure must be coordinated by design development.
- Typically the University assumes responsibility for all utility costs 60 calendar days before project completion. IF the building automation system is not TOTALLY functional by this date, the Mechanical Contractor is responsible for paying all utility costs until the project is complete.

SANITARY FACILITIES

- Location of temporary facilities must be coordinated and located on the construction drawings.

TEMPORARY SCAFFOLDING AND PLATFORMS

- All scaffolding must have protection to prevent unauthorized access. A lockable plywood surround is typically utilized.

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

- Coordinate location of dumpsters and locate on the drawings. Recycling may be available for certain materials. Coordinate on case by case bases.

PARKING

- Coordinate all parking requirements for the project and include direction in the bid documents to identify the associated costs/requirements.

SIGNAGE

- It is the design professional's responsibility to coordinate and produce an evacuation plan. This is to be coordinated with the Project Manager and Risk Management and Safety.



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Architecture, Design and Construction Standards
Division 01- General Requirements

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

-----END OF SECTION-----

REVISION DATE: 03-21-12, 01-14-14, 08-10-15



Ohio University
Architecture, Design and Construction Standards
Division 03- Concrete

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

SINGLE SOURCE PRODUCT

- N/A

NOT PERMITTED PRODUCTS

- N/A

REQUIREMENTS:

- Please reference American Concrete Institute (ACI) 301 and 318.
- Testing responsibility shall be determined per project and by the Ohio Building Code.

SIDEWALKS: Reference Division 32

ELEVATED SLABS: Reference Division 7

CONCRETE

- All exterior concrete shall be air entrained to 5% (\pm 2%)
- Patio areas shall have reinforcing wire installed in accordance with ACI 318
- No fiber allowed.
- See Division 5 Metals for handrail standards

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

-----END OF SECTION-----

REVISION DATE: 03-21-12, 1-7-14



Ohio University
Architecture, Design and Construction Standards
Division 04-Masonry

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

SINGLE SOURCE PRODUCT

- N/A

NOT PERMITTED PRODUCTS

- N/A

REQUIREMENTS:

- Use of stone is not preferred for horizontal surfaces i.e. sidewalks and patios.
 - Limestone block is permitted for stairs/steps.
 - No flagstone.
- Limit/reduce the use of horizontal mortar joints (Caps, parapets, etc.) no brick caps.
- Approval of flashing details (masonry flashings, weeps, parapets, wall caps, etc.) by Design Development. Review expansion joint and masonry opening detailing.
- Brick patterns/coursing must be approved at Design Development.
- All control joints must be shown on elevation drawings during Design Development.
- The use of masonry cleaners shall not be scheduled without prior approval by the Project Manager.
- Existing conditions of exterior masonry should be evaluated for all projects.
- Use of ground face block is encouraged in residence hall common spaces.
- Graffiti resistant coating/sealant preferred on all ground level vertical surfaces. (anything up to 10'± above finished grade)
- A mock up is required for all stone and masonry applications.
 - Masonry unit, color, size, texture, coursing
 - Mortar color, texture, tooling



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Division 04-Masonry

- Mortar net, flashing, water proofing, masonry ties, vapor barrier, weeps, and accessories

LINTELS

- Hot process galvanized primed lintels. No field cutting permitted.
- No exposed weld joints. If necessary, they must be ground smooth and hot galvanized.

COLD WEATHER CONDITIONS

- Review cold weather conditions during Design Development. Include language/address allowances and responsibility for protection and scheduling.

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

-----END OF SECTION-----

REVISION DATE: 03-21-12, 01-14-14



Ohio University
Architecture, Design and Construction Standards
Division 05- Metals

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

SINGLE SOURCE PRODUCT

- N/A

NOT PERMITTED PRODUCTS

- N/A

REQUIREMENTS:

HANDRAILS AND GUARDRAILS

- Aluminum handrails with permission.
- Exterior: University prefers painted galvanized steel handrails with bolted base plates and stainless steel fasteners. Installation detail required on Construction Documents.
- Interior: University prefers painted metal or natural finish metal (also see Division 06 for wood handrails).
- On new installations review existing styles of handrails in adjacent areas, match details.

GATES

- Coordinate locations/usage/design details.
- Review for emergency access/special requirements.
- Must be designed to accept a BEST padlock provided by University.

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

-----END OF SECTION-----

REVISION DATE: 03-21-12, 01-14-14



Ohio University
Architecture, Design and Construction Standards
Division 06-Wood, Plastic and Composites

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

SINGLE SOURCE PRODUCT

- N/A

NOT PERMITTED PRODUCTS

- No EIFS (Exterior Insulating Finishing Systems)

REQUIREMENTS:

COLUMNS

- Review all column types for durability/maintenance during design.
- Coordinate installation for 2 piece composite columns. Pre-installation conference is required.
- Column bases shall be abuse resistant solid material.
- All wood columns must be vented.

GENERAL CARPENTRY REQUIREMENTS

- Exterior trim board should be a homogeneous PVC material.

MILLWORK

- Interior wood trim shall not be painted.
- All wood millwork must be delivered on site to a conditioned space and allowed to acclimate before installation.

WINDOW SILLS

- Window sill to be solid/durable repairable material.

SHEETING

- Minimum $\frac{3}{4}$ " Plywood for all roof/sub-floor decks (no OSB or composites).

GYPSUM PRODUCTS See Division 09



Ohio University
Architecture, Design and Construction Standards
Division 06-Wood, Plastic and Composites

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

-----END OF SECTION-----

REVISION DATE: 03-21-12, 01-14-14



Ohio University
Architecture, Design and Construction Standards
Division 07- Thermal and Moisture Protection

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

SINGLE SOURCE PRODUCT

- N/A

NOT PERMITTED PRODUCTS

- No spray-on foam coated roofing systems.
- No ballasted roofs.

REQUIREMENTS:

ROOFS

- Roof type will vary by project/requirements/building type; review type before designing.
- All roofing systems require a pre-design meeting during Design Development and pre-installation meeting during shop drawing review.
- Requirements for fall protection shall be coordinated for all new building roofs. Fall protection is preferred on all roof renovations. It is the University's intent to provide fall protection for all new buildings.
- Review snow and ice guards on all steep slope roofs during Design Development, paying special attention to all entrances and exits.
- The University prefers a white membrane or light granulated shingles.
- Interior roof drain connections' installation must be coordinated between all trades (roofing, plumbing and general trades) and clearly detailed on the drawings.
- Roof access to be coordinated, man-door access preferred.
- No major equipment on roof tops, limit all other mechanical equipment on roof tops.
- Walk ways shall be provided to all maintenance points on a roof.
- Consider odors (hot tar, primers, adhesives, etc.) from the roofing system and effects on building and adjacent buildings.



Ohio University
Architecture, Design and Construction Standards
Division 07- Thermal and Moisture Protection

- Provide language that assures the building will remain protected (dry) during reroofing and holds the contractor liable for any damages.
- Review warranty requirements during design development. Review sample warranty included with required submittals before contractor starts work.

PATIOS AND WALKWAYS

- Try to limit the use of exterior patios and walk-ways over occupied space; review water-proofing details during Design Development.
- Review all waterproofing systems/details at design development.
- Avoid topical waterproofing applications; under slab drainage system is preferred. Water testing required.
- Review warranty requirements during design development. Review sample warranty included with required submittals before contractor starts work.

EXPANSION JOINTS

- Location and details of expansion joints and covers shall be reviewed at Design Development. This includes roofs, ceilings, walls (interior and exterior), floors, and must be coordinated with building systems and finishes.

SEALANTS

- All sealants must provide long life cycles (minimum 10 year) and remain flexible to prevent cracking and water infiltration. Specify and review submittals to assure only high quality products are utilized.

MOISTURE/VAPOR BARRIER

- Moisture/vapor barriers for vertical surfaces shall be reviewed.

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

-----END OF SECTION-----

REVISION DATE: 03-21-12, 01-21-14

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

SINGLE SOURCE PRODUCT

- BEST 93K Cylindrical lock for all locksets
 - Store Room function on Residence Hall Student Rooms
 - Office/Turnbutton function on all Classrooms not electronically controlled.
- BEST small format 7 Pin interchangeable core

NOT PERMITTED PRODUCTS

- Avoid flush bolts and vertical rods (surface or concealed) whenever possible. Use rim exit devices and keyed removable mullions instead.
- Avoid Electronic Strikes. Use Electrified cylindrical lock or electronic latch retraction exit device.
- Mag Locks are not permitted.
- Mortise locks are not permitted. If retrofitting an existing door prepped for a mortise lock, please use wrap/Install-A-Lock that is mortised or indented into the existing door and install a Best Cylindrical 93K lockset.
- Hinges with built-in electronic power transfer are not permitted.

REQUIREMENTS:

- The University requires the project manager and design professional to include Access Control in all phases of project planning. The university project manager will coordinate with Access Control in developing the master keying system, including specified keyway and all lock codes.
- It is the responsibility of the design professional to obtain the Access Control Openings Specifications and Electronic Door Access and Installation Guide from Access Control.

HARDWARE

- Avoid floor mounted door stops
- Avoid concealed or surface mounted vertical rod exit device
- Avoid cross bar exit device
- Construction cores are installed and provided by the contractor on all projects unless otherwise specified. Permanent cores will be installed by the University key shop.

- ADA Compliant power activated and electronically controlled door will be included on at least one main entrance in consultation with the University Project Manager.
 - All hardware finish to be US26D unless matching that in an existing building.
 - Hardwired/network card access system will be required on all major entrances of all other buildings. All remaining doors should be electronically supervised.

DOOR HARDWARE

HINGES

- Butt Hinges. All doors up to 7'-0" shall have 1 ½ pair of 4 1/2 x 4 1/2 hinges. Use 2 pair of hinges on doors taller than 7'-0".
- All hinges shall be ball bearing with non-removable or non-rising pins.

EXIT DEVICES

- Von Duprin 99 Rim Exit Devices in all installations.
 - Mechanical exit devices installed on perimeter doors should be installed with store room function and hex dogging.
 - Electronic latch retraction exit devices installed on all opening should be installed with store room function and cylinder dogging.

LOCKS AND LATCHES

- Use BEST small format 7 Pin interchangeable core. Cores must match hardware finish.

CLOSERS

- All closers to be *LCN 4040XP*
- Installed closers should comply with ADA Standards for Accessible Design.

LOW ENERGY/ ADA AUTOMATIC OPERATORS – Use LCN9560 Senior Swing Automatic Operator

- Locations for push buttons/pads shall be coordinated with Access Control and Project Manager.
 - Preferred placement is within the architecture of the building.
 - Pedestal mounted operators should be avoided wherever possible.

- Design should not allow entrapment in air locks.
- Battery powered wireless actuators are not permitted.
- Installation should comply with ANSI Standards.

WALL STOPS AND HOLDERS

- Install blocking as necessary

MULLIONS

- Provide keyed removable to match exit device.
- Avoid flush bolts and concealed or surface mounted vertical rods.
- Use Von Duprin KR4954 and Von Duprin 99 Rim Exit Devices.

HARDWARE FINISHES

- Use US 26D, unless matching existing conditions.

KEYING

- Temporary construction cores are required.
 - Smaller projects can be done by the OU Key Shop. Check for size requirements.
 - For larger projects it is the contractor's responsibility.
 - Ohio University Access Control will provide and install permanent cores.

KEY CABINETS

- Required in Residence halls only.
- Lund 1200-1205AA or Key Control M228-2480
- Must accept BEST small format 7 Pin interchangeable core.
- Hold 1 ½ times key capacity of the building.

FLUSH BOLTS

- Avoid flush bolts whenever possible. Use keyed mullions and rim exit devices instead.
- When the use of flush bolts is unavoidable, use lvs.

CARD KEY ACCESS CONTROL HARDWARE

- Hardwired/network card access system is required on all exterior residence hall doors and on selected interior doors required to secure living areas from other public spaces.
- Avoid the use of electronic strikes whenever possible.
- If networked wireless access is desired, the approved model is Schlage AD400.
- Hardwired/network card access system is also required on primary entrances for other campus buildings.
- All equipment must be on UPS or emergency circuit.
- All electronic locksets must possess mechanical key override, a request to exit sensor, and latch bolt monitoring when available (exit devices).
- All power/communication cables are required to be concealed to prevent tampering. No door cord loops/surface wiring are permitted without clearance by Access Control.
- Hardware requirements for door types are described below. Applications of door types will be determined by consultation with Access Control. Hardware sets include but not limited to:
 - Type 1
 - a. Card reader (owner provided)
 - b. Panic Bar with power supply
 - c. Electronic latch retraction
 - d. Latch bolt monitoring
 - e. Recessed door position switch
 - f. Request to exit switch
 - g. Electronic power transfer (no power transfer hinges)
 - h. Keyed by-pass outside trim
 - i. Cylinder dogging

- j. J-Box above door (12'x12"x4")
- k. Local horn
- l. Security controller with ups – remotely mounted,(prefer mech. Room, provided by Ohio University) (owner provided)
- m. ½" EMT conduit in all areas.
- n. Composite wiring to connect all devices
- Type 2
 - a. Same as type 1, except delete card reader
- Type 3
 - a. Panic bar with power supply
 - b. Latch bolt monitor
 - c. Recessed door position switch
 - d. Electronic power transfer
 - e. Local horn
- Type 4
 - a. Recessed door position switch
 - b. Local horn

KEY KEEPERS

RESIDENCE HALLS

- 3'x3' blocking in Staff Office adjacent to key cabinet for installation of Key Retainers
- Recessed Knox Postal Key Keeper required on exterior of building and exterior of staff office.
- Recessed Knox Fire Key Keeper required on exterior of buildings.

LOCK SETS



Ohio University
Architecture, Design and Construction Standards
Division 08 - Openings

- All lock sets or locking devices shall accept a BEST small format 7 Pin interchangeable core.
- In cylindrical application use BEST 93K 15D handle, no substitutions.

KEYING

- Temporary construction cores are required on all projects.
- On larger projects, contractor to provide temporary cores during construction and remove cores prior to building turnover.
- Permanent cores to be provided and installed by Access Control.

ACCESS PANELS

- All access panels must be lockable and accept a Best 7 Pin small format interchangeable core.

MAILBOXES

- Reference DIVISION 10 SPECIALTIES: POSTAL SPECIALTIES

GARAGE DOOR

- All Garage doors must accept a Best 7 Pin small format interchangeable core.

PAD LOCKS

- All pad locks shall be Best and must accept a Best 7 Pin small format interchangeable core.

TUNNEL ACCESS

- Tunnel hatches must accept a Best 7 Pin small format interchangeable core.
- Preferred lockset is Yale #112.

FIRE PANELS

- See Division 21 Fire Suppression
 - All fire panel cores must accept a Best 7 Pin small format interchangeable core.



Ohio University
Architecture, Design and Construction Standards
Division 08 - Openings

ELEVATOR KEYING

- Must accept a Best 7 Pin small format interchangeable core. See Division 14.

ELECTRONIC KEY PADS

- Coordinate the use of all key pads.

DOORS

- Performance Spec will be developed at the time of schematic design.

WINDOWS

- Performance Spec will be developed at the time of schematic design.
 - Security screens on ground access floor rooms in residence halls by exception.

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

-----END OF SECTION-----

REVISION DATE: 03-21-12, 05-05-14, 08-07-15



Ohio University
Architecture, Design and Construction Standards
Division 09 - Finishes

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

SINGLE SOURCE PRODUCT

- N/A

PRODUCTS NOT PERMITTED

- Type 6 nylon fiber
- vinyl base
- metal base

REQUIREMENTS

- Design for the use of low-volatility paint, finishes, adhesives and carpeting. Provide complete set of samples and colors of all finishes to the project manager for review and approval. Number of sets determined by project manager.
- Provide complete list of all finish materials, including manufactures, finishes, stains and all other products at the completion of the project. Information may be provided on the drawings as a finish schedule or in the project manual.
- Any environmental attributes of all interior finishes should be specified when product is proposed, including percentage recycled content, zero VOC, wood certification, etc.
- Design Professional to coordinate all available standard and custom colors/finish from manufacturers i.e. doors, windows, storefronts. Limit the use of custom colors and finishes with respect to future renovations.

EXTERIOR PAINT

Metal surfaces to be black Pantone color 426C. Submit sample for approval.

- Railings and handrail
- Bollards
- Light Poles
- Fences
- Gates



Ohio University
Architecture, Design and Construction Standards
Division 09 - Finishes

Metal surfaces to be hunter green per manufacturers' standard

- Benches
- Trash and recycling containers
- Meters (TBD)
- Signage(green per signage standard)

INTERIOR PAINT

- Flat finish on ceilings only. Eggshell or satin finish on walls.
- Interior metals i.e. door frames, hand rails, window frames, etc. shall be semi-gloss.
- Door Frames to be darker tone to hide abuse. Existing frames to be evaluated for excessive paint build-up which may require stripping.

PAINT COLOR

RESIDENCE HALLS

- All walls and ceilings in student rooms and corridors are to be match Pantone color 7499C
- Corridor soffits may have accent colors.

GENERAL FUND

- All offices and classrooms to match Pantone color 7499C

COLORS

- Incorporate use of University standard paint color Pantone color 7499C (OU Soft White)into color schemes
- Avoid trendy color schemes.

- Consider maintenance and repairs when specifying multi-color schemes. Limit number of colors.
- Renovations/Additions shall incorporate existing elements into new interior scheme where possible. Examples include brick, glazed wall tile, and terrazzo. Consider existing building finishes and colors.

FLOORING

- Design for hard surface at entry level extending at least 25 feet minimum into building. Design entry level flooring & vestibules to accommodate walk-off mats. OR design for 25 feet of walk-off material (recessed mats or walk-off carpet tile). In vestibules, material must go edge to edge, no borders.
- Design for epoxy - resin terrazzo when feasible. Terrazzo preferred in high traffic public areas.
- Design for porcelain or mosaic ceramic tile is preferred in restrooms. No light colored grout in floor areas. No terrazzo permitted in restrooms.
- Entire restroom floor area shall slope to floor drain. Refer to Appendix DSG.1.
- Do not use laminated or faux-look wood flooring, painted or rough brick flooring, or porous ceramic tile.
- Carpet tiles are required. See APPENDIX I.1 VARIANCE REQUEST FORM for all deviations.
- Design large scale spaces with patterned carpet. Specify only Ultron or Antron/Dupont Type 6.6 nylon.

BASE

- Use full rolls of rubber base.
- Cove or straight base to be coordinated.
- Carpet base to be used in approved locations only, no metal edge, coordinate details.
- Natural wood base by permission only.
- No synthetic composite wood or marble base

WOOD DOORS, TRIM AND HARDWARE

- Use hardwood and apply clear or stain finish.



Ohio University
Architecture, Design and Construction Standards
Division 09 - Finishes

- Match existing door veneers in renovations/additions.
- Locks and hardware finish shall match existing. New buildings shall be stainless steel US 10 or 26 finish.

GYPSUM BOARD

- Specify level of finish for all gypsum in bid documents.
- Areas requiring high level of finish must have a pre-installation meeting to assure contractor understands contract requirements/expectations.

WALLS

- Use minimum 5/8" drywall on frame walls, specify as vandal resistant and moisture resistant.
- **Metal studs max. 16" O.C., minimum 20-gauge (no equivalents accepted).**
- High traffic areas shall have a high-impact drywall surface.

CEILINGS

- Concealed spline support systems are prohibited.
- Acoustical ceiling tile shall be 24"x 24" from manufacturer's standard palette and must be consistent with existing finishes. Limit the use of different styles. Basis of design is Armstrong Cirrus.
- Verify and provide access to above ceiling equipment, preferably in corridor space, not occupied space.
- Labs, Wet/humid locations: Check for special requirements. Ceiling grid should be appropriate for application.
- Kitchen locations: Check with local health department requirements.

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

-----END OF SECTION-----

REVISION DATE: 03-21-12, 01-14-14, 04-03-14

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

SINGLE SOURCE PRODUCT

- (POSTAL SPECIALITES) Mailbox – shall accept a BEST small format 7 Pin interchangeable core.

PRODUCTS NOT PERMITTED

- Dry erase wall covering

REQUIREMENTS

OWNER SUPPLIED RESTROOM ITEMS

- See Appendix 10.3
- Toilet paper holders
- Paper towel dispenser if required.
- Soap dispenser
- A/E to verify location of items on the drawing and show blocking, contractor to install. Verify if the project will use electric hand dryers (provided by the Contractor) or paper towels (provided by the Owner). Design Professional to obtain cut-sheets on owner provided items based on the current supplier contract.

CONTRACTOR SUPPLIED RESTROOM ITEMS

- Sanitary Disposal
- No integral trash receptacles or dispensers
- Hand dryer if required.
- Glass mirrors with stainless steel frame, minimum ¼" mirror

TOILET COMPARTMENTS

- Partitions must be ceiling and floor mounted. Design Professional must show blocking location on drawings.
- Preferred material: solid homogeneous material. Basis of design is Bobrick Sierra collection.

- Hooks located on interior stall-side door.
- Provide flip-down courtesy shelf in each stall in general fund buildings/public restrooms.

SHOWER AND DRESSING COMPARTMENTS

- Residential Solid Surface (Corian Glacier White) Walls, Ceilings and Corner Trim
- Provide stainless steel shelf with stainless steel fasteners with blocking
- Provide stainless-steel curtain rod at entrance to dressing and shower, verify curtain rod height installation

FIRE EXTINGUISHER CABINETS

- Completely recessed cabinet required, coordinate wall thickness to flush mount.
- Non locking glass door with catch.
- Coordinate cabinet size with extinguisher requirements.

KNOX BOX

- Knox Box must meet city of Athens Fire Department specifications.
- See APPENDIX 10.1: KNOX BOX ORDER FORM
- Recessed mounting is preferred. Coordinate wall thickness.

POSTAL SPECIALITES

RESIDENTIAL HOUSING

- Provide a Key Keeper (exterior)
- Provide a Key Keeper (interior)
- Mailboxes shall accept a BEST small format 7 Pin interchangeable core. Typically this is a long lead time item. BEST 8L series mailbox lock.

- Provide/install a key cabinet in the staff office. Cabinet shall have a capacity of 1 ½ times the number of keys required in the building. Allow 3'x3' of wall space with blocking to allow owner to install key keepers after construction.

GENERAL FUND

- Buildings with multiple departments will have a central mail drop/pick-up area.

MARKERBOARDS/CHALKBOARDS

- Porcelain over steel or tempered glass

CORNER GUARDS

Food Service

- Stainless steel guards all outside corners in food-service areas

General Fund

- Guards on all drywall outside corners(corridors and public areas).

PARTITIONS

- No Accordion Door Partitions

COAT RACKS/HOOK

- No coat racks in general fund classrooms unless specifically requested.
- Provide double coat hook on general fund office door.

PEST CONTROL

- Evaluate new construction to reduce the ability for bird roosting.

BANNERS

- Use of banners must comply with the signage standards/requirements.



Ohio University
Architecture, Design and Construction Standards
Division 10 - Specialties

SIGNAGE

- It is the design professional's responsibility to coordinate and produce an evacuation plan. This is to be coordinated with the Project Manager and Risk Management and Safety.
- SEE APPENDIX 10.2: SIGNAGE and 10.2.1 INTERIOR SIGNAGE STANDARDS MANUAL

TELEPHONE EQUIPMENT

- See Division 28 for Emergency phone requirements

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

-----END OF SECTION-----

REVISION DATE: 03-21-12, 01-21-14, 04-03-14, 08-11-15



Ohio University
Architecture, Design and Construction Standards
Division 11 - Equipment

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

SINGLE SOURCE PRODUCT

- N/A

PRODUCTS NOT PERMITTED

- N/A

REQUIREMENTS: REVIEW ALL EQUIPMENT WITH PROJECT MANAGER

- All equipment specified by the Design Professional with “or equals” must have the same MEP and space requirements. If an “or equal” is listed the Design Professional must provide model numbers to assure the manufacture has equal equipment. DO NOT provide approved manufacturers only.
- The Design Professional is responsible for reviewing with the Project Manager all equipment requirements. The Design Professional is responsible for reviewing the base bid and “or equals” to insure they meet the intent and requirements of the project.
- All equipment shall be reviewed and approved by the Project Manager and Design Professional. This includes the mechanical requirements, electric, steam, refrigerants, etc.

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

-----END OF SECTION-----

REVISION DATE: 03-12-21, 01-21-14, 04-03-14



Ohio University
Architecture, Design and Construction Standards
Division 12 - Furnishings

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

SINGLE SOURCE PRODUCT

- Corian Solid Surface

PRODUCTS NOT PERMITTED

- N/A

REQUIREMENTS

ART

- The university encourages incorporation of public art in university projects. The exploration of public art in a university project will be led by the Project Manager.

WINDOW TREATMENT

- Interior windows shall not receive window treatments.
- Coordinate all window treatments, drapery will be provided and installed by the university unless otherwise directed. Match existing window treatments.
- Blocking for all window treatments shall be provided by the General Contractor.
- Standard window treatment is stack-pleat drapery except residence hall student rooms, research labs and public spaces. Drapery pockets need to be 5" recess with appropriate blocking.
 - Residence hall student rooms to be roller shades, provided and installed by General Contractor. Please check with Project Manager for specific information including sizes.
 - College Green: academic/administrative use draperies for standard treatment.
 - Window ceiling pockets: Window pockets in low ceiling areas must be large enough for maintenance and replacement of window treatments.

CASEWORK

Residence Hall Casework

- Plywood core box: veneer or HP Laminate
- Door fronts: Solid wood or HP Laminate w/ 3mm PVC edge band

- Drawer Fronts: Solid wood
- 5 knuckle hinge
- Ball-bearing Drawer Glides
- Bent wire pulls (ADA compliant)
- All countertops shall be Solid-surface (Corian, color: Sahara) with backsplashes.
- Toe kick with rubber base 4" height.
- Accommodate GFCI electrical outlet locations (sink/shelf; see detail)
- For configuration see Appendix xxxx (Reference Bush or Adams)

Academic

- Plywood core box: veneer or HP Laminate
- Door and drawer fronts: Solid wood or HP Laminate w/ 3mm PVC edge band
- 5 knuckle hinge
- Ball-bearing Drawer Glides
- Bent wire pulls
- No laminate countertops in wet areas. All wet areas should have a backsplash.
- No countertops in restrooms (use wall hung sinks)
- Toe kick with rubber base 4" minimum

WASTE RECEPTICLES

- No built-in. Coordinate locations for free-standing waste/recycling containers.

ENTRANCE MATS

- Provide 25' of walk-off material including exterior. Coordinate with flooring in General Fund buildings.



Ohio University
Architecture, Design and Construction Standards
Division 12 - Furnishings

- Exterior with overhang coordinate owner provided walk-off mat i.e. door under cut
- Interior with airlock: wall-to-wall flooring walk-off carpet tile. provide interior walk-off
- Interior without airlock: provide walk-off material

SITE FURNISHINGS

- See Appendix 12.1 SITE FURNISHINGS

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

-----END OF SECTION-----

REVISION DATE: 03-21-12, 04-03-14



Ohio University
Architecture, Design and Construction Standards
Division 13 – Special Construction

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

SINGLE SOURCE PRODUCT

- N/A

NOT PERMITTED PRODUCTS

- N/A

REQUIREMENTS:

FOUNTAINS

- All fountains may only be used with Variance Form.
- Shall have an approved domestic recharge line. It is desired to have chemical injection lines in the piping.

FABRIC STRUCTURES

- Fabric Structures may only be used with Variance Form.

BLEACHERS

- Must have input from EH&S (Environmental Health & Safety Department)

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

-----END OF SECTION-----

REVISION DATE: 03-21-12, 03-11-14

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

SINGLE SOURCE PRODUCT

- BEST cylinder keyed switches

NOT PERMITTED PRODUCTS

- N/A

REQUIREMENTS:

- Elevator type shall be reviewed and approved prior to Design Development.
- All keyed electronic switches must be able to accommodate BEST 7 pin cores (i.e. light, fans, stop/start override, etc.).
- Coordinate all emergency phone requirements.
- When electronic swipe card access is required, coordinate requirements, locations and owner supplied equipment.
- All elevator equipment and controls shall be non-proprietary.
- Any cooling required for elevator equipment rooms shall not be connected to district chilled water/building chillers. It must be serviced by an independent DX unit.
- Elevator machine and/or equipment rooms shall be acoustically treated.
- The elevator subcontractor shall provide evidence that a service office is located within 45 miles of the installation and a warehouse of parts is maintained within 100 miles. Service must be performed within 12 hours of the initial report.
- Passenger entrapment being of utmost concern, a maximum 45 minute response time is required on all callbacks. Upon Failure to meet this requirement, the University will call another maintenance company and the expense will be passed to the contractor. If the contractor fails twice on arriving to the site, the University will hire another Contractor to fulfill the agreement for the balance of the contract and pass the cost to the Contractor.
- The University prefers tractionless, gearless elevator. It is the University's intent to utilize a hole-less hydraulic elevator if necessary with eco-friendly oil.



Ohio University
Architecture, Design and Construction Standards
Division 14 – Conveying Equipment

- Project specifications shall include 3 manufacturers that can provide elevator systems/hoistways and cars to fit within the specified requirements/shaft size.
- A service light shall be provided at the top of the shaft and at the bottom of the shaft.

FINISHES:

- Finishes shall be coordinated.

Lighting

- Vandal-resistant fixtures with energy-efficient lamps shall be used.

GENERAL BUILDINGS

- Paint shall not be used as a finish.
- Door front, controls, trims, etc. to be stainless steel skin/covering.
- No painted doors and frames.
- Floors shall be carpet squares, 12x12 VCT or sheet goods. Coordinate with the Project Manager.

RESIDENCE HALLS

- Paint shall not be used as a finish.
- Door front, controls, trims, etc. to be stainless steel skin/covering.
- No painted doors and frames.
- It is preferred to use aluminum diamond plate for car floors.

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

-----END OF SECTION-----

REVISION DATE: 03-21-12, 03-14-14

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

SINGLE SOURCE PRODUCT

- Knox Box by KNOX COMPANY, No substitutions

NOT PERMITTED PRODUCTS

- N/A

REQUIREMENTS:

COPIES OF FIRE SUPPRESSION LICENSES REQUIRED TO BE ON SITE DURING PROJECT ACTIVITIES.

KNOX BOX

- See Appendix 10.1 KNOX BOX ORDER FORM
- Location adjacent to main entrance, coordinated with Project Manager/City of Athens Fire Chief.
- Project Manager is to provide small scale drawings.
- General Contractor to coordinate order form with Project Manager.
- Design to be based on KNOX-VAULT 4400 Series #4444 Recessed

FIRE SPRINKLER PIPING

- Design drawings shall indicate location of all drain locations, inspector test ports and stair standpipe. All drain locations shall be coordinated. Design Professional of record and Project Manager to review shop drawings prior to submission to state.
- All sprinkler systems shall be drained to outside of the building.
- PIV located exterior of building split from domestic water. Must accept Best padlock, provided by owner.
- In unheated areas a dry system is preferred.
- Each floor shall have a supervised isolation valve.
- Sprinkler head braided flex connections not permitted.
- Schedule 40 steel pipe only.
- Piping material types shall not be intermixed i.e. do not mix black and galvanized piping.

Ohio University
Architecture, Design and Construction Standards
Division 21 – Fire Suppression

FIRE PUMP

- Coordinate audio/visual water flow indicator type/location(s).
- All drain lines shall be copper with sweat fittings.
- All associated plumbing hardware shall be properly supported.
- All pump discharge lines shall be monitored for flow at their respective locations.
- PVC piping shall be provided on packing bowls and casing relief valve if permissible by applicable codes.

STANDPIPES

- All penetrations to standpipe shall have a drill doughnut/coupon permanently attached at location.
- All standpipe locations shall be coordinated.

KITCHEN HOODS

- Coordinate all kitchen hood systems.
- All associated components shall be properly labeled.
- Each hood system shall have its own pull station and suppression system.

RESIDENCE HALL

- Approved plastic pipe shall be considered.
- All residence hall apartments that have cooking facilities shall have heat only detection in the immediate area.
- Self-contained suppression hoods required in all common cooking areas.

LIFE SAFETY

- For all life safety requirements, refer to Section V – Environmental Health and Safety.

FIRE SYSTEM IMPAIRMENT

- For information pertaining to Fire System Impairment refer to Section V – Environmental Health and Safety Guidelines.

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

-----END OF SECTION-----

REVISION DATE: 03-21-12, 06-11-14, 5-8-15

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

SINGLE SOURCE PRODUCT

- N/A

NOT PERMITTED PRODUCTS

- Dielectric Unions
- Sweat Valves

REQUIREMENTS:

DOMESTIC WATER (COLD & HOT)

- No dielectric unions- use threaded bronze body valve, bronze nipple in place.
- All piping to be copper, type "L" or heavier wall thickness only.
- No compression fittings; soldered joint connections only. Pipe diameters above 2" shall be brazed.
- No grooved joint piping permitted.
- Domestic hot/cold water metering- see Division 33 Utilities.
- Provide a backflow preventer with flanged connections, no by-pass, with valves on both sides.
- Threaded ball valves on all lines up to 3" (no sweat valves). Flanged ball valves on all lines up to and including 6".
- Use of butterfly valve by variance form only.
- Provide isolation valves for each restroom/area.
- Provide hot water recirculation pump and return, no heat traced piping.
- Lavatory faucets shall have ¼ turn isolation stops.
- Building main water pipe to be class 53 or heavier ductile iron with tracer lines.
- Restrain joint fittings and powder coated valves on all ductile iron piping.

- All underground domestic piping shall be GPS located and shall be reflected on as-built drawings.

SANITARY WASTE AND VENT

- No sewage ejectors to be used without *Variance Request Form*; see APPENDIX I.1.
- Coordinate location of grease interceptor, if required, prior to design development.
- Clearly show all clean outs and access on drawings and review prior to bidding.
- Cast Iron no hub piping with 4 band mechanical clamp required above grade.
- Below grade schedule 40 PVC or cast iron with tracer wire.
- All underground sanitary piping shall be GPS located and shall be reflected on as-built drawings.
- Lavatories shall be required to have 17 gauge chrome plated brass P-traps.

FLOOR DRAINS

- All exterior area drains must have drainage slope indicated on the drawing with elevations.
- RESIDENTIAL HOUSING
 - All restroom floors MUST be sloped from corners of the room to the floor drain. Show drainage slopes on the drawings. Contractor is responsible for water testing- demonstrating to the project manager positive drainage to floor drain before flooring is installed. Any area that has ponding water must be corrected before final floor is installed.
- GENERAL FUND
 - In new construction provide floor drains. Show slope to floor drain.

PLUMBING FIXTURES

- Manual dual flush toilet/single flush urinals (no electronic flush valves).
- Electronic sensor lavatories. All fixtures to be hard wired. Battery sensors not permitted.
- Ceramic stem faucets only. Finishes should be polished chrome.



Ohio University
Architecture, Design and Construction Standards
Division 22 - Plumbing

- All sink drains shall be chrome plated, cast grid only.
- All locations with ADA roll-in showers provide a floor drain adjacent to the shower.
- Drinking fountains – Bubblers only, no electric water coolers. Water bottle fillers should be considered.
- RESIDENTIAL HOUSING- Provide a hose connection under the lavatories in gang restrooms/shower areas with hot & cold water for cleaning purposes. See Appendix

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

-----END OF SECTION-----

REVISION DATE: 03-21-12, 03-11-14

Ohio University
Architecture, Design and Construction Standards
Division 23 – Heating Ventilating, and Air Conditioning (HVAC)

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

SINGLE SOURCE PRODUCT

- N/A

NOT PERMITTED PRODUCTS

- N/A

APPROVED MANUFACTURERS

- CHILLERS
 - Carrier
 - Trane
 - York
- AIR HANDLING UNITS
 - Carrier
 - Trane
 - York
- VARIABLE FREQUENCY DRIVES
 - Allen Bradley
 - Baldor
 - Yaskawa

REQUIREMENTS:

- Motor Starters, Control Panels, & Variable Frequency Drives shall be mounted on wall at accessible height standing from floor. Meet NEC for all clearances. Equipment mounted VFD's are not acceptable. Preferred location for all electrical controls is on the wall. Provide note on drawings.
- Provide a Hand-Off-Auto (HOA) switch for all HVAC Equipment.
- Provide shut-off valves for all services into laboratory spaces to allow for single lab to be isolated. Locate shut-off valve in corridor/common space. It's preferred to have isolation valves per work station within individual labs.
- Isolate branch piping (heating hot water, chilled water) serving laboratory space. Provide Shut-off valves outside the lab space in accessible areas in addition to equipment isolation valves.

Ohio University
Architecture, Design and Construction Standards

Division 23 – Heating Ventilating, and Air Conditioning (HVAC)

- Locate main piping runs above corridors when possible, and provide isolation valves to shut down each floor or section of a floor.
- Locate all valves above coil pull line to allow coil to be removed without disruption to hydronic services to other units.
- Outdoor Design Conditions: 95°F DB/75°F WB for Summer and 0°F for Winter.
- For 100% outdoor air systems, size pre-heat coil for minus 26°F outdoor temperature which is the lowest recorded temperature in the area.
- Special areas such as Computer Rooms, Animal Rooms, Laboratories etc. shall have inside temperature and humidity requirements established during the conceptual phase.
- Unless otherwise required, indoor design conditions shall generally be 75°F DB and 50% RH in Summer and 70°F DB in Winter. These conditions shall be validated during conceptual phase.
- Coordinate HVAC system concepts during Programming. VAV systems with reheats are preferred.
- Heating hot water reheats are preferred. No electric or steam reheat systems. Variance forms for any deviations.
- Reheat coils should be located in corridors. Provide clearance for access and maintenance to equipment. Required equipment maintenance clearances shall be indicated on drawings.
- VAV boxes should be located in corridors. Provide clearance for access and maintenance. Required equipment maintenance clearances shall be indicated on drawings. Flex connections are only allowed on the low pressure discharge side of the box. No inlet flex connections permitted.
- 5 ½" high concrete housekeeping pad for all equipment.
- All rotating equipment shall be provided with vibration isolation.
- It is the University's preference to not use internally insulated duct. Variance form for all deviations.
- No un-insulated duct work. Exceptions: Exhaust ductwork and return ductwork in conditioned space.

Ohio University
Architecture, Design and Construction Standards

Division 23 – Heating Ventilating, and Air Conditioning (HVAC)

- All flexible connections to the supply diffusers should be insulated. Also, the supply diffusers should be insulated.
- No flexible connections on medium and high pressure duct work including connections to terminal boxes.
- It is preferred for 4" and above valves to have insulation bags.
- All piping at terminal boxes should be insulated up to the coil.
- All Hydronic piping shall have automatic air-vents at high-points and drains at low-points.

HEATING HOT WATER

- Heating and Hot Water Pumps
 - 100% redundancy is required.
 - VFD with electrical bypass shall be considered on all heating hot water systems.
 - Triple duty valves are not preferred.
 - No dielectric unions unless approved. For dielectric isolation of valves, use threaded bronze body valve and bronze nipples on both sides. Place unions on both sides.
 - Piping 2" and below type "L" copper, 2 ½" and over shall be copper or welded steel pipe.
 - No compression fittings; soldered joint connections or threaded joint required for copper piping.
 - No grooved piping permitted.
 - Provide isolation valves on each piece of equipment/zone. Indicate location on drawings.
 - Threaded ball valves on all lines up to 2" (no sweat valves). 2 ½" and higher flanged ball valves on all lines up to 8". Bronze valves with copper piping. Carbon Steel valves with steel piping.
 - Provide automatic air vents and drain valves as required.

CHILLED WATER

Ohio University
Architecture, Design and Construction Standards
Division 23 – Heating Ventilating, and Air Conditioning (HVAC)

- Design chilled water systems and air handling coils for 16°F ΔT. Chilled Water Supply Temperature of 42°F and Chilled Water Return Temperature of 58°F.
- Chilled Water Design Pressure = 150 psig. Test building systems at 1 ½ times the design pressure. Test Direct Bury Systems for 1 times the design pressure.

CHILLED WATER PUMPS IN THE BUILDING

- 100% redundancy is required.
- VFD with electrical bypass.
- Triple duty valves are not preferred
- No dielectric unions unless approved. For dielectric isolation of valves, use threaded bronze body valve and bronze nipples on both sides . Place unions on both sides.
- Piping 2" and below type "L" copper, 2 ½" and shall be over copper or welded steel pipe.
- Welded Joints shall use the gas tungsten-arc welding process for the root pass of all circumferential butt welds. A consumable insert ring shall be used for fit-up as required. The consumable insert ring material shall be compatible with the pipe material.
- No compression fittings; soldered joint connections or threaded joint required for copper piping.
- No grooved piping permitted.
- Provide isolation valves on each piece of equipment/zone. Indicate location on drawings.
- Threaded ball valves on all lines up to 2" (no sweat valves). 2 ½" and higher, flanged ball valves on all lines up to 8". Bronze valves with copper piping. Carbon Steel valves with steel piping.
- Use High-Performance Butterfly Valves for pipe sizes greater than 8" diameter.
 - ANSI/AWWA C504 Class 150B
 - Body: Ductile.
 - Trim, disc and shaft: Ductile and Stainless steel.
 - Seat: Buna N/EPDM bonded non-replaceable
 - Actuation: Hand wheel worm gear.
- Approved Valves:
 - Milliken Model 511
 - K-Flo Series 500, Model 504

Ohio University
Architecture, Design and Construction Standards
Division 23 – Heating Ventilating, and Air Conditioning (HVAC)

- Mueller Lineseal XP
- Kennedy Valve 4500

- Provide automatic air vents and drain valves as required.
- Chilled Water Metering - see Division 33 Utilities.
- Chilled Water Distribution Piping – see Division 33 Utilities.

STEAM/CONDENSATE PIPING

- Condensate metering- see Division 33 Utilities.
- Minimum schedule 80 Carbon Steel pipe for condensate return
- Minimum schedule 40 Carbon Steel pipe for steam supply
- Design all building service piping for 150 psi steam pressure

RESIDENCE HALLS

- 4 pipe fan coil units are required.
- Project requires 2-4 additional units for parts.
- DDC control
- All units must have standard filter size. 1 extra set of filters must be supplied.
- Condensate drain pan overflow switch
- DC variable speed fan
- Thermostat:
- Digital display
- Adjustable room temperature ($\pm 4^{\circ}\text{F}$ range set)
- Durable
- No battery for power
- Minimum 6' wire length required



Ohio University
Architecture, Design and Construction Standards

Division 23 – Heating Ventilating, and Air Conditioning (HVAC)

HVAC WATER TREATMENT

- Step 1: Project Manager is responsible for witnessing flushing and pressure testing of all piping systems.
- Step 2: Project Manager shall verify all chemical treatments have been properly preformed prior to acceptance.

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

-----END OF SECTION-----

REVISION DATE: 12-02-13

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

SINGLE SOURCE PRODUCT

- Square D Distribution Equipment
- Square D panel boards/ distribution panels

NOT PERMITTED PRODUCTS

- Square D VFD (variable frequency drives)

REQUIREMENTS:

PRIMARY TRANSFORMERS

- All transformers must have a primary switch.
- All transformers must be copper windings primary and secondary.
- All building transformers to be exterior to the building, Variance Form must be submitted for all interior installations.
- Exterior installation should include some type of screening.
- All transformers must be certified PCB free.
- All installations shall require spare conduits/raceways to be coordinated with the university.

SECONDARY TRANSFORMERS

- Coordinate location with the university; all transformers to be pad-mounted floor level in primary mechanical/electrical rooms
- Must have copper windings, primary and secondary.

HIGH VOLTAGE DISTRIBUTION

- All copper buss.
- METERING; see metering section.
- All high voltage distribution cables must be copper conductor, no splicing permitted. Variance form required for all deviations.



Ohio University
Architecture, Design and Construction Standards
Division 26 –Electrical

- It is the University's goal to implement Remote High Voltage Switching for safety where practical.
- Campus distribution is 12,470V typical; coordinate location.
- It is desired to have 1 spare switch for all new high voltage line-ups; please design for future expansion.

GENERAL REQUIREMENT

- Bolt in breakers are required.
- 25% spare breakers in panels.
- No shared neutrals.
- All conductors shall be copper.
- All circuits must have ground wires.
- ¾" trade size conduit, minimum (No ½").
- PVC conduit permitted underground only.
- All conductors must be in a conduit/raceway.
- No BX, Arma Flex or MC cable permitted.
 - 6' maximum MC light fixture whips only
 - A variance form is required for any other use
- University prefers 277V lighting circuits.
- GFCI circuits
 - No feed through circuitry.
 - Point of use protection; no GFCI breakers.
 - GFCI required in all common spaces.

- All duplex outlets must be minimum 20amp back wired, spec grade.
- All device covers must be stainless steel or vinyl.
- Review light switches/occupancy sensors/energy requirements during design development.
- All standard toggle lighting/control switches must be minimum 20amp back wired, spec grade.
- Minimum 12 gauge copper wire.
- University desires a limited amount of lamp diversity
 - 2' or 4' straight lamp T5 fluorescent fixture.
 - a. 18 cell parabolic lens is the smallest allowable lens (no egg crates).
 - Accent lighting to be LED type fixtures.
 - All fixtures must be accessible by a 6' ladder, variance form required for deviations.
 - Residential housing: all fixtures must be vandal proof (**Kenall**) tri-level lighting.
- Minimum 4 sq. x 2 1/8" box size.

EXTERIOR LIGHTING

- Minimum Acceptable Lighting Levels
 - High Pedestrian Activity, High Volume Parking Lots, Parking Garages: .75 FC (8 LUX)
 - Primary Walkways, Primary Streets: .50 FC (5 LUX)
 - Secondary Walkways, Secondary Streets: .25FC (3LUX)

VFD

- Allen Bradley, Baldor, or Yaskawa drives are preferred.
- All rotating equipment shall have a grounding ring installed.
- Inverter duty motors required.

MOTORS



Ohio University
Architecture, Design and Construction Standards
Division 26 –Electrical

- University prefers 90%+ efficient electric motors.
- All motors 1 HP and above shall be 3 phase.
- University prefers HOA switches on all motor controls.
- Motor starters shall be equipped with electronic overload protection.

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

-----END OF SECTION-----

REVISION DATE: 03-21-12, 05-05-14



Ohio University
Architecture, Design and Construction Standards
Division 27 - Communications

SINGLE SOURCE PRODUCT

- N/A

NOT PERMITTED PRODUCTS

- N/A

REQUIREMENTS:

- **Please see all OIT requirements in APPENDIX 27.1: OIT SPECIFICATIONS**
- An Office of Information and Technology (OIT) representative needs to be invited to attend the kick-off meeting and all construction, scheduling, and progress meetings.
- Main Telecommunication Rooms and Telecommunication Rooms need to be completed and turned over to the owner early in the project. This item shall be a milestone in the project schedule.
- Coordinate all conduit sizes with OIT.
- Coordinate water proofing efforts for all below grade MTR's/TR's rooms with Project Manager.
- Coordinate heat gain and electrical requirements of MTR's/TR's rooms with Project Manager. This information will be based upon building requirements/occupancy loads.

-----END OF SECTION-----

REVISION DATE: 03-21-12, 05-06-14



Ohio University
Architecture, Design and Construction Standards
Division 28 – Electronic Safety and Security

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

SINGLE SOURCE PRODUCT

- The preferred vendors for security systems are ADT, EPS, and Simplex.

NOT PERMITTED PRODUCTS

- N/A

REQUIREMENTS:

SECURITY SYSTEMS

- The intent is to have consultant designed systems.
- All panels must be flush mounted with a locking cover that accepts a Best 7 Pin small format interchangeable core.
- Show all conduits and box locations on all drawings during Design Development.
- All security devices shall be painted blue with a blue reflective surface.
- Provide one courtesy phone location and conduit pathway on every floor in residence halls. Phone and communication lines provided by owner.
- Coordinate other alarms in the building with audible fire alarm signal. Any other building notifications shall be audibly distinguishable from fire alarm notification.

VIDEO SURVEILLANCE SYSTEMS

- All Residence Hall renovations and construction should include video surveillance on the interior and exterior of all exterior entrances. Other projects may include video surveillance.
- Hardware model shall be provided by the University during Design Development. Project Manager will coordinate with necessary University staff.
- Show all camera locations on drawings during Design Development. Camera locations shall be reviewed and approved by the Ohio University Police Department.
- All exposed cabling shall be in secured raceway or conduit.



Ohio University
Architecture, Design and Construction Standards
Division 28 – Electronic Safety and Security

- All camera cabling shall terminate in the nearest telecommunication closet (cameras are IP based).

BLUE LIGHT EMERGENCY PHONES

- Type: Code Blue
- Coordinate locations of building based emergency blue light phone system at main entrance of every building. University will provide, contractor will install blue light phone system.

ELECTRONIC FIRE ALARM SYSTEMS

COPIES OF FIRE SUPPRESSION LICENSES REQUIRED TO BE ON SITE DURING PROJECT ACTIVITIES.

- The preferred vendors for fire safety systems are Edwards United Technologies, Siemens and Simplex.
- All electronic fire alarm signaling and monitoring systems shall use Simplex 4100ES or newer equivalent as basis of design with voice notification and auto-dialer secured in the fire alarm panel.
 - Fire alarm equipment may be owner supplied.
 - Fire alarm equipment and installation may be purchased from state contract.
 - Fire alarm equipment and installation may be bid through the project.
 - Approved equivalent manufacturer considered by variance form only.
- The two communication lines shall be coordinated.
- Coordinate exterior locations of weather-proof, approved covered speakers and strobes.
- Stopper II required in all pull station locations in residence halls.

Ohio University
Architecture, Design and Construction Standards
Division 28 – Electronic Safety and Security

- During design development the Design Professional shall establish a required decibel level with the Project Manager. Ambient noise level shall be evaluated with the Project Manager during design development.
- An allowance for additional A/V devices shall be coordinated.
- All fire alarm devices and locations shall be labeled in such a way that they are readily identifiable.
- All single conductor fire alarm wire shall be stranded.
- Smoke detection shall be installed in an accessible location at the top of each stairwell as required per applicable code.
- Fire alarm wiring shall be contained in red conduit except where necessary in coordinating with building finishes.
- All ceiling mounted fire alarm devices shall be white in color. All wall mounted fire alarm devices shall be red in color.
- Duct detectors shall be mounted externally on HVAC ductwork with sampling tubes as required in a serviceable location. No in-duct smoke detection devices.

FIRE PANELS

- Alarms with secondary priority shall not be connected to fire panels; i.e. door monitoring alarms and eyewash station monitoring shall not be connected to fire panels.
- Coordinate Facilities Management requirements for system programming and panel user interface during design development.
- Ensure device descriptions in the panel programming provide room numbers. Corridor device descriptions shall provide nearby room number and stairwell labeling shall match provided building map. Please refer to Division 1 – General Requirements for room numbering.

RESIDENCE HALLS

- Location of fire alarm devices shall be coordinated to avoid nuisance alarms that may be caused by cooking, makeup areas or showers.
- Multi-criteria detection devices are required for all private living areas/combustion equipment areas.



Ohio University
Architecture, Design and Construction Standards
Division 28 – Electronic Safety and Security

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

-----END OF SECTION-----

REVISION DATE: 03-21-12, 03-11-14, 5-8-15



Ohio University
Architecture, Design and Construction Standards
Division 31- Earthwork

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

SINGLE SOURCE PRODUCT

- N/A

NOT PERMITTED PRODUCTS

- N/A

REQUIREMENTS:

- Consultants shall review all state, local and federal codes including well head protection regulations, city of Athens hillside ordinance and current EPA regulations during Schematic Design.
- Sites that require engineered fill need to be reviewed for surcharge requirements. (This will impact the schedule and require review.)
- Consultant will provide all details for erosion and sediment control.
- Imported fill shall be tested to be free and clean of all hazardous materials. Test results shall be provided by a certified testing lab.
- Consultants should have geo-technical report. Review all proposed boring locations.
- Consultant to review all foundation options.
- Consultants should develop allowances for cut and fill, possible unforeseen conditions. Consultant is responsible for site analysis to determine the possibility of all foreign materials.
- Any deep foundation shall have an add/deduct for quantities above or below estimated amount on bid form.
- Project Manager shall coordinate material testing laboratory contractual responsibilities.
- The consultant shall prepare plans and specifications that address site constructability issues. The intent is to protect the project site from saturated soils, eroded conditions;
 - Utility trench locations



Ohio University
Architecture, Design and Construction Standards
Division 31- Earthwork

- Building foundations
 - Parking lots and roadways
 - Erosion Control
 - All disturbed areas by construction equipments/vehicles and any other related activity.
- Consultants are responsible for reviewing and administering Division 00 Standard Requirements for site protection.
 - Contractors are responsible for the cleaning of all University and city streets/ sidewalks and adjacent areas. (See Appendix 31.1: GROUNDS)
 - Consultant is responsible for reviewing all general requirements; Division 1 General Requirements and Division 32: Exterior Improvements, Section: FENCING

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

-----END OF SECTION-----

REVISION DATE:03-21-12

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

SINGLE SOURCE PRODUCT

- N/A

NOT PERMITTED PRODUCTS

- N/A

REQUIREMENTS:

ROADWAYS, SIDEWALKS, AND PARKING LOTS

- University Project manager/design professional must coordinate with Parking Services to determine preliminary scheduling, impact to campus, road and lot closure/fees.
- All parking bump blocks must be pinned each end 5/8" minimum steel pins.
- Locate all utilities on drawings. Refer to appendix 33.2 for existing utility locating procedures. At this point project manager/design professional will determine if further investigation is necessary.
- Contract documents shall specify contractor to mark all utilities on site before any excavation.
- Coordinate all pavement marking colors.
- Coordinate specific parking space usage including ADA, state vehicle, motorcycle, departmental vehicle, alternative vehicle and bicycle parking.
- Provide a concrete collar/apron: minimum 3' from edge of casting.
- Catch basin shall be minimum 4 sq. ft. drainage opening.
- All drainage grating should be AASHTO H-20 rated. Bicycle proof grates are required.
- Seal coating requires 2 coat minimum, first coat to be squeegee. Proven sustainable seal coating is preferred.
- All pavement joints shall be detailed on civil drawings.
- No asphalt curbs or sidewalks

- Coordinate ADA curb cuts.
- Concrete sidewalks to be 5 ½” minimum thicknesses.
- Concrete sidewalk shall have a broom finish.
- Minimum of 4” compacted crushed limestone base required below sidewalks.
- Coordinate width of sidewalks based on quantity of pedestrian traffic.

ADA RAMPS

- Desire of the University for all ramp slopes to be 1:20 ratio.
- All handrails/ guardrails to be coordinated.

BRICK WALKS

- 5 ½” concrete base minimum, 8” minimum in traffic areas.
- Integrated, anchored galvanized edge banding; see Appendix XX
- Bituminous layer and mastic between concrete and brick is preferred.
- Basis of design shall be Pine Hall Pathway Full Range, 4”x8” (standard) or Belden – regimental full paver. Pre-installation meeting required
- Lugged masonry units by permission only.

BRICK DRIVES

- Bituminous layer and mastic between concrete and brick is preferred.
 - Basis of design shall be Pine Hall Pathway Full Range, 4”x8” (standard) or Belden – regimental full paver. Pre-installation meeting required
 - Lugged masonry units by permission only.
 - 8” concrete base minimum
- Topsoil shall be back filled and hand tamped to the top of the adjacent paved surfaces in lawn areas. Final surfaces should be anticipated to insure that positive area drainage occurs.

FENCING AND GATES

- All permanent chain-link fences shall have green vinyl coated components and 9 gauge minimum metal fabric
 - Top rail, mid rail and bottom rail
- Temporary Fence (Residence Halls)
 - Provide privacy screen, mid, top and bottom rail with appropriate anchoring
- Temporary Fence (All other areas)
- Ornamental Fencing/Handrails/Guards
 - Style shall match adjacent railings
 - Anchoring Methods: A/E shall submit calculations for anchoring design and details.

BOLLARDS

- Typical design
- Coordinate lock function if located in roadway/fire access.

RETAINING WALLS

- No split-face concrete masonry units.
- Coordinate all retaining wall materials/finishes.

CONCRETE: Reference Division 3

- No stamped or stained concrete
- All vertical exposed surfaces shall be uniformly rubbed/parged
- Show all control joints in expansion detailing on drawings
- Patio areas shall have reinforcing wire installed in accordance with ACI 318
- All areas shall have positive drainage; show drainage plan on drawings.



Ohio University
Architecture, Design and Construction Standards
Division 32 – Exterior Improvements

- Positive drainage, no ponding at building entry ways. Accommodate finish elevation for exterior walk-off mats where required (3M Nomad). Direction of drainage and slope shall be noted on the drawings.
- All exposed concrete walls shall have an aesthetically consistent finish.
- Exterior concrete steps shall be broom finished. No integral cast/tooled nosings.
- Review floor flatness requirements.

ROADWAY MARKINGS

- Hot applied striping / marking are preferred on concrete. Coordinate all markings and colors.

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

-----END OF SECTION-----

REVISION DATE: 03-21-12, 01-07-14

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

SINGLE SOURCE PRODUCT

- N/A

NOT PERMITTED PRODUCTS

- N/A

REQUIREMENTS:

- No buried tanks.

ELECTRICAL

- SEE DIVISION 26 ELECTRICAL

CHILLED WATER DISTRIBUTION PIPING

- Chilled Water Distribution Piping Systems shall be installed only by contractors having a current State of Ohio Contractor's License for Hydronic Piping Systems.
- All chilled water pipe shall be ductile iron restrained joint pipe, pressure class 350.
- All direct bury piping shall be a fully (100%) restrained system. Manufacturer shall be pre-qualified prior to letting.
- Current Pre-Qualifications:
 - o U. S. Pipe TR-Flex system, except no "Gripper Rings" are permitted.
- Cut-Joints for Restrained Joint Piping Systems shall be field welded in accordance with manufacturer's requirements.
- All valves for chilled water mains shall be enclosed in concrete valve vaults.
 - Piping for vaults shall take into account the ergonomics required for maintenance operations.
 - All vault piping shall require a contractor shop drawing for review and approval.
 - Chilled Water Vaults shall meet all Tunnel Standards.
- Velocity for pipe sizing shall be no greater than 10 ft per second.
- All direct buried chilled water supply piping shall be pre-insulated.

- Chilled Water Branches shall have a ductile iron valve box with lid marked "CHILLED WATER".
- Chilled water design pressure to be 150 psig. Direct Bury DIP Systems shall test pressure 1 times design pressure witnessed by Project Manager.
- Long radius elbows are preferred
- All piping systems shall be protected against corrosion in accordance with AWWA standards.
- High-Performance Butterfly Valves
 - ANSI/AWWA C504 Class 150B
 - Body: Ductile iron full face flange.
 - Trim, disc and shaft: Ductile and Stainless steel.
 - Seat: Buna N/EPDM bonded non-replaceable
 - Actuation: Hand wheel worm gear.
- Approved Valves:
 - Milliken Model 511
 - K-Flo Series 500, Model 504
 - Mueller Lineseal XP
 - Kennedy Valve 4500

WATER SUPPLY SYSTEM

- All pipes shall be ductile iron restrained joint pipe, pressure class 350.
- 3 valve piping configuration shall be provided to minimize future connection utility outages.
- All water service piping shall be in full compliance with the standards of the local community supplying water. In addition, to conform to the following:
 - A minimum of 42" cover shall be provided over the underground pipe to prevent freezing.
 - Domestic water service and fire service must be separated outside the building and incorporate a PIV (Post Indicator Valve).
- All piping systems shall be protected against corrosion in accordance with AWWA standards.
- Coordinate all work with City of Athens design guidelines.

STEAM

- All steam/condensate piping shall be contained within a tunnel.

- Direct bury by variance form only.
- No butterfly valves permitted.

GAS AND AIR PIPING SYSTEMS

- Gas piping shall be high density polyethylene rated for gas service.

TUNNELS

- All tunnel hatches shall be rated for AASHTO H20 wheel loading.
- All tunnel hatches must be lockable, to accept a 7 pin BEST core and be self locking.
- All tunnels must have appropriate lighting and courtesy GFCI receptacle minimum every 100'.
- Lighting and GFCI on separate circuits.
- Utilities permitted in tunnels: Steam, condensate, condensate return, domestic hot water, heating hot water, compressed air, electric, and communications. Variance Form required for domestic cold water, chilled water supply and return.
- All tunnels require drainage, gravity drain preferred. Submit a Variance Form for use of pump. See Appendix I.1 VARIANCE REQUEST FORM
- All electric and communication shall be installed in trays or conduit, minimum height of 24".
- Coordinate all utility racking.
- Coordinate all expansion loops and expansion joints with your piping and valving, valve stem locations.
- For steam services, expansion loops are preferred. Deviations by Variation Form only.

SANITARY SEWER

- No clay pipes
- All structures shall conform to ODOT standards.

- Coordinate all work with City of Athens design guidelines.
- Consultant to coordinate EHS/EPA regulations and permitting.

STORM SEWER

- No clay pipes
- All storm water mains shall be reinforced concrete pipes conforming to ASTM C-76 or approved plastic.
- All structures shall conform to ODOT standards.
- See Division 32 Exterior Improvements for gratings.
- Coordinate all work with City of Athens design guidelines.

SUB DRAINAGE

- Use of corrugated, perforated pipes shall be minimized. Approval required.
- All below grade structures shall have sub surface drainage.

HYDRONIC PIPING

- Hydronic piping shall be installed by appropriately licensed contractor.

CULVERTS

- All culverts shall be concrete conforming to ASTM C-76, C-789, C-850.

MEDIUM VOLTAGE CABLE

- OU Spec on Medium Voltage Cable
 - 3/c Armored Cable--Okonite MV-90 Armor Clad cable or equivalent.
 - Single conductor cable shall be Rome-EPR power cable, 15000 volts, spec. 7292, single conductor, shielded, 133% insulation level AIEC CS6, MV-90 or approved equal.
- All splices in primary cable shall be performed by a Certified Cable Splicer. Splicers shall conform to the recommendations of the IPCEA and the cable manufacturer. Cable splicers shall

Ohio University
Architecture, Design and Construction Standards
Division 33 - Utilities

be certified by the Contractor submitting, in writing, the cable splicer's name and qualifications to the Engineer for approval prior to the beginning of any work.

- Phases shall be identified as Phase A, B, C at all splices with tags and attached with wire. Identify phase arrangement at switches so that when facing the front of the switch, Phase "A" shall be on the left, Phase "B" at the center, and Phase "C" on the right. Where phases are aligned front to rear, Phase "A" shall be front, Phase "B" center, Phase "C" at rear.
- Primary cable shall be wrapped with flame resistant tape where exposed in manholes and junction boxes. Contractor shall not block a manhole to such an extent as to prevent the full use of all available duct space. Cable placement in manholes shall be on insulated cable racks and so arranged as to conserve space and provide the accessibility of all cables for maintenance work.
- Testing: all primary cable shall have a D.C. Hi-Pot test performed per the cable manufacturer's recommendations, after the cable is installed and all splices and stress cones are completed, except those splices where connecting to existing medium voltage cable. Certified curves and tabulated data shall be submitted to the Engineer for approval prior to energizing the service.
- D.C. Hi-Pot Test applied to existing cables shall not exceed twice the rated voltage plus 1000 volts.
- All new medium voltage insulated distribution conductors and equipment shall be meggar tested after all final connections, splices, etc., are made, but before the system is energized.
- Contractor shall calculate the pulling strength required or otherwise measure in order to verify the installation complies with linear and sidewall tension allowed by the manufacturer.

METERING: See Appendix 33.1: METERING

- OVERVIEW

Ohio University will be metering total building utility consumption. This will be accomplished through the continuous monitoring of utilities via the Building Automation System (BAS) and the energy dashboard overlay (enteliWEB). The monitoring system, outlined in this Standard, is designed to provide accessible and accurate key performance metrics to inform the maintenance and operations team regarding the performance of campus buildings and central utility plants (CUPs). Service categories to be monitored are (more detailed list and instructions to follow):

- Electricity
- Steam/Condensate

- Heating Hot Water
- Chilled Water
- Natural Gas
- Domestic Cold Water
- Domestic Hot Water

This Utility Metering Standard provides a guideline for the necessary tools, communications standards, and techniques used to measure and record energy and water performance for OU buildings. This Standard also outlines the required implementation practices such as the methods for measuring and reporting building utility usage. The Building Automation System and Energy Dashboard (enteliWEB) will be used to collect, store and display the required utility data. See Diagram 1 for system architecture. The remaining goals of this Standard include:

1. Define the parameters that need to be measured and the associated data to be stored for long-term use/review.
2. Identify the general locations, types and characteristics of the measurement devices, and whether the devices need to be added, calibrated and/or connected to the BAS.
3. Indicate quality assurance measures and procedure for calibration of measurement devices.
4. Describe the method for establishing the baseline energy performance.
5. Define and distinguish the Team's Roles and Responsibilities.
6. Define the appropriate metrics and naming conventions that should be trended via the BAS and energy management dashboards.

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

-----END OF SECTION-----

REVISION DATE: 01-07-14, 08-07-15



Ohio University
Architecture, Design and Construction Standards
Appendix I.1: Variance Request Form

VARIANCE REQUEST FORM

Exceptions to any design requirement or construction requirement herein may be discussed and modified. The requirements are not meant to replace Professional judgment or practice. If deviations are necessary to satisfy the conditions of certain projects, the Professional must submit a request to the Project Manager and receive approval for such deviation in writing from the Associate Vice President of Facilities.

Date Submitted: _____ Date Response Needed: _____

Project Name: _____

Project Manager: _____

Design Professional: _____

Reason for request(Pros & Cons – Cost, Operation, Maintenance, Etc.):

Approved: Assoc. VP Facilities: _____

Date: _____

Remarks: _____

Copy to effected depts. _____

Revision: 03-23-12



Ohio University
Architecture, Design and Construction Standards
Appendix I.2: Standards Revision Form

DATE: _____

NAME: _____

TITLE: _____

COMPANY/DEPARTMENT: _____

DIVISION: _____

Please provide in writing any requested changes to the University Design Standards to the Director of Design & Construction. Include an explanation for your reasoning/request:

Approved (Director): _____

Date: _____

Remarks: _____

SIGNATURE: _____

Copy to effected depts. _____



OHIO
UNIVERSITY

Ohio University
Architecture, Design and Construction Standards
Appendix I.3: Sign-Off Form for Revisions

DATE: _____

DIVISION: _____

NAME: _____

TITLE: _____

DEPARTMENT: _____

This form serves as verification that the above person has reviewed and approved any changes made to the section that is referenced above. Any future recommended changes can be made through a Standards Revision Form; See Appendix I.2.

SIGNATURE: _____



Ohio University
Architecture, Design and Construction Standards
Appendix CR.1: Design Compliance Form

This form is required at the submission of Design Development and submission of Construction Documents. This signed form will certify that the Ohio University Design and Construction Standards have been incorporated into the project. Any future recommended changes can be made through a Standards Revision Form; See Appendix I.2.

DATE SUBMITTED: _____ CONTRACT DATE: _____

RECEIVED STANDARDS DATED: _____

PROJECT NAME: _____

UNIVERSITY PROJECT MANAGER: _____

DESIGN PROFESSIONAL: _____

TITLE: _____

COMPANY: _____

Please complete the consultant deliverables checklist located [here](#).

SIGNATURE: _____



Ohio University
Architecture, Design and Construction Standards
Appendix CR.2: Meeting Minute Format

Coordinate with the University Project Manager to determine whether OAK CI will be used for the project. If OAK CI is not used, the following outline will be required. Follow current SAO Manual 0350 Meeting and Reports with the following modifications. Weekly progress meetings are required. All prime contractors are required to attend all meetings and must have signature authority. All items shall include a status, action by, and date required. Approve format and numbering system with University Project Manager.

PROJECT NAME:
PROJECT NUMBER:
MEETING NUMBER:
START DATE:
COMPLETION DATE:
DURATION:
PERCENT COMPLETE:

PARTICIPANTS:

1. All contact information must be provided including emergency phone numbers,
2. Document may be attachment or included in meeting notes

MEETING AGENDA

1. Health and Safety
2. Permits
3. Review Previous Construction Meeting Minutes; Record Exceptions
4. Review/Discuss Coordination Meeting Minutes
 - a. Report from Pre-Installation Meetings
5. Total Job Site Workforce/Manpower by prime contractors/subcontractors
 - a. Report Subcontractors activities and review their manpower for schedule compliance as well.
6. Contractor Progress Reports, work completed and work projected
7. Review Construction Schedule
 - a. Owner Supplied Equipment/Materials
8. Conflicts and Concerns
9. Submittals
 - a. Owner Supplied Equipment/Materials
10. Request for Interpretation

Revision: 03-23-12; 04-17-12

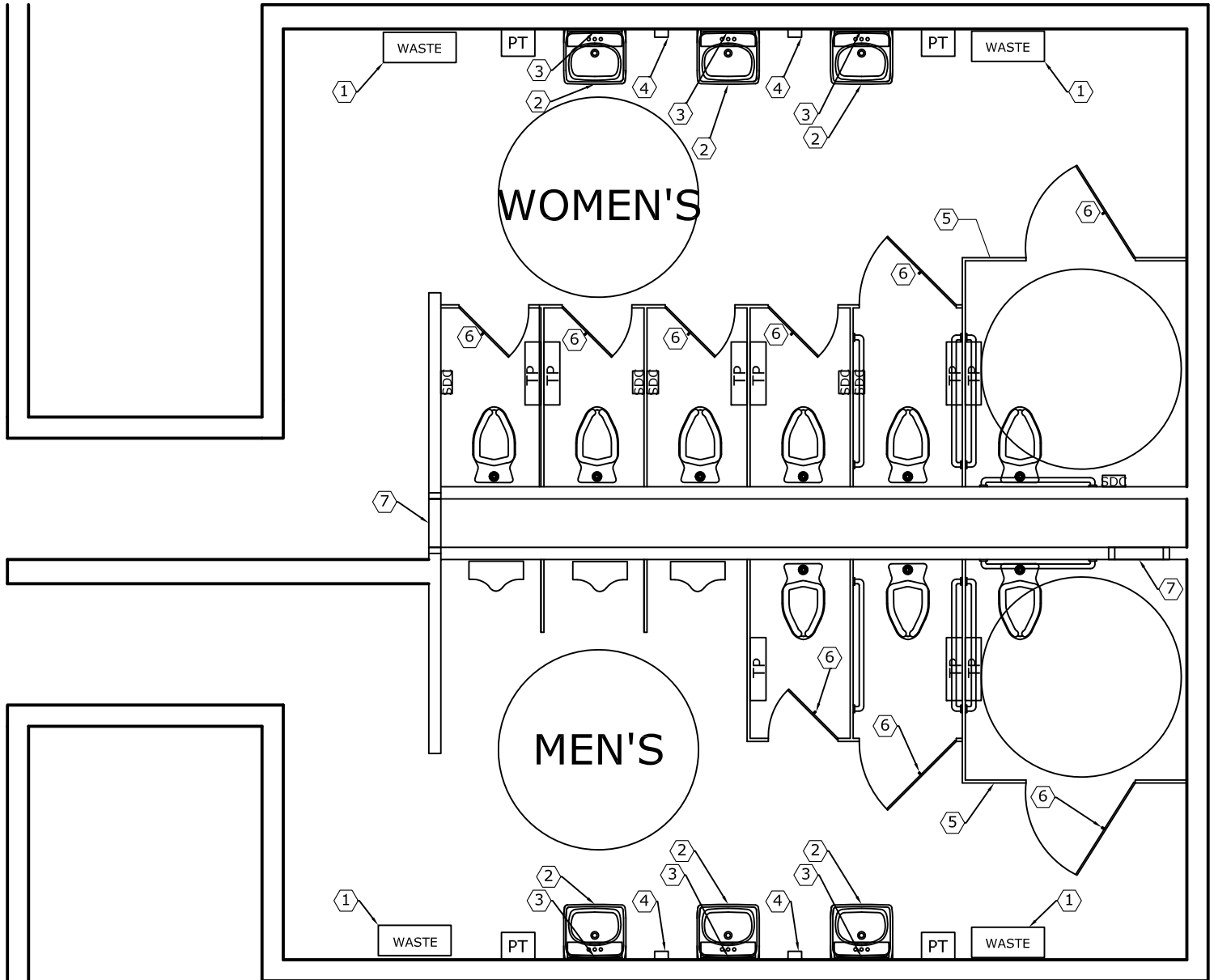


Ohio University
Architecture, Design and Construction Standards
Appendix CR.2: Meeting Minute Format

11. Field Work Orders
12. Change Orders
13. Pay Requests
14. Owner Discussion/Coordination
15. Old Business
16. New Business
17. LEED
18. Verification of next meeting time and location
19. Post Meeting Discussion

ATTACHMENTS:

- Submittal Log
- Change Order Log
- RFI
- Sign-in Sheet



CODED NOTES

1. WASTE RECEPTACLES TO BE FREESTANDING.
2. WALL HUNG SINK.
3. WALL MOUNTED MIRROR AND SHELF COMBO WITH HOOKS ABOVE SINK.
4. WALL MOUNTED SOAP DISPENSERS.
5. TOILET PARTITIONS TO BE CEILING AND FLOOR HUNG SOLID PHENOLIC.
6. COAT HOOK ON BACK OF DOOR.
7. ACCESS PANELS TO CHASE SPACE.

GENERAL NOTES

- MINIMUM OF (1) BABY CHANGING STATION PROVIDED PER BUILDING.
- (1) UNISEX BATHROOM TO BE PROVIDED PER BUILDING.
- ENTRY DOES NOT REQUIRE A DOOR.
- WET WALLS TO BE GLAZED TILE.
- 8" CMU WALLS FOR CHASE SPACE.
- INCLUDE A FLOOR DRAIN WITH SLOPE OF $\frac{1}{8}$ " PER FOOT.
- WALL MOUNTED TOILETS EXCEPT FOR ADA STOOL.
- ADA STALLS TO HAVE 5'-6" TURNING DIAMETER.
- TOILET PAPER DISPENSER TO BE MOUNTED ABOVE GRAB BAR (34" HIGH) WITH A 6" CLEARANCE.

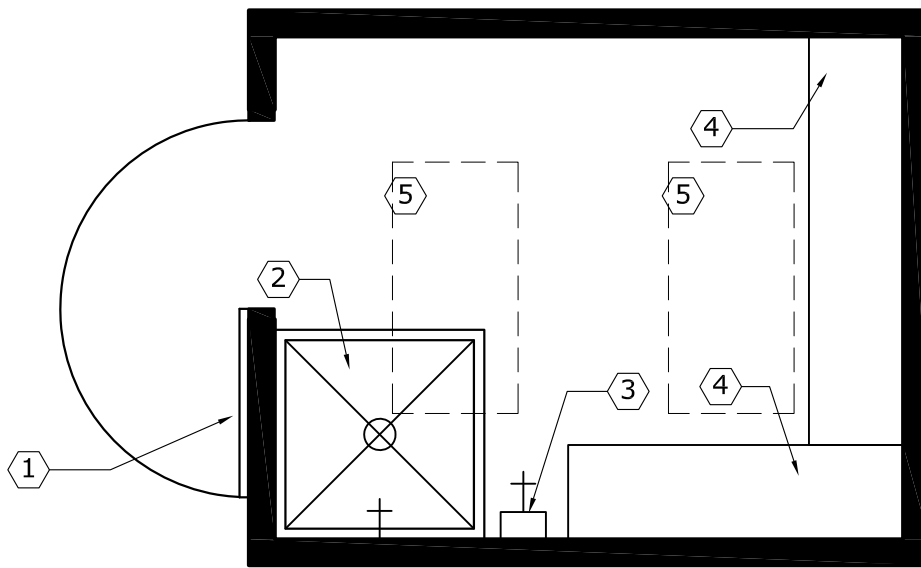
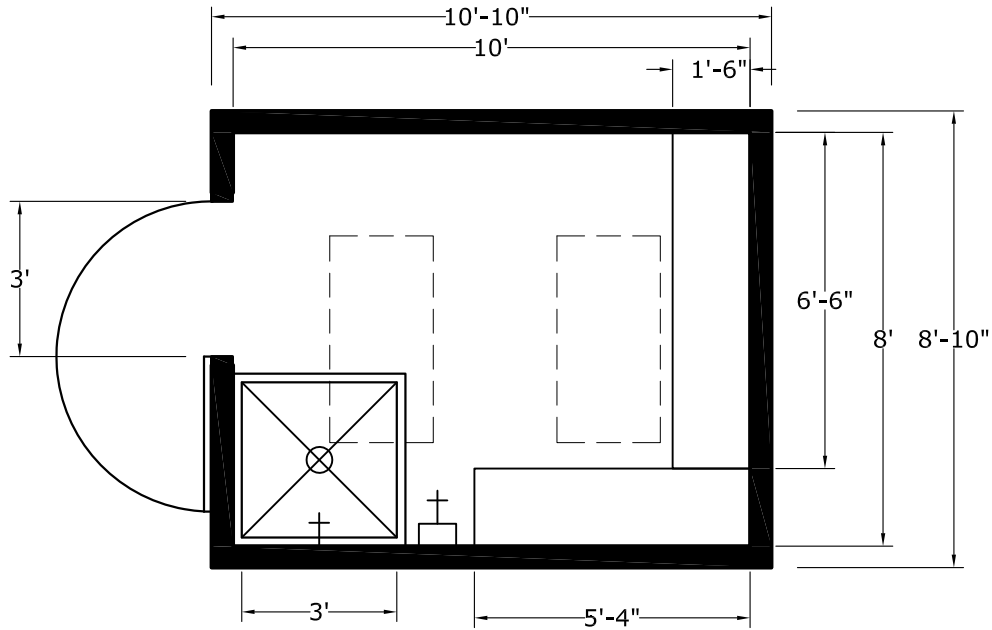
LEGEND

PT - PAPER TOWEL DISPENSER OR
HAND DRYER
SD - SOAP DISPENSER
TP - TOILET PAPER DISPENSER
SDC - SANITARY DISPOSAL
CONTAINER

Appendix DSG.1 Toilet Rooms

Appendix DSG.3

Secondary Custodial Rooms



NOTES:

1. DOOR OPENS OUT INTO CIRCULATION SPACE (WHERE CODE ALLOWS. SEE SECTION 1005 & 1017 OBC).
2. MOP SINK AT FRONT (3' SQUARE TYP) WITH HOT AND COLD WATER, BACKSPASH CONTINUED 4' UP FROM TOP OF SERVICE AREA.
3. SEPARATE DOMESTIC COLD WATER FAUCET.
4. OPEN METAL FREESTANDING SHELVING ALONG ONE SIDE AND BACK, THIRD WALL IF POSSIBLE.
5. LIGHT FIXTURES HAVE SHIELDS TO PROTECT LAMPS FROM DAMAGE.

GENERAL NOTES:

- ROOMS ARE TO BE FOR CUSTODIAL USE ONLY. NO CO-LOCATING WITH O.I.T., ELECTRICAL, OR OTHER.
- ROOMS ARE TO HAVE A FLOOR DRAIN WITH A SLOPE OF $\frac{1}{8}$ " PER FOOT.

Appendix DSG.2

Primary Custodial Rooms

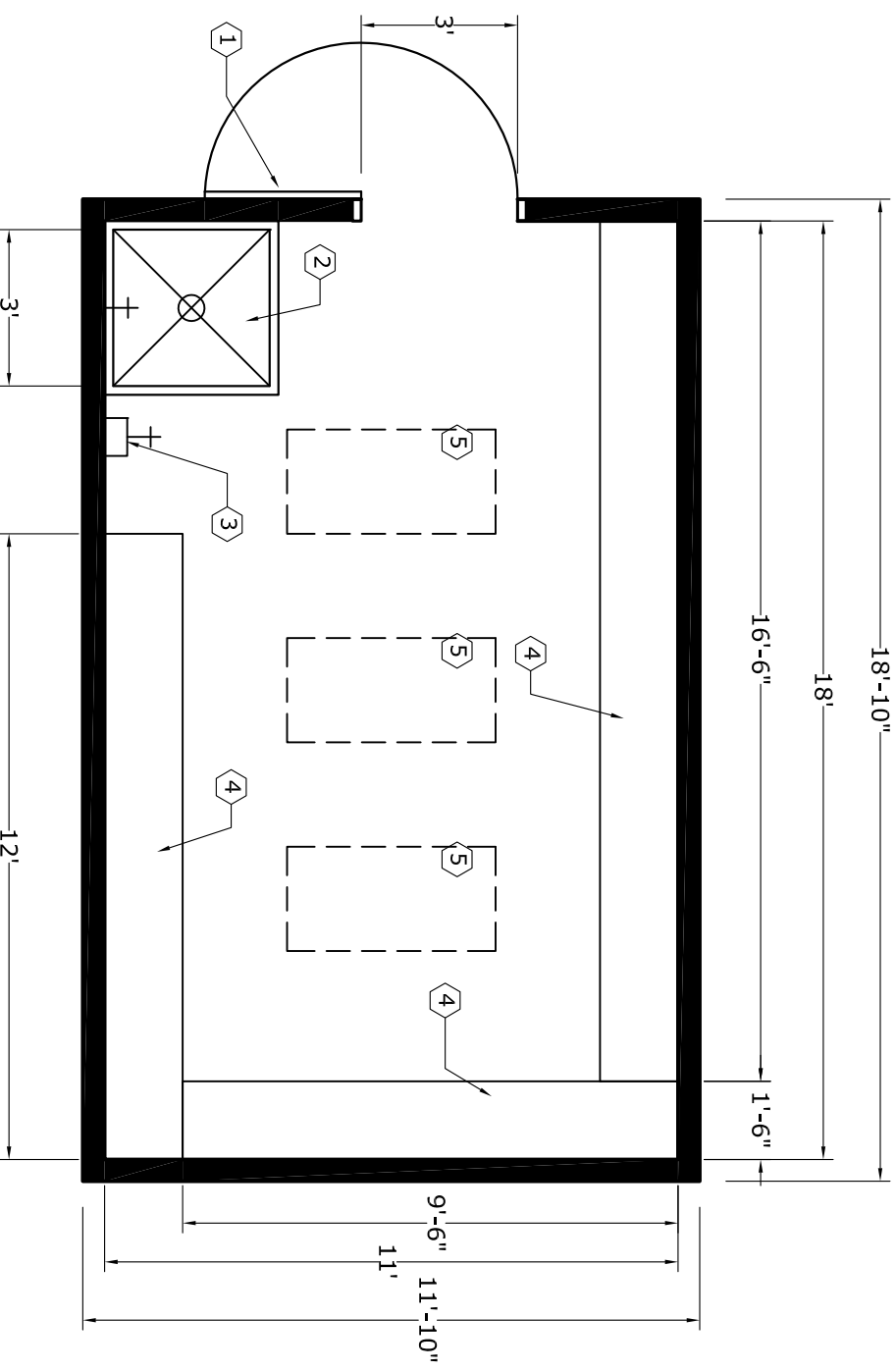
NOTES:

1. DOOR OPENS OUT INTO CIRCULATION SPACE (WHERE CODE ALLOWS. SEE SECTION 1005 & 1017 OBC).
2. MOP SINK AT FRONT (3' SQUARE TYP) WITH HOT AND COLD WATER, BACKSPLASH CONTINUED 4' UP FROM TOP OF SERVICE AREA.
3. SEPARATE DOMESTIC COLD WATER FAUCET.
4. OPEN METAL SHELVING ALONG ONE SIDE AND BACK, THIRD WALL IF POSSIBLE.
5. LIGHT FIXTURES HAVE SHIELDS TO PROTECT LAMPS FROM DAMAGE.

GENERAL NOTES:

- ROOMS ARE TO BE FOR CUSTODIAL USE ONLY. NO CO-LOCATING WITH O.I.T., ELECTRICAL, OR OTHER.
- ROOMS ARE TO HAVE A FLOOR DRAIN WITH A SLOPE OF $\frac{1}{8}$ " PER FOOT.
- MAIN CUSTODIAL ONLY

SCALE: $\frac{1}{2}$ " = 1'-0"



2004

Fire/Law Enforcement Rapid Entry System AUTHORIZATION ORDER FORM



Section 1 **ORDERED BY - PRINT ONLY** **Effective July 1, 2004**

COMPANY / NAME

STREET (NO P.O. BOXES) SUITE / BUILDING

CITY STATE ZIP CODE

CONTACT NAME

PHONE NUMBER P.O. NUMBER (GOV. AGENCIES ONLY)

CHECK BOX IF SHIPPING ADDRESS IS DIFFERENT. SEE SECTION 5

Send this form with payment to:
KNOX COMPANY
1601 W. Deer Valley Road,
Phoenix, AZ 85027

Section 2 **ORDER WILL NOT BE PROCESSED Without Authorized Signature**

Athens Fire Dept
61 North Columbus Rd
Athens OH 45701

Robert Tropea
Authorized Fire Agency Signature
PS-37-181-09-91

Robert Tropea
Print Name Clearly

System Code

IMPORTANT NOTE - Knox® Master Keys are provided to authorized fire departments or other registered entities on an as-needed basis solely for use with the Knox Rapid Entry System. No other use of the keys or their associated codes is authorized. Key codes associated with the Knox Master Keys and Keyways remain the property of the Knox Company and are maintained by the Knox Company in Irvine, California. For questions regarding this policy, contact Knox at 800-552-5669.

Section 3 **ORDER PRODUCT HERE**

Quantity	Part Number	Amount
		Total \$
		Total \$
		Total \$

Shipping & Handling

1 lb. to 7 lbs. \$7.00
8 lbs. to 25 lbs. \$15.00
26 lbs. to 50 lbs. \$28.00
51 lbs. to 75 lbs. \$37.00

75 lbs.+ call Knox for quote. Alaska, Hawaii, Canada or Priority Shipping, please call for rates.

If required, add \$7.00 per submastered item

Shipping and Handling \$

Subtotal \$

NO TAX

Required Sales Tax \$

Pre-payment Total \$

PRE-PAYMENT INFORMATION REQUIRED **USE PRICE LIST ON NEXT PAGE**

Check or Money Order made payable to: **KNOX COMPANY** Federal I.D. #95-3617858

VISA AMEX MC DISC

CARD NUMBER EXP. DATE (MM / YYYY)

Cardholder Signature

Section 4 **INSTALLATION ADDRESS - REQUIRED BY FIRE DEPARTMENT**

1. BUILDING NAME (WHERE ITEM WILL BE INSTALLED)

ADDRESS

CITY STATE ZIP CODE

2. BUILDING NAME (WHERE ITEM WILL BE INSTALLED)

ADDRESS

CITY STATE ZIP CODE

Fire Department Approval Signature Required to Submaster Items

Check here to Submaster

Authorized Fire Agency Signature

Submaster fee \$7.00 per keyed item.

www.knoxbox.com
800-552-5669
623-687-2299
Fax: 623-687-2299

KNOX COMPANY

O/N

REC'D

SINGLE SOURCE PRODUCT

- N/A

NOT PERMITTED PRODUCTS

- N/A

APPROVED MANUFACTURERS

- Architectural Identification Inc.
- Columbus Graphics Inc.
- Diskey Sign Company
- REM Graphics and Signs LLC

REQUIREMENTS:

- For information on room numbering please see section IV. DESIGN SPACE REQUIREMENTS, a. ROOM NUMBERING.
- Cost for all signage to be included in project budget.
- Signage type and location to be shown on the construction documents, coordinated with Project Manager, and installed by the contractor.
- Donor Recognition Signage and Building Dedication Plaques will be provided by the University. Coordinate with the Project Manager during design development.

EXTERIOR

- All Exterior System Signage will be specified and provided by the University, coordinate through Project Manager.
- All existing exterior signage that is removed by the project to be turned over to the University Sign Shop.
- The use and installation of exterior architectural lettering will be on a project by project basis and coordinated with the project manager.

INTERIOR

- Reference Appendix 10.2.1 INTERIOR SIGNAGE STANDARDS MANUAL; All projects shall adhere to this standard. Coordinate with Project Manager.
- All interior signage that is removed by the project will be evaluated by the Project Manager for possible reuse.

Ohio University
Architecture, Design and Construction Standards
Appendix 10.2: Signage

- General Fund installed using double stick tape. All residential room identification signage must be glued and screwed to wall or door. Screw/Fastener to match paint color.
- All signage must be correct material and installation .i.e. add specifications to manual.
- Manufacturer must submit actual sample of sign. A pre-installation conference is required.
- Evacuation plans will be required in all buildings. It is the design professional's responsibility to coordinate and produce an evacuation plan. This is to be coordinated with the Project Manager and Risk Management and Safety.
- Rooms containing electrical, mechanical and fire safety equipment shall be given a type KK sign.

SIGNAGE MATERIALS

General Fund

- Cast Acrylic Sheet: Provide cast(not extruded or continuous cast) methacrylate monomer plastic sheet, in sizes and thicknesses indicated, with a minimum flexural strength of 16, 000 psi when tested according to ASTM D 790, with minimum allowable continuous service temperature of 176°F (80°C), and of the following general types
 - Transparent Sheet: Where sheet material is indicated as "clear", provide colorless sheet in matte finish, with light transmittance of 92%, when tested according to the requirements of ASTM D 1003.
- Fasteners: Use double-stick tape
- Colored Coatings for Acrylic Plastic Sheet: Use colored coatings, including inks and paints for copy and background colors that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are non-fading for the application intended.

Residential

- Photopolymer: For exact material specification please see University Project Manager.
- Fasteners: glued and screwed to wall or door. Screw/Fastener to match paint color.

-----END OF SECTION-----

REVISION DATE: 03-23-12, 08-06-15

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Section One – Project Overview

History and Overview

This manual is a working document that will guide Ohio University through the implementation of a comprehensive interior sign system for academic and administrative buildings. Under the supervision of Lynnette Clouse, Interior Designer/ Facilities Planner and Laurie Lovell, Coordinator of Campus Signage, the Ohio University Sign Committee guided the creation of this manual. Design Collective

Graphics, a division of Design Collective Incorporated (Columbus, Ohio) prepared this manual as a result of extensive research, planning and design. The goal of this document is to provide a detailed explanation of the components of the sign system which will be used to create and maintain a cohesive interior signage program.

The Goals and Strategies

The interior sign system is designed to guide the general public, academics, and students. The sign system complies with current ADA standards. The signs incorporate traditional design elements that work with all of a building's interior color selections, compliment the exterior signage system, and reflect the historic atmosphere of the campus. The basic design is a rectangular panel, with an arch at the top. The signs are to be durable and made of quality materials so as to add to the aesthetic appearance of the campus. The system is designed as a "navigational hierarchy". Signs greet the visitor inside the main entrance of buildings to inform and guide them to final destinations. The system is designed to be used effortlessly by the visitor, yet appear as a subtle visual element in all buildings. The system was

developed to minimize visual clutter. Even frames are part of the system to allow for a quality presentation of temporary signage (or non-permanent signs).

The Interior Signage Standards Manual is intended to be used by the University and its vendors as a reference book which will insure consistency. This manual is to be used by the University to create sign schedules for academic, administration and athletic buildings. A supplemental guide to this manual for residence halls and dining facilities is under study. Information contained in the manual will provide guidance to sign manufacturers and to the University for the fabrication of the signs. The manual is the guide to the Interior Sign System but the success of design depends on compliance.

Section Two – Sign Type Introduction

Explanation of the Hierarchy

The system is organized with a hierarchy based on the amount of information a visitor needs to navigate through a building. The types of signs are grouped into categories that move the visitor to a final destination. A didactic or informational category of sign for placement at destination is also included in the system.

Directories

Are located at the most prominent locations in the building, floor or section and supply information about the entire building, a floor or a section of the building.

- Large Building Directory (A)
- Main Floor Directory (B)
- Department Directory (C)
- Building Map and Cap (D)

Directional

Visually directs the visitor to one destination using text or symbols with an arrow.

- Single Destination Directional (E)
- Multi-Destination Directional (F)

Room Signs

Are Used at door ways to indicate a final destination.

- Room Number (G)
- Single Line Insert (H)
- Single Line Plaque with Insert (I)
- Multiple Line Insert (J)
- Small Plaques (K)
- Toilet Room Sign (L)

General Statement Signs

Are used where information of a permanent nature needs to be conveyed.

- Toilet Room Accessibility (M)
- Floor Numbers (N)
- Stairs Access (O)
- In Case of Fire..." (P)
- Area of Refuge (Q)
- Sprinkler Control Valves (R)
- Standpipe Control Valves (S)
- Fire Extinguishing Equipment (T)
- No Food or Drink (U)
- Designated Smoke Area (V)
- Room Occupancy Signs (W)
- Changing Station (X)
- Evacuation Plan Cap (Y)
- Temporary Information Frame (Z)

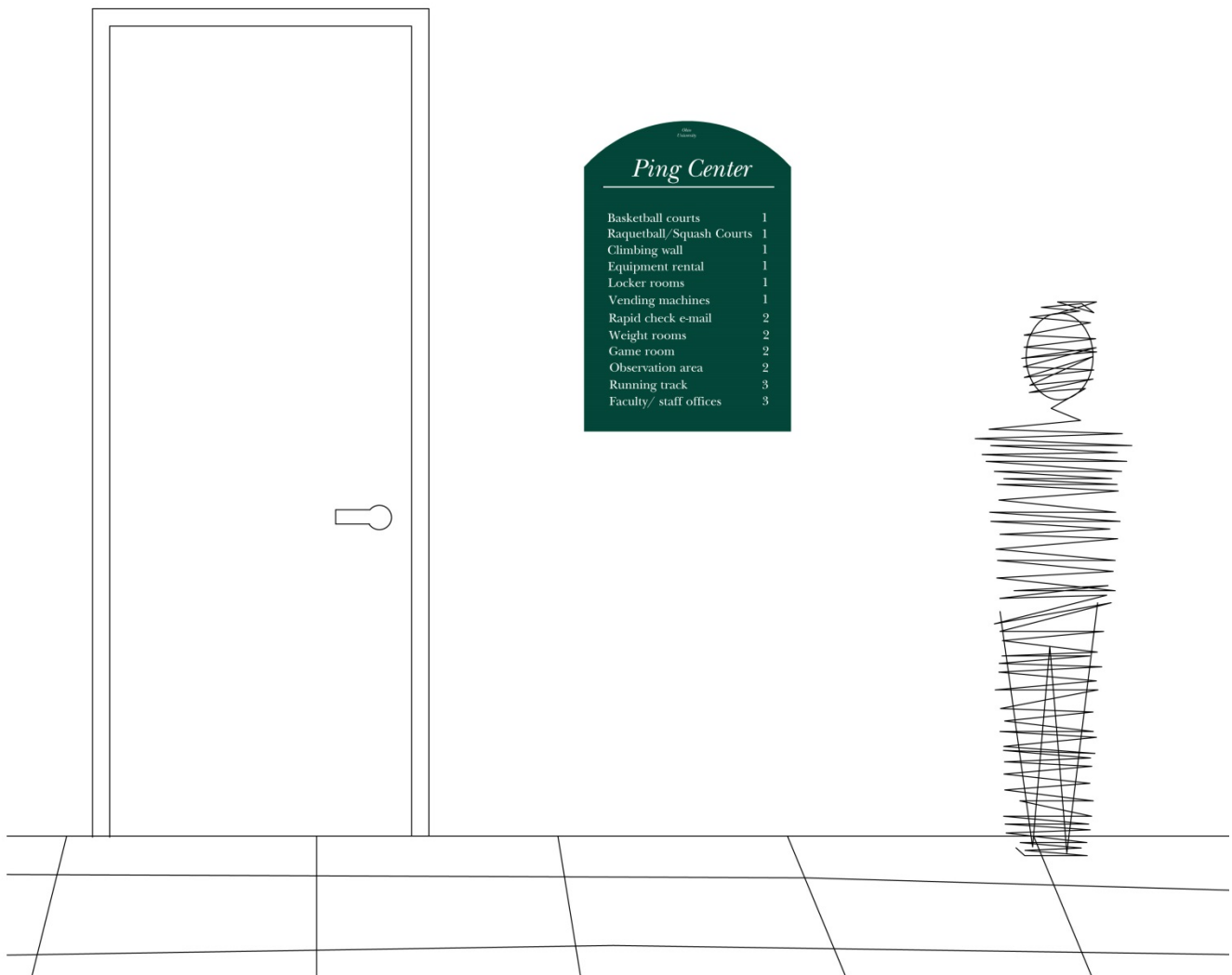
A General Description of the Types - Directories



Large Building Directory (A)

This sign type is located at the most prominent position of the main entrance(s) to a building and identifies uses of areas or department locations in the entire building. These large signs are constructed using a slat system that allows information to be changed, but are tamper-resistant. They may be used individually or in a series to accommodate larger lists.

A General Description of the Types - Directories



Main Floor Directory (B)

This sign type is located at the most prominent position at the main entrance(s) to the building and is used when information is more permanent and provides an overview of the building rather than the temporary information listed on the Large Building Directory. They inform the visitor of general destinations by floor. These large signs are constructed from a solid panel and are not changeable. This sign type complies with ADA sign design requirements; it has raised type.

A General Description of the Types - Directories



Department Directory (C)

This sign type is located at the next most prominent position in the building and in some cases may replace the Large Building Directory. These signs provide information about locations of individual offices or rooms with specific uses. This sign shares the same design as the Large Building Directory; a large sign, constructed using a slat system that allows information to be changed, but is tamper-resistant. It may be used individually or in series to accommodate larger lists.

A General Description of the Types - Directories



Building Map and Cap (D)

This sign type is used in conjunction with Large Building Directory and Department Directories to supply additional navigational information. The goal of this sign is to provide a floor plan that acts as visual information and to say 'you are here'. BMCs are simple frames that hold an 8 1/2" x 11" sheet of paper and have a curved cap that states 'Building Map'. The inserts may be updated but is tamper-resistant.

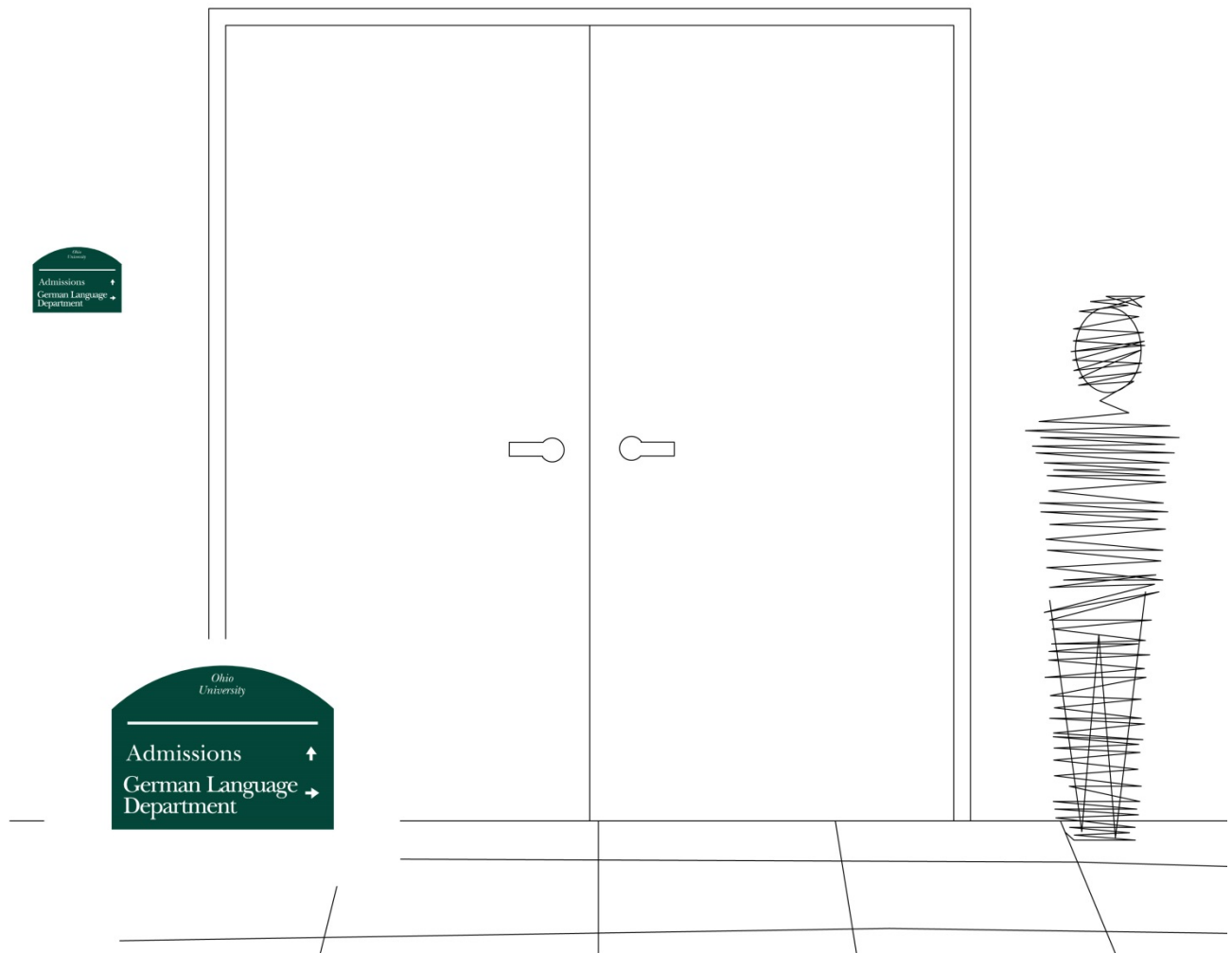
A General Description of the Types - Directional



Single Destination Directional (E)

This sign type directs the visitor to one destination using a single line of text with symbol and an arrow. Some specific uses are to direct the visitor to a range of room numbers, telephones, elevators for accessibility, or restrooms. This is a solid panel sign that has a permanent legend and complies with ADA sign guidelines; it has raised type.

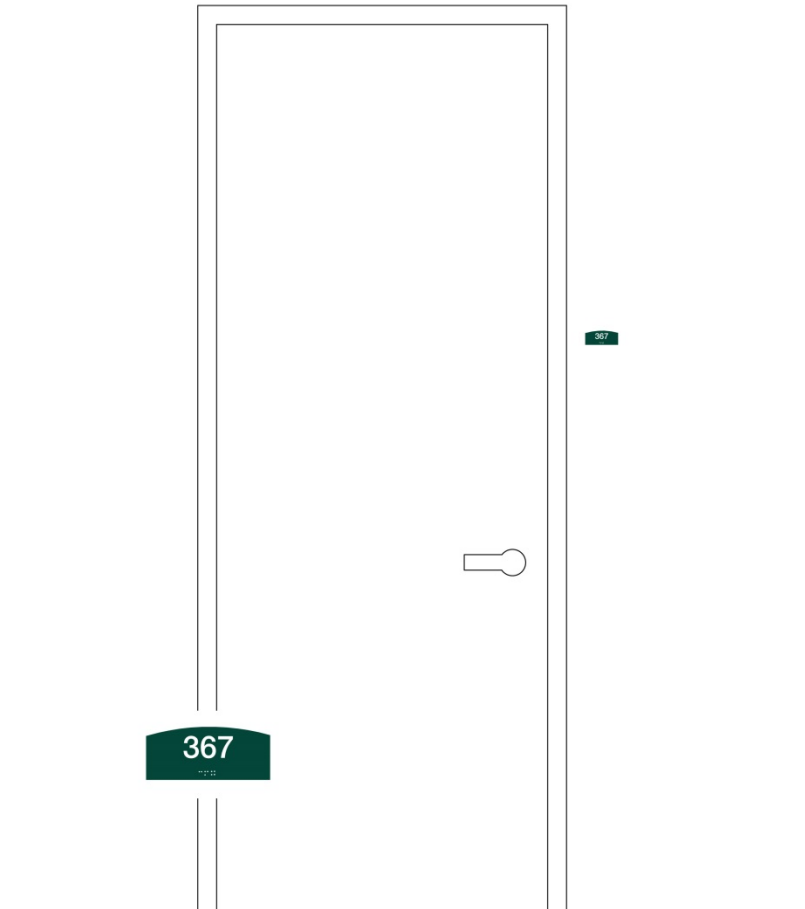
A General Description of the Types - Directional



Multi-Destination Directional (F)

This sign type provides direction to several locations using multiple lines of text and arrows. This is a solid panel sign with a permanent legend and complies with ADA sign guidelines; it has raised type. The panels for these signs can vary in height depending on the number of destinations listed, but will use the same width and top arch as a Single Destination Directional Sign.

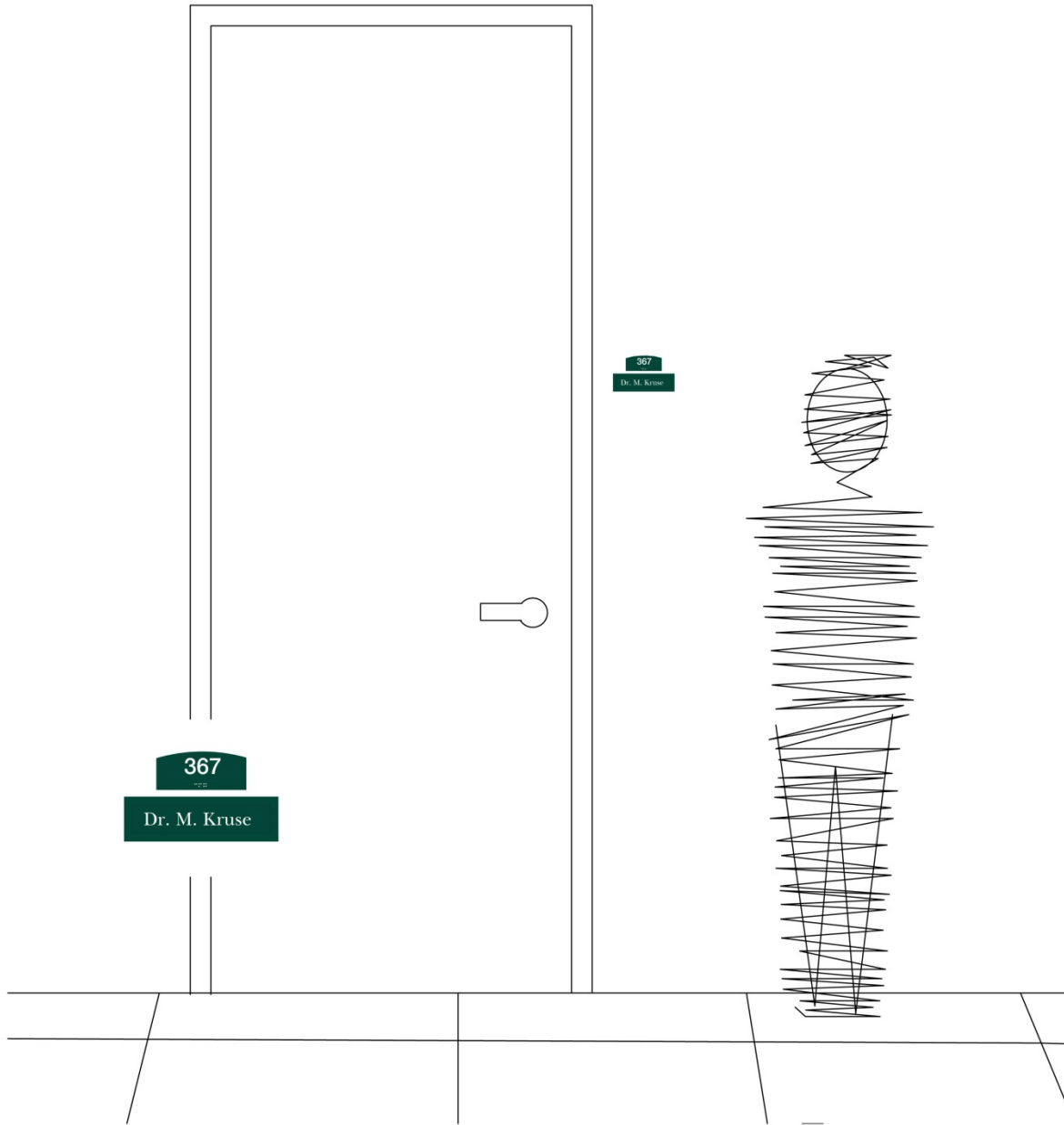
A General Description of the Types – Room Signs



Stand Alone Room Numbers (G)

This sign type is used at doorways to indicate the university assigned room number with a final destination for both general and maintenance purposes. This sign type complies with ADA sign design requirements; they have raised numbers and braille characters. These signs are designed to be unobtrusive and eliminate visual clutter. They are rectangular with an arched top and have a permanent legend.

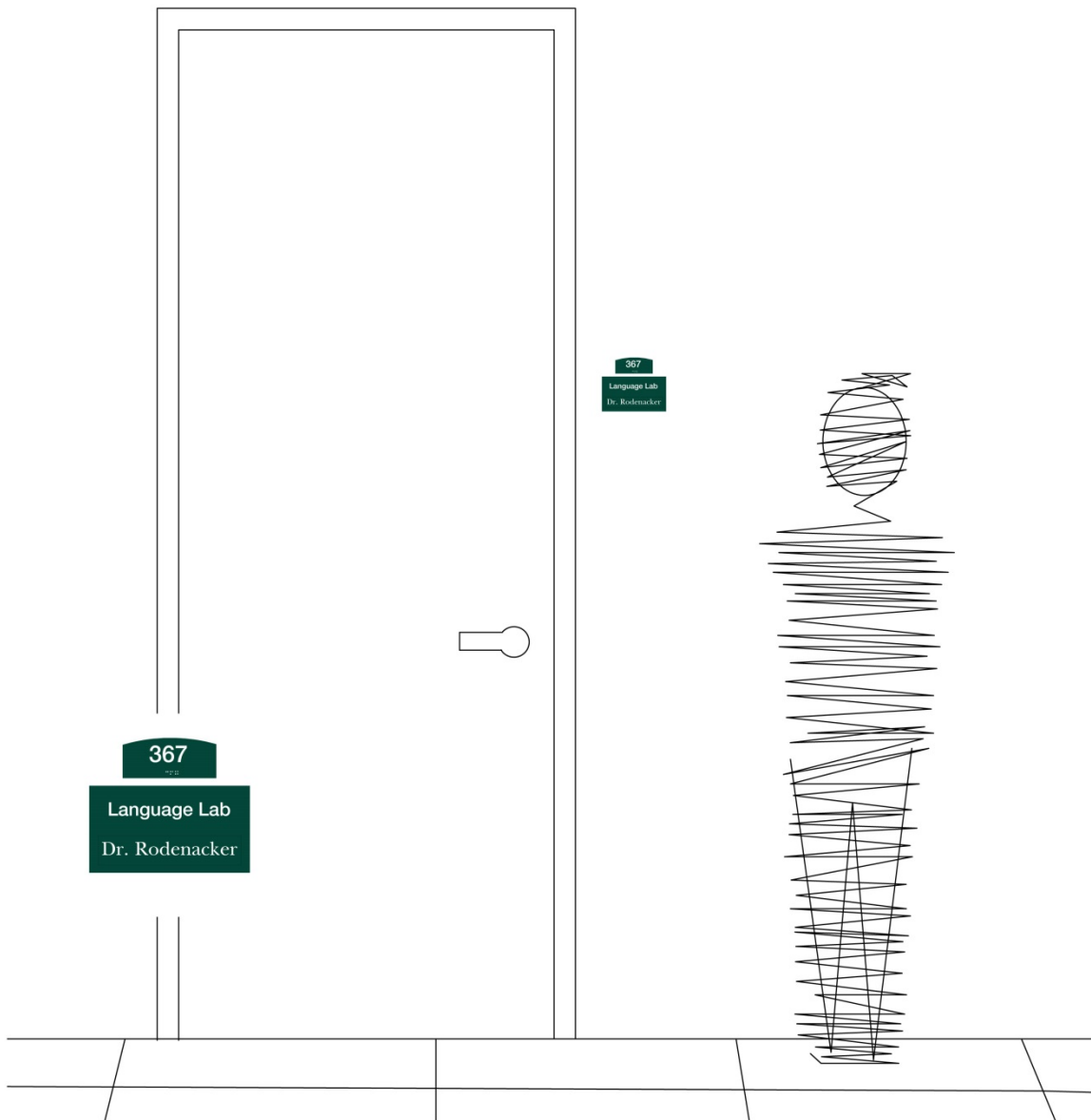
A General Description of the Types – Room Signs



Single Line Insert (H)

This sign type is a changeable sign used with room numbers to specify the occupant's name or temporary use for a room. The Type (H) sign works as an addition to the Room Number (G) sign.

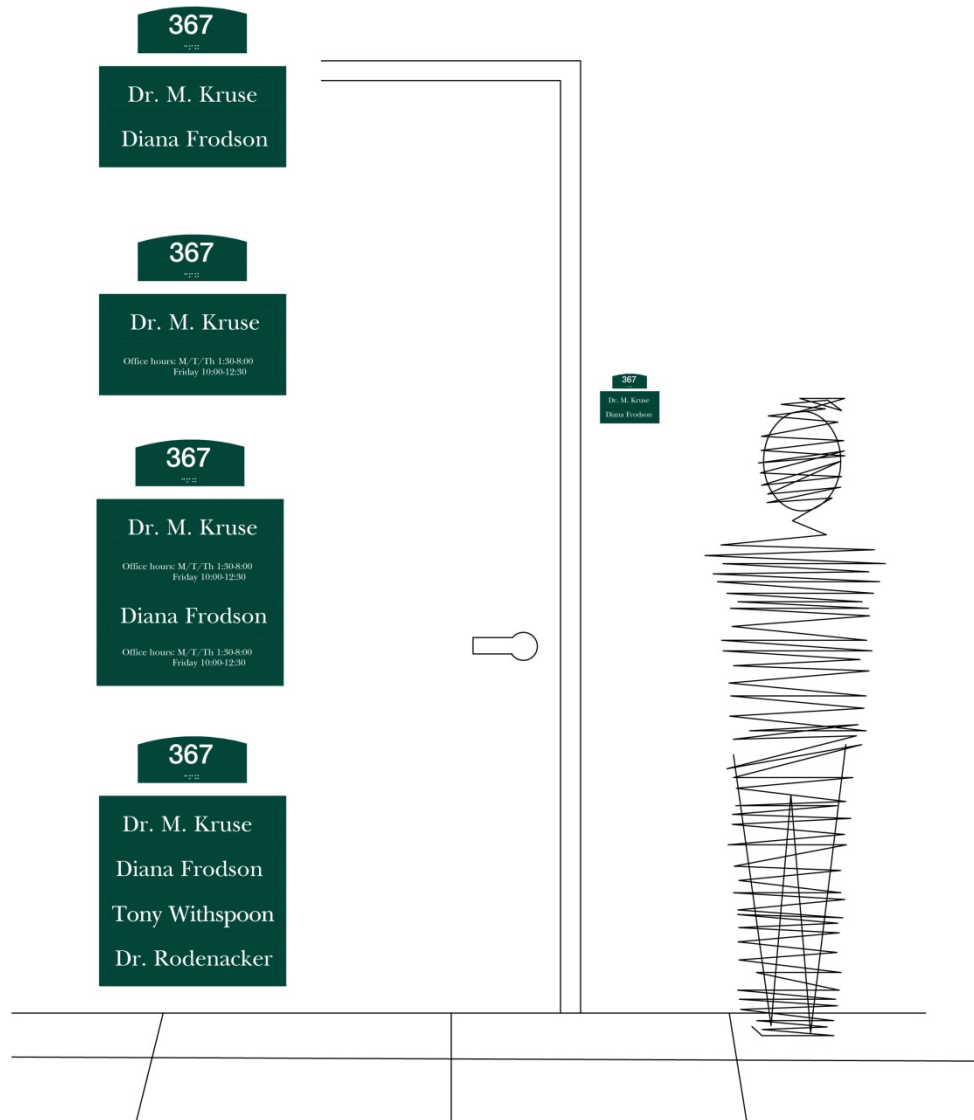
A General Description of the Types – Room Signs



Single Line Plaque with Insert (I)

This sign type is a changeable sign used with the Room Number (G) sign to specify a permanent use for a room with a changeable occupant. This sign type works as an addition to the Room Number (G) sign. I's are a combination of a plaque and a slot that allows information to be changed and is tamper-resistant.

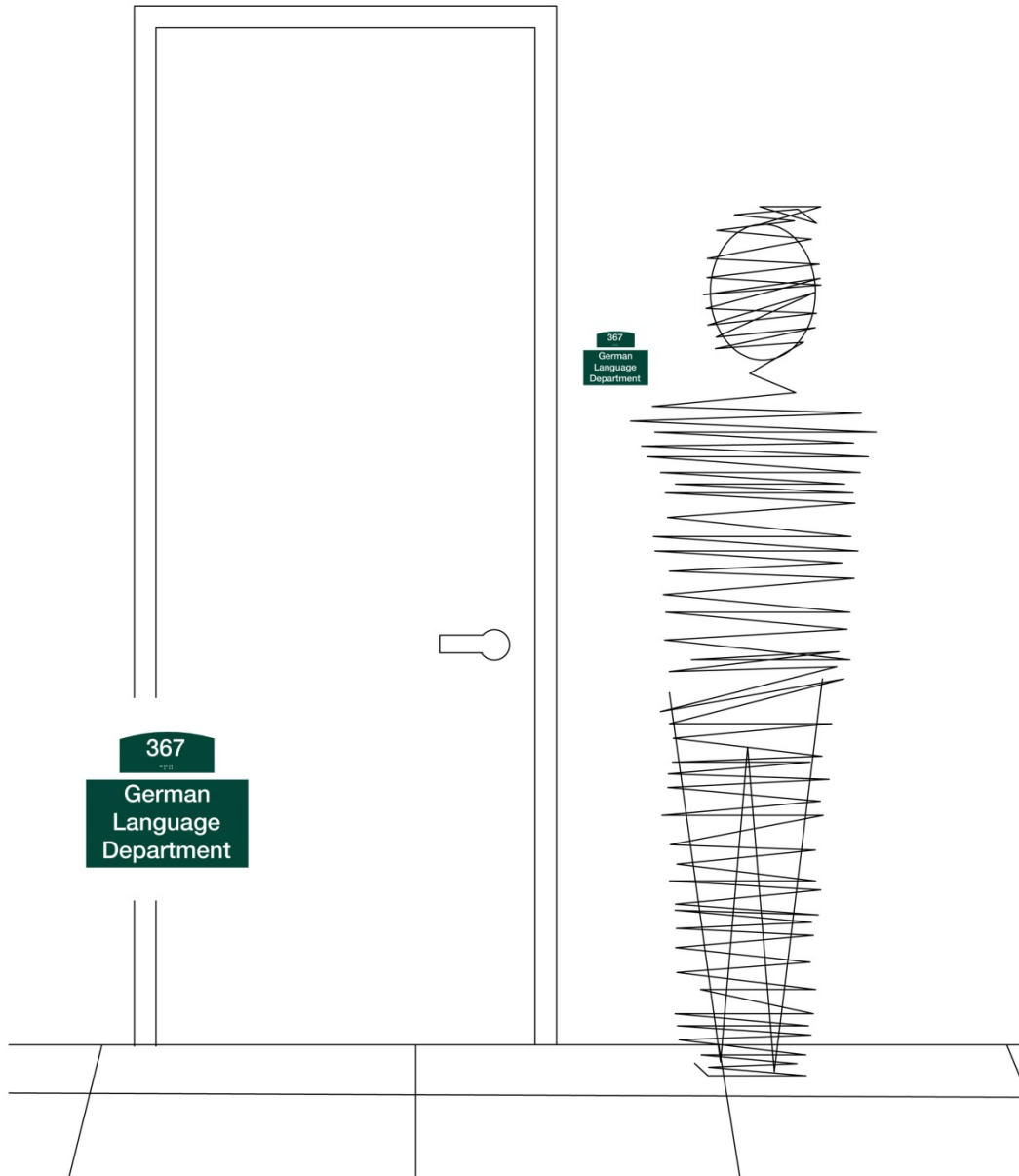
A General Description of the Types – Room Signs



Multiple Line Insert (J)

This sign type is used with room numbers to specify occupants(') name(s) and office hours, or a temporary use for a room. This sign works as an addition to the Room Number (G) sign. It is slotted to allow information to be changed and is tamper-resistant. It can be manufactured with up to ten slots; if more slots are required, Department Directory (C) should be used.

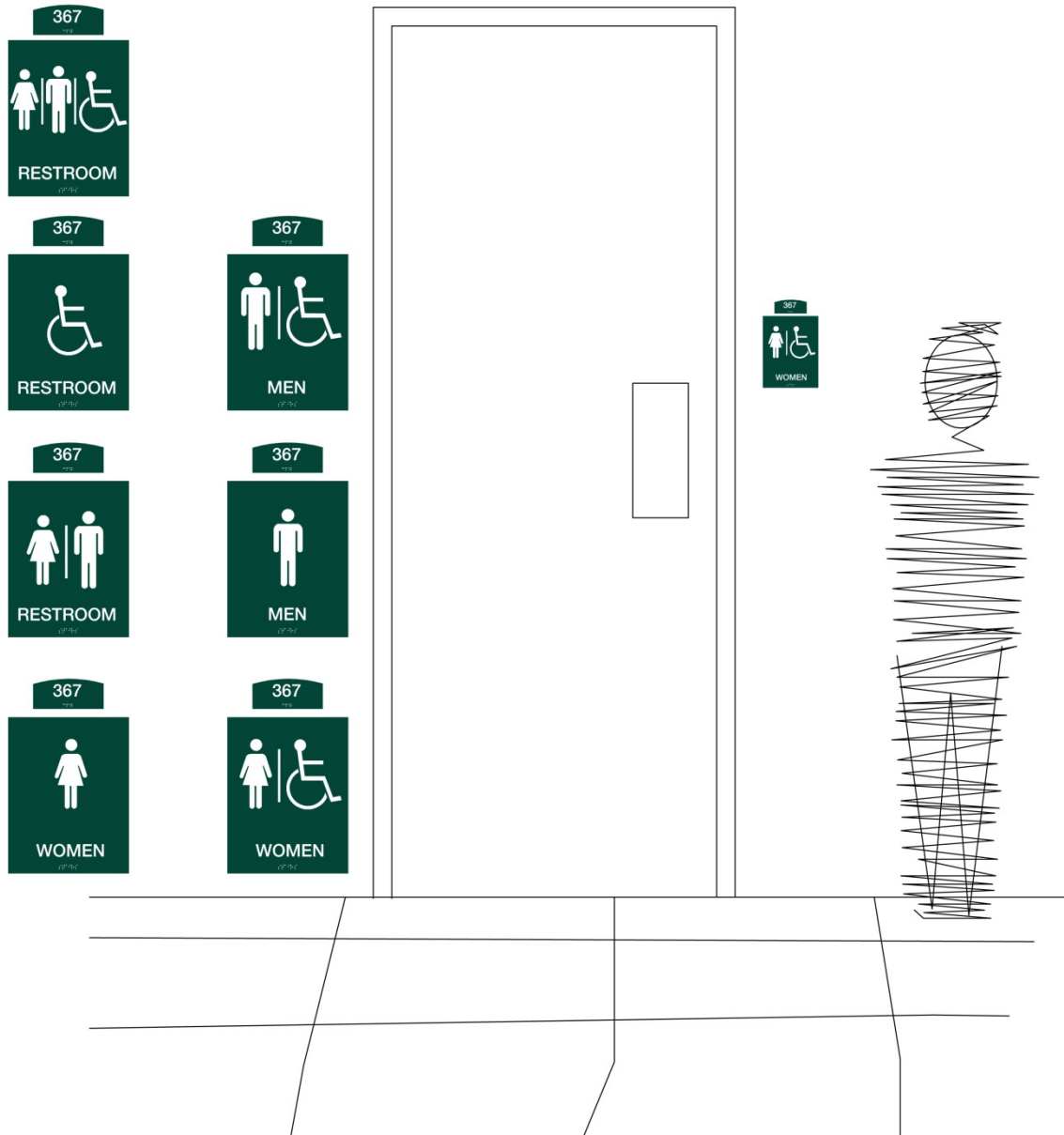
A General Description of the Types – Room Signs



Small Plaques (K)

This sign type is used with a Room Number (G) sign to specify a permanent room use. It is to comply with ADA design requirements (raised lettering). SPs are the same dimensions as the Single Line Insert (H) signs, but are not slotted.

A General Description of the Types – Room Signs



Toilet Room Sign (L)

The Toilet Room Sign is to be used with Room Number (G) signs. The same sign type is used whether it is a Male, Female, Single Use, ADA or combination restroom. All (L) signs are to be ADA compliant, containing symbols, raised lettering and braille.

A General Description of the Types – Room Signs



Restroom Flag Sign (LL)

The Restroom Flag Sign is to be used in corridors with recessed banks of restrooms to make their location more apparent to occupants.

Lettering is to be printed on both sides of sign. Sign should be anchored on one side with separate mounting plate. Sign will slide onto plate via channels in bracket.

These signs are to be mounted according to ADA guidelines.

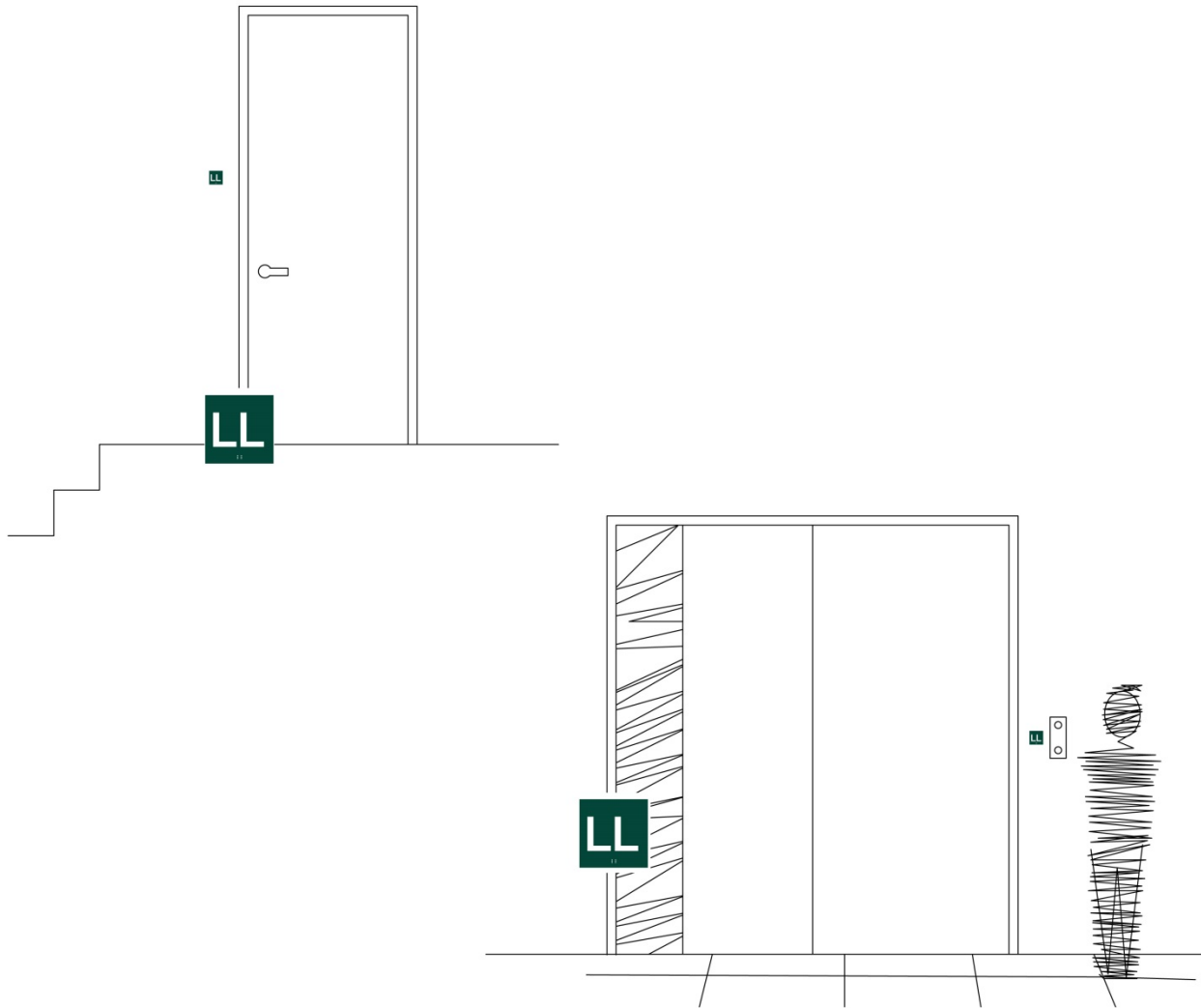
A General Description of the Types – General Statement Signs



Toilet Room Accessibility (M)

This sign type is used as required by ADA at all non-accessible restrooms to direct the public to an equipped toilet room. Signs are to have raised letters and tactile symbols.

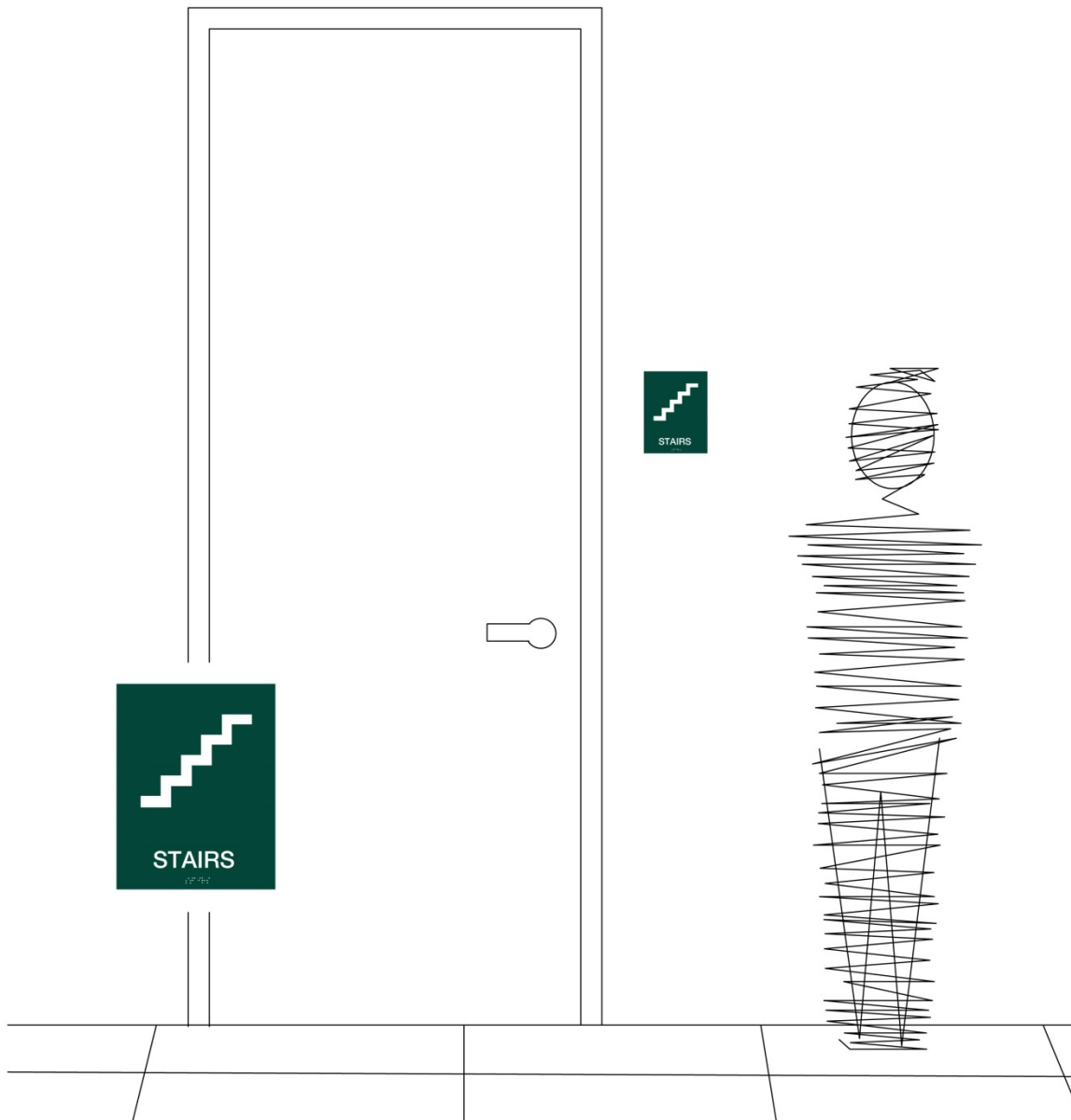
A General Description of the Types – General Statement Signs



Floor Number (N)

This sign type is placed on the inside of all stairwell doors and next to all elevator doors per the Ohio Building Code(1014.11.5/5). They are to be ADA compliant in design; raised lettering and braille are used.

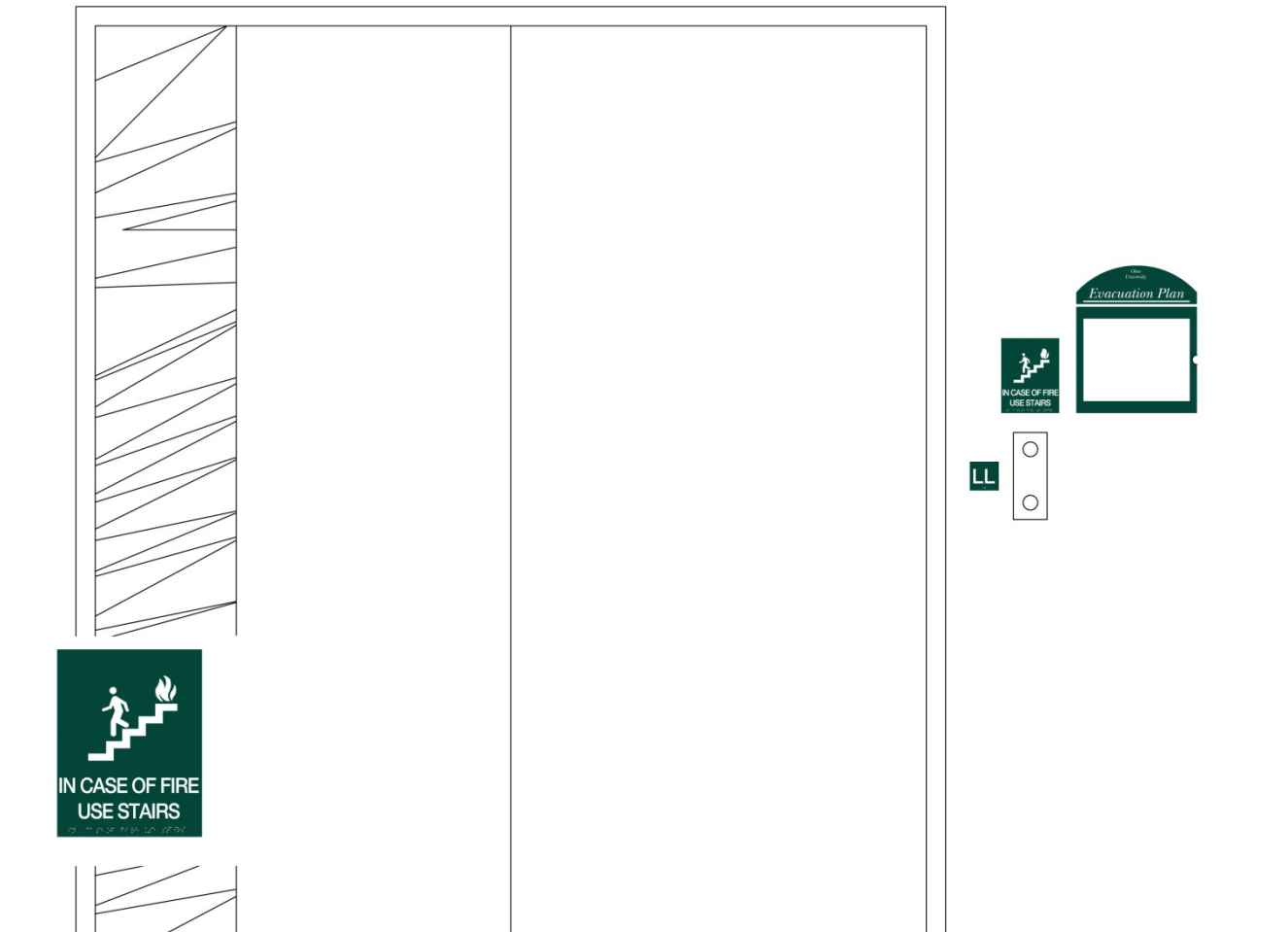
A General Description of the Types – General Statement Signs



Stair Access (O)

This sign type is to be used on all outside doorways leading to stairwells per the Ohio Building Code (1014.11.5/5). They are to be ADA compliant in design; raised lettering and braille are used.

A General Description of the Types – General Statement Signs



"In Case of Fire..." (P)

This sign type is to be positioned at every elevator call station per the Ohio Building Code (3009.1). They are to be ADA compliant in design; raised lettering and braille are used.

A General Description of the Types – General Statement Signs



Area of Refuge (Q)

This sign type is used at applicable areas which correspond with Evacuation Plan information. This sign is required to be posted according to current ADA guidelines. Lettering to be raised.

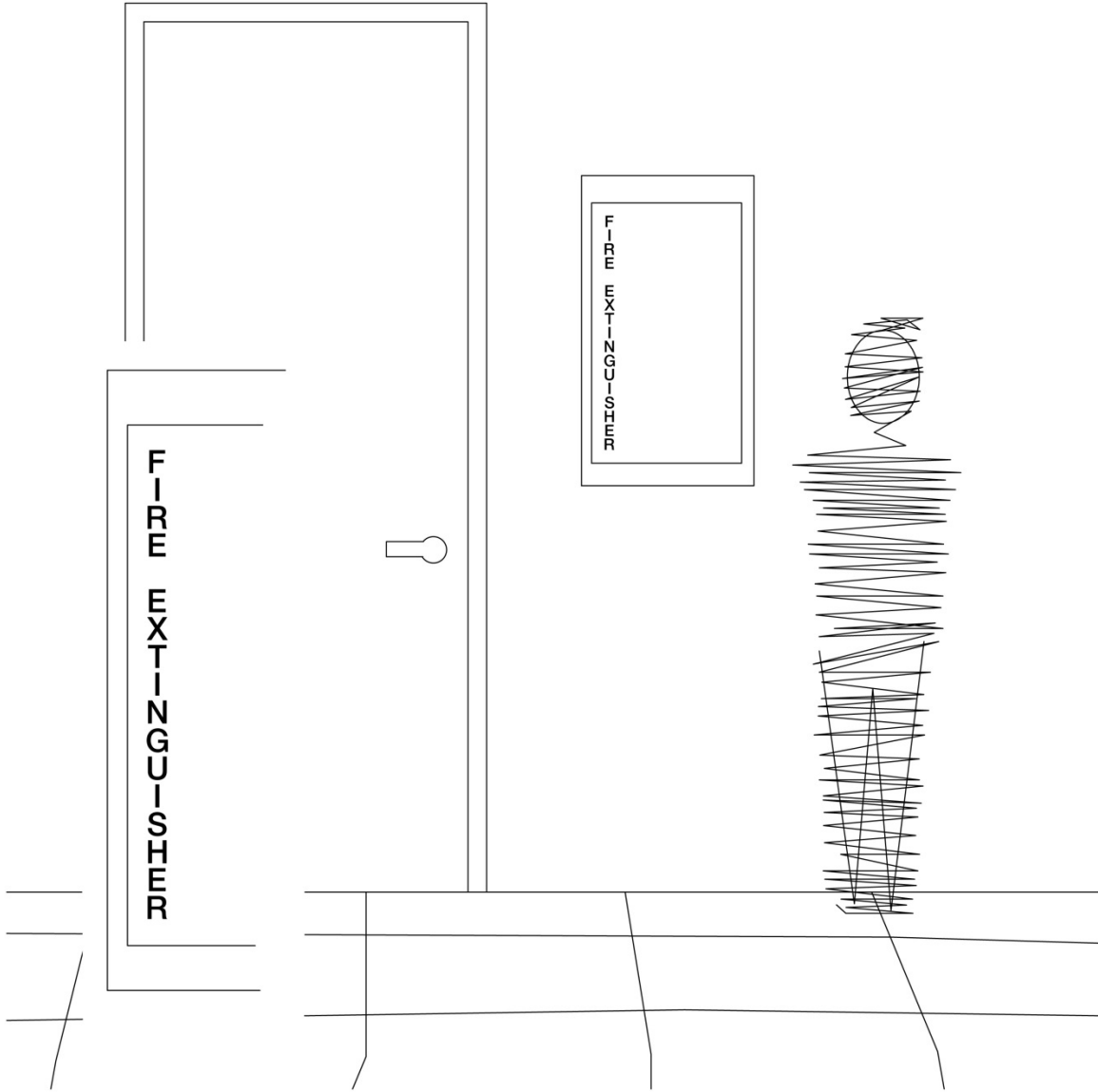
Sprinkler Control Valves (R)

This sign type is required to be posted at the entrances to any room where a sprinkler control valve is located by the Ohio Fire Code (906.8). Lettering to be raised.

Standpipe Control Valves (S)

This sign type is required to be posted at the entrances to any room where a standpipe control valve is located by the Ohio Fire Code (915.11). Lettering to be raised.

A General Description of the Types – General Statement Signs



Fire Extinguishing Equipment (T)

This sign is required to identify any fire hose or fire extinguisher per the Ohio Fire Code. Lettering to be applied to face of enclosure.

A General Description of the Types – General Statement Signs



No Food or Drink (U)

This sign type is to be used where applicable. Lettering to be raised and symbols tactile.

Designated Smoking Area (V)

This sign type is to be posted according to the Ohio Fire Code (1301:7-7-04 (L) F-312.0) and as applicable. Lettering to be raised and symbols tactile.

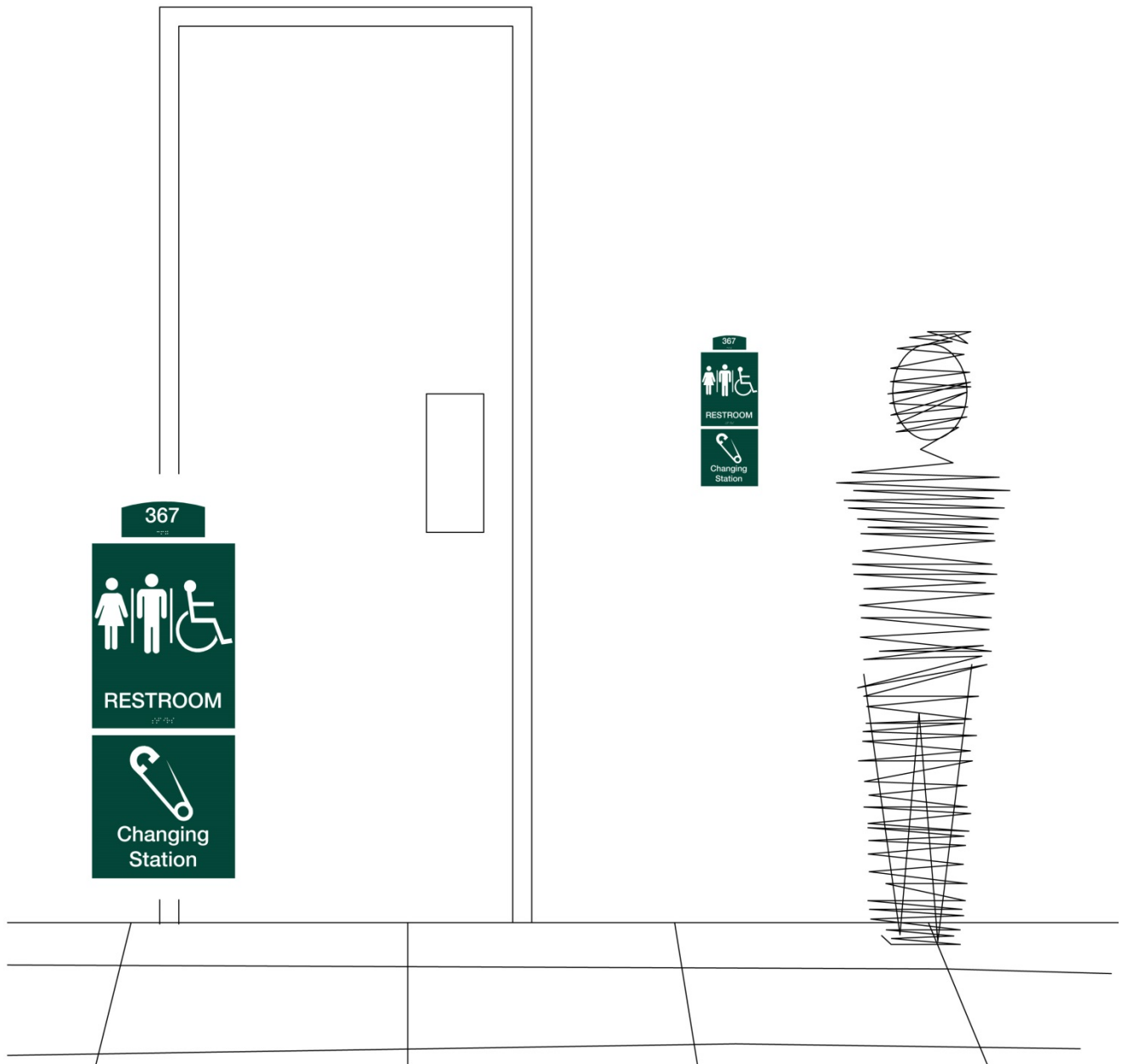
A General Description of the Types – General Statement Signs



Room Occupancy Signs (W)

This sign type is to be positioned as required by Ohio Fire Code (1301:7-7-05(7) FM-601.7) and must be placed inside the room. It is intended to show maximum occupancy. Generally, this sign type should be placed near a primary light switch so as to be noticed upon entering a room.

A General Description of the Types – General Statement Signs



Changing Station (X)

This sign is used in conjunction with restroom signs where applicable. Lettering to be raised and symbols tactile.

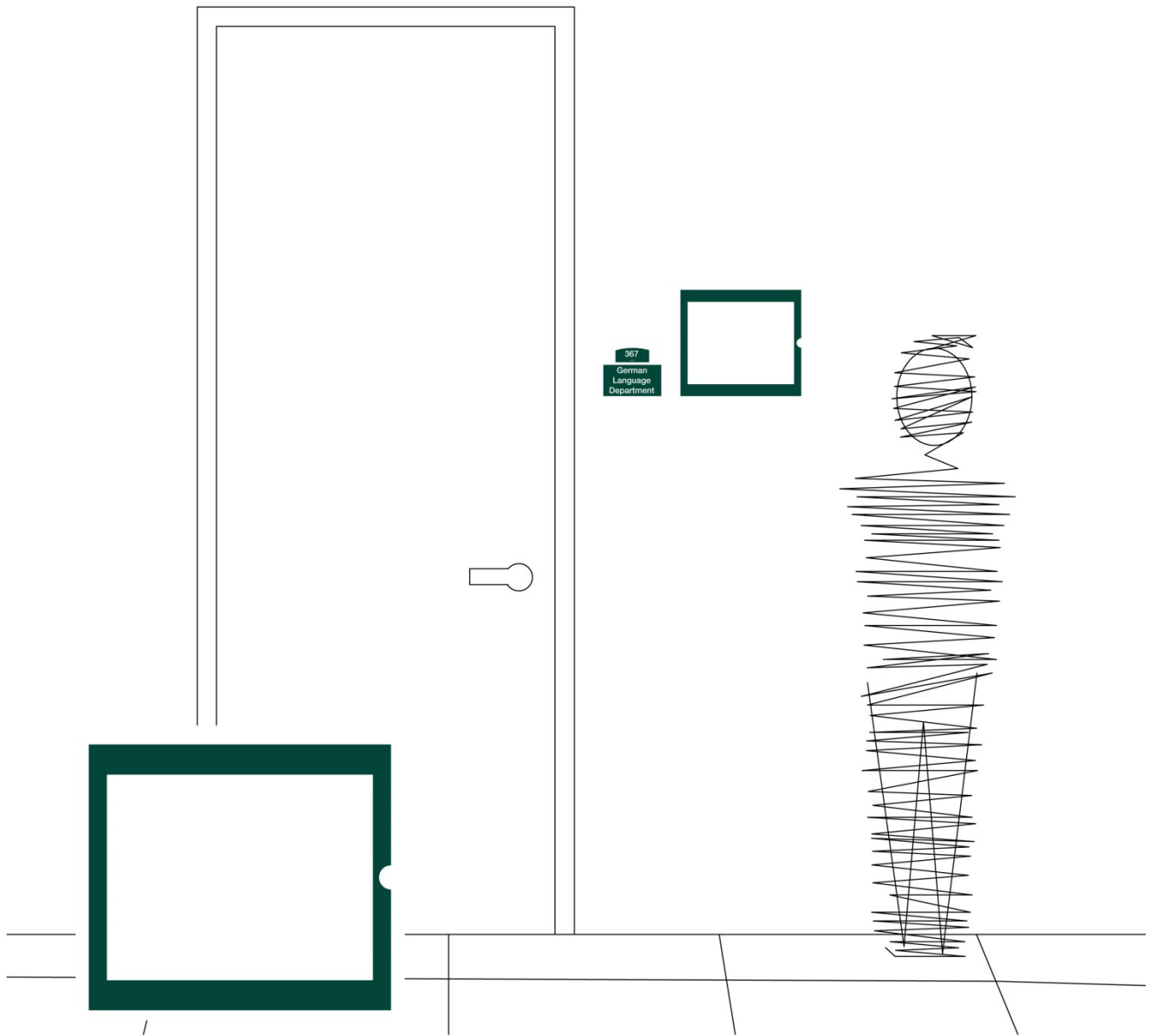
A General Description of the Types – General Statement Signs



Evacuation Plan (Y)

This sign type is required to be posted according to the Ohio Fire Code (1301:7-7-04 (D) 404.2). This sign uses a floor plan that can be created and maintained by the University. EPs are simple frames that hold an 8 1/2" x 11" sheet of paper and have a curved cap that states "Evacuation Plan". The frame may be updated, but is also tamper-resistant.

A General Description of the Types – General Statement Signs



Temporary Information Frame (Z)

This sign type is to be used as needed and acts as a frame for a single, 8 1/2" x 11" piece of paper. It is intended for temporary information only; to be posted in an aesthetic, tamper resistant manner. These frames can be used for Hazardous Materials postings as well.

Section Three – Graphic Standards and Specifications

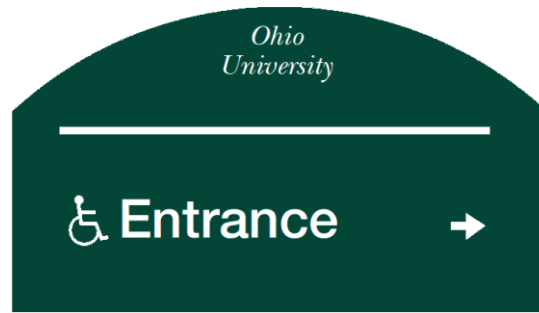
The Ohio University interior signage system was designed as several elements that work together visually. The system will be successful when all of the elements are used consistently as described on the following pages.

In each part of this section the Americans with Disabilities Act has been applied to the design. The compliance with ADA guidelines prevents discrimination, allowing equal usage of facilities by all people. The ADA sets forth regulations or codes pertaining to the usage of type styles, character height, tactile and braille characters, pictograms (symbols), finish and contrast and mounting conditions. Every sign in the system has been analyzed and developed to comply with current ADA guidelines.

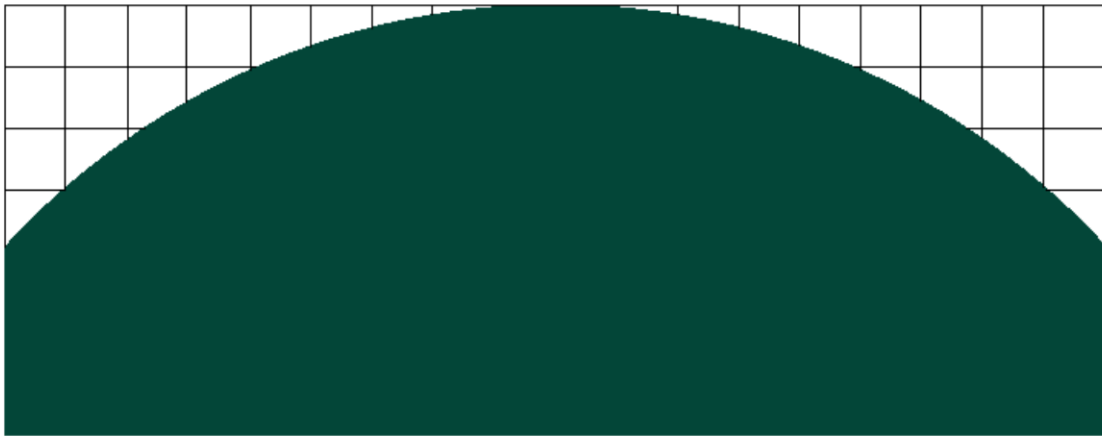
Graphic Standards and Specifications

The Panels and Carriers

The signature panel is a rectangle with an arched top. This panel shape is an important part of the University's interior sign system. The size of a panel is determined by the type of sign and the amount of information needed to be displayed on the panel. Recommended sizes for each sign type can be found in the Working Drawing Section (Section 5) of this manual.



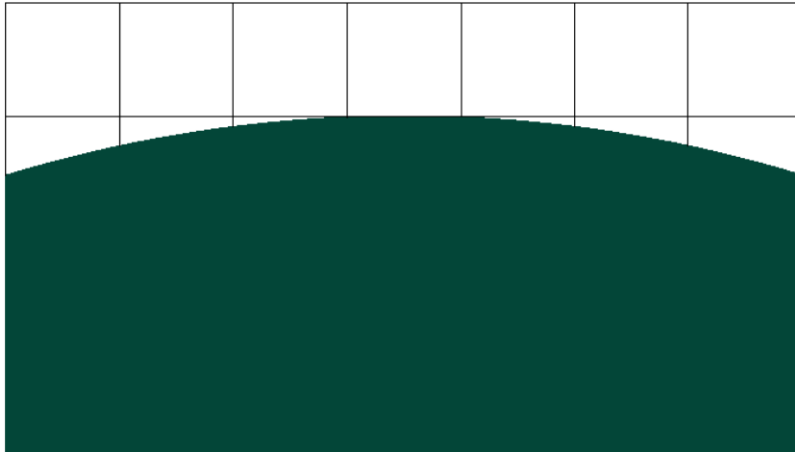
Graphic Standards and Specifications



The Large Arch

The heights of a sign may change but the width of the arch remains proportional. The Basic grid is 18 units wide with an arch that rises 4 units to the center point or 9 units.

Graphic Standards and Specifications



The Small Arch

The Room Number (G) sign panel top has a unique design. Its proportions are slightly different to the Signature Panel but reflect the same design feeling. If the panel is 3-1/2 units wide then it is 1-3/4 units tall to the top of the arch. The arch rises just 1/2 unit.

Graphic Standards and Specifications

The Typefaces and Typography

The basic type families that are used in all interior signs are Helvetica Medium and New Baskerville. New Baskerville is the same font family as used on the exterior signs. No substitutions should ever be made for the fonts. These fonts, in conjunction, fully comply to ADA guidelines. For headers and headlines and subheadings the New Baskerville italic font is used. For basic information the New Baskerville Roman font is used. Any time that New Baskerville is used, the text will not be raised type. For all tactile, raised type lettering Helvetica Medium is used in compliance with ADA guidelines.

Helvetica Medium

abcdefghijklmnopqrstvwxyz
 ABCDEFGHIJKLMNOPQRSTUVWXYZ
 1234567890!@#\$%^&*()-+=?/

New Baskerville

abcdefghijklmnopqrstvwxyz
 ABCDEFGHIJKLMNOPQRSTUVWXYZ
 1234567890!@#\$%^&*()-+=?/

New Baskerville Italic

abcdefghijklmnopqrstvwxyz
ABCDEFGHIJKLMNOPQRSTUVWXYZ
1234567890!@#\$%^&()-+=?/*

The letters are set with a normal spacing or kerning. Each sign vendor should provide a sample of their setting for approval before starting production. If the University sign designer is to specify and complete schedules for the sign system, it is suggested that

Graphic Standards and Specifications

digital files be provided to the sign vendor with exact fonts and copy for production. This will eliminate any variations between vendors or sign contractors.

Type and Braille ADA Requirements

To comply with ADA requirements the type for some signs are set in all capital letters. This is a special case and wherever it is not specified, it is assumed that capitals and lower case will be used. In Section 5-Working Drawings it is explained where certain proportions for type need to be maintained to insure compliance. Grade 2 Braille is used throughout the system on signs where braille is required. Grade 2 Braille includes additional characters and character combinations which represent contractions of certain words. (As opposed to standard Braille which uses one symbol per letter and mimics the written word exactly.) Refer to Section 5-Working Drawings for guidelines on where braille must be used.

Raised, tactile lettering shall be Helvetica Neue Medium. No raised lettering, character, or symbol shall be within 3/8" from braille characters.

Graphic Standards and Specifications

The Colors

The colors to be used for all interior signs are noted and shown below. The colors have been cross referenced to different mediums to be used for different applications. The colors for the system are non-custom mixes that can be easily referenced by sign fabricators. The usage of these colors is specified in Section 5-Working Drawings. The choice of these colors and their application assure compliance with ADA.

For dark green elements:

Painted surfaces

Benjamin Moore #644 (dark green)



Vinyl

3M Scotchcal 220 Bottle Green



Printed

PMS 3308U/C



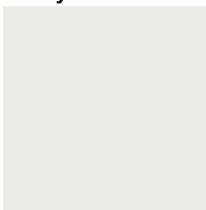
PANTONE

3308 C

For white elements:

Painted

Benjamin Moore Brilliant White



Vinyl

3M Scotchcal 220 Matte White

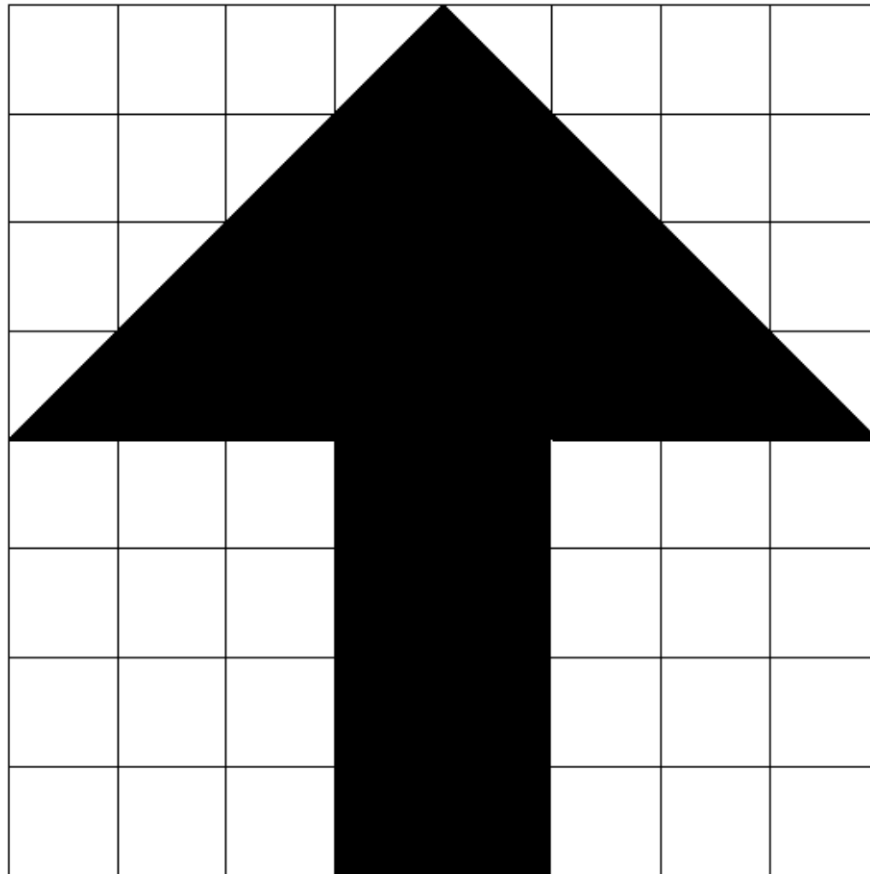


Graphic Standards and Specifications

Substrate

Hammermill Accent Cover White/ Smooth 80# (laser guaranteed)

White Sintra

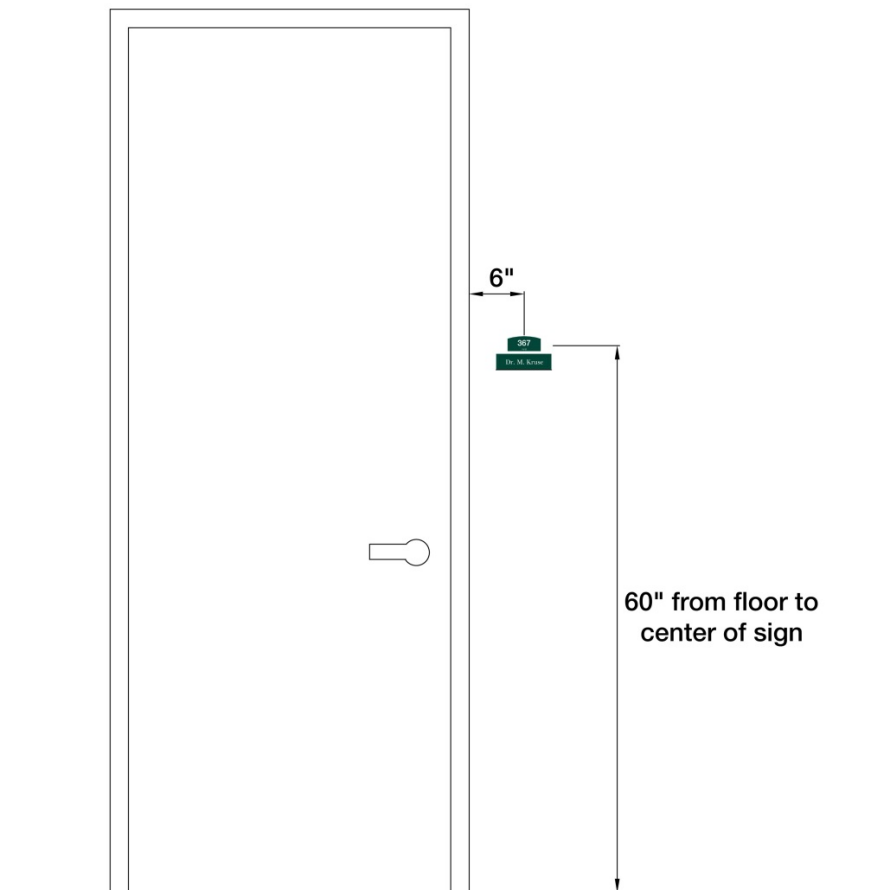


The Arrows, Rule Line, and Miscellaneous Information

There is just one style of arrow used in this system. It is a standard symmetrical arrow which is rotated from the middle to point in any direction needed. The diagram shown here will be used to create arrows of any size for the interior signage system. It can be photographically reproduced.

The arrow is based on a grid eight units square where the stroke for the "stem" is two units. Rule lines are always 1/8" in width when used at the top of the arch to separate the headline part of the sign from the information area.

Graphic Standards and Specifications

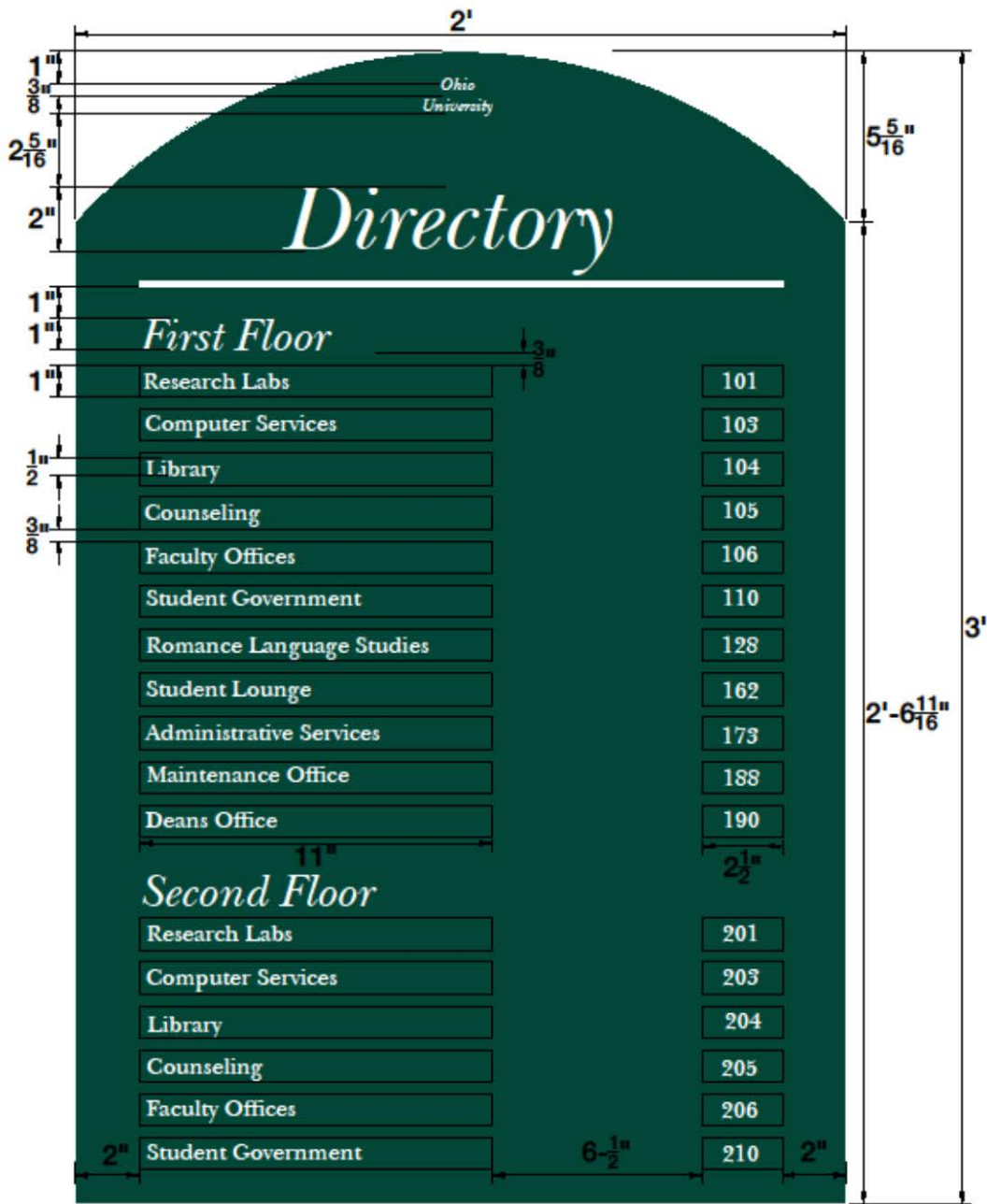


ADA Mounting Standards

ADA requires that all signs be installed so that the center of the sign is at 60" from the floor. This mounting height requirement is to enable a blind person to easily locate signs at a consistent height. This height applies to sign components that contain braille. For instance the room number sign, which contains braille when combined with the multiple line insert. The 60" center is measured for the room number and then the multiple line insert sign is mounted 1/4" below. For permanently designated areas, signs must be mounted on the wall adjacent to the latch side of the door. In case of obstructions, the sign will be mounted on the wall surface nearest to the latch side of the door and located to avoid door swing and protruding objects. There are often instances where doors are located so that mounting exactly as ADA requires is not feasible. For ADA preferred direction, refer to "The Americans with Disabilities Act White Paper" by the Society for Environmental Graphic Design.

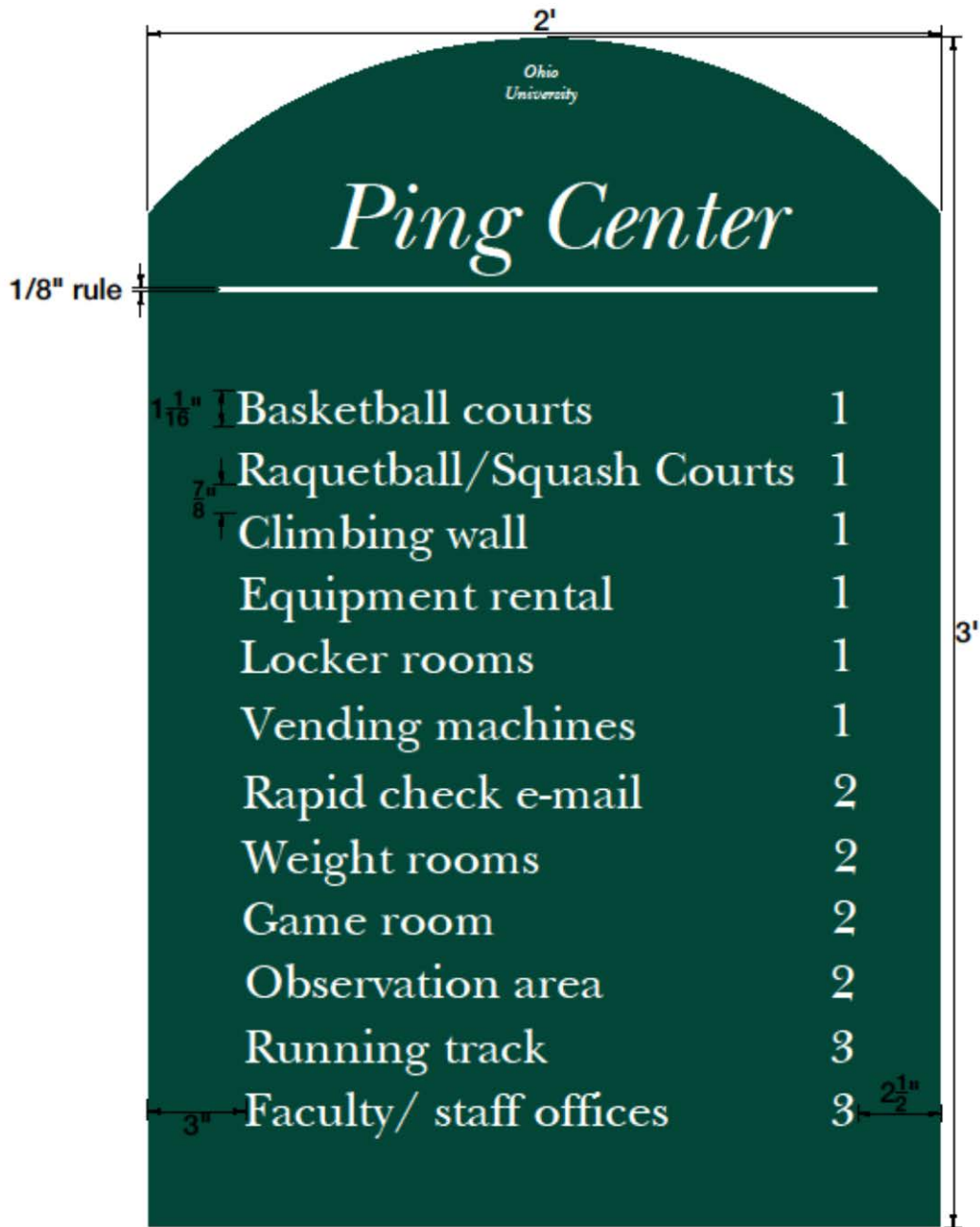
Working Drawings

Large Building Directory- A



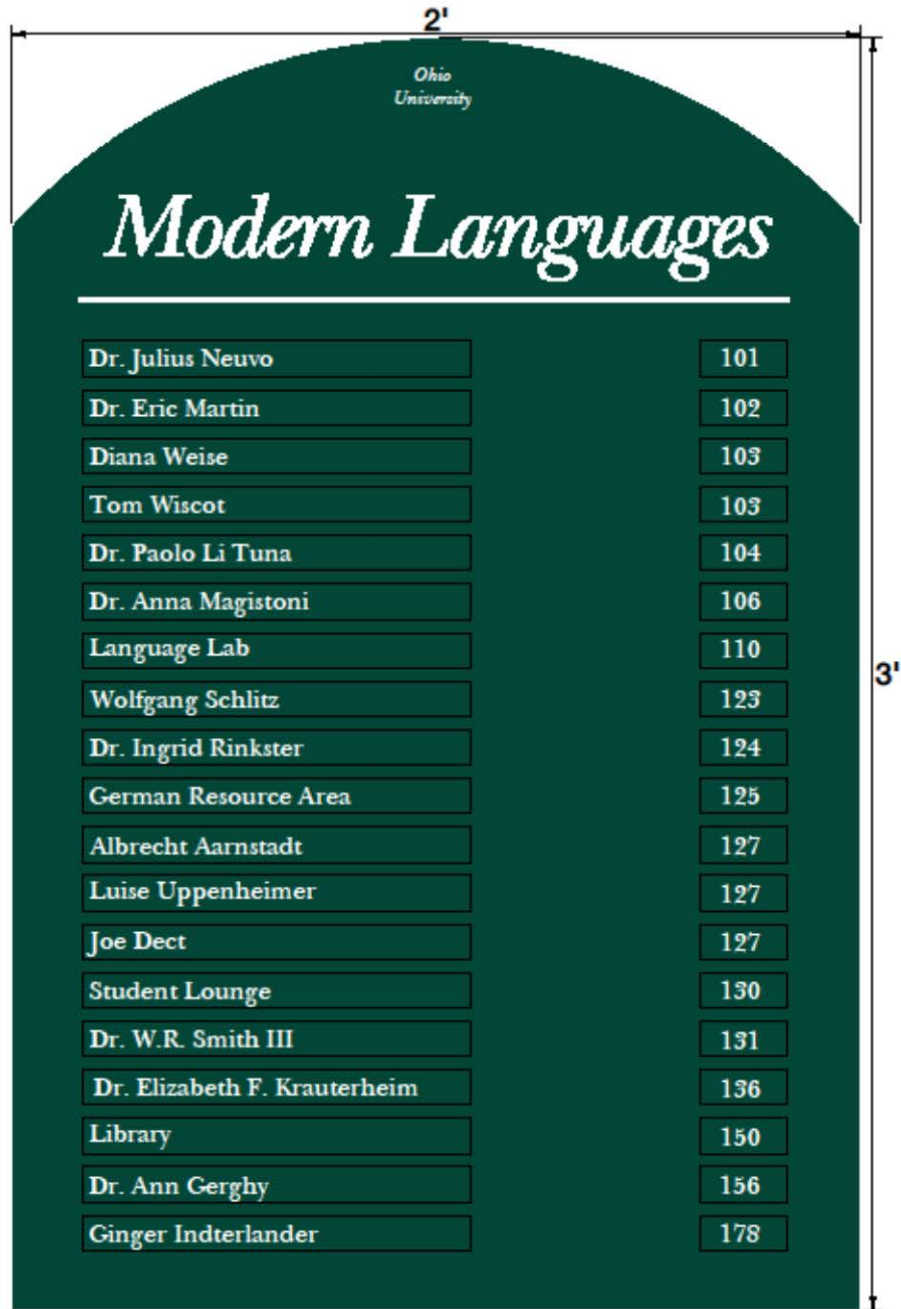
Working Drawings

Main Floor Directory- B



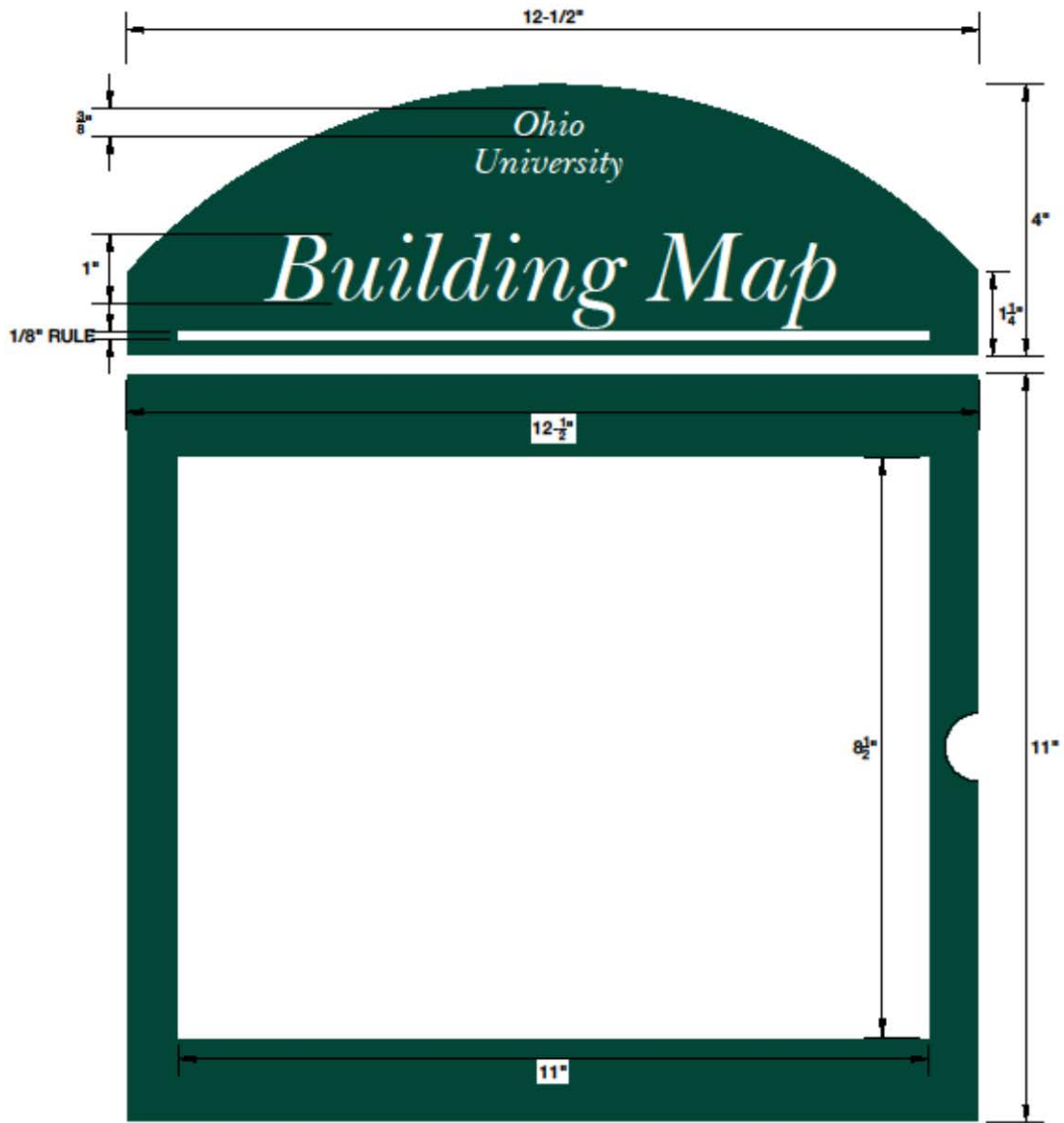
Working Drawings

Department Directory- C



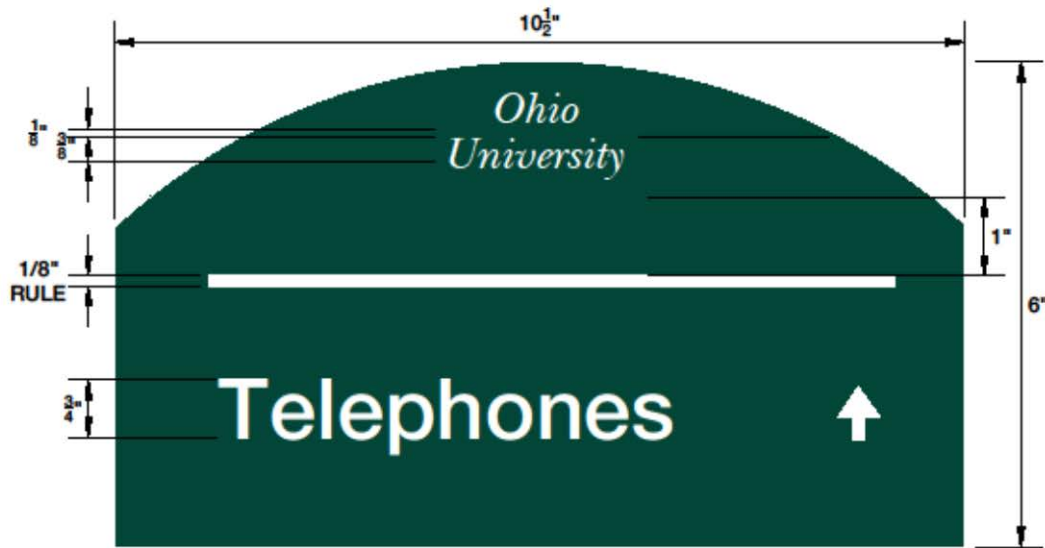
Working Drawings

Building Map and Cap- D



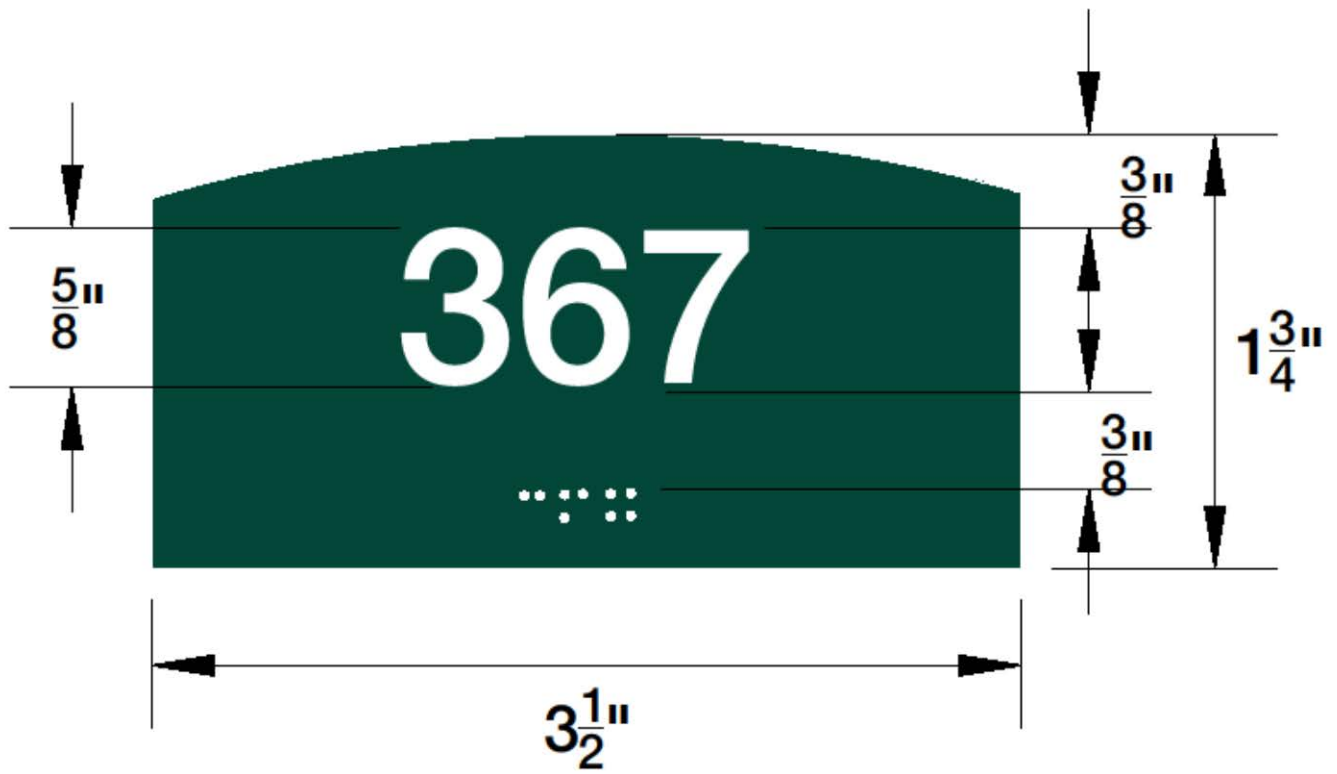
Working Drawings

Destination Direction- E/F



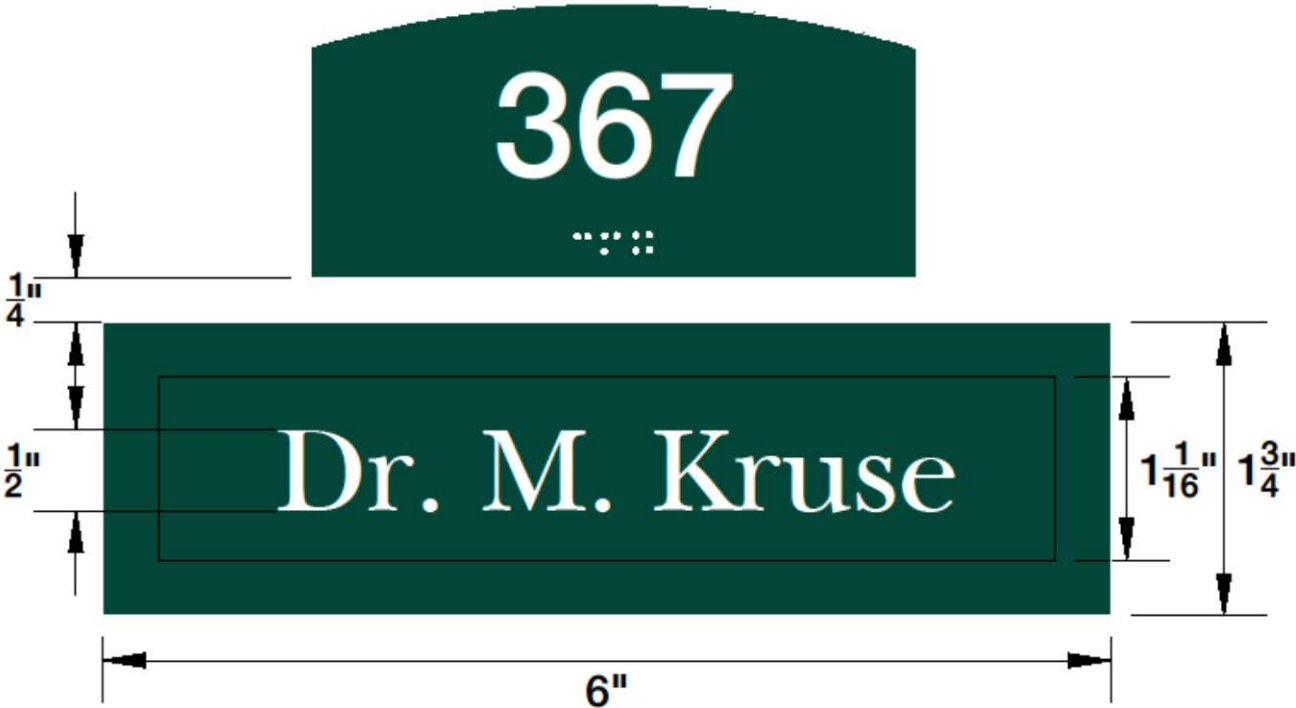
Working Drawings

Room Number- G



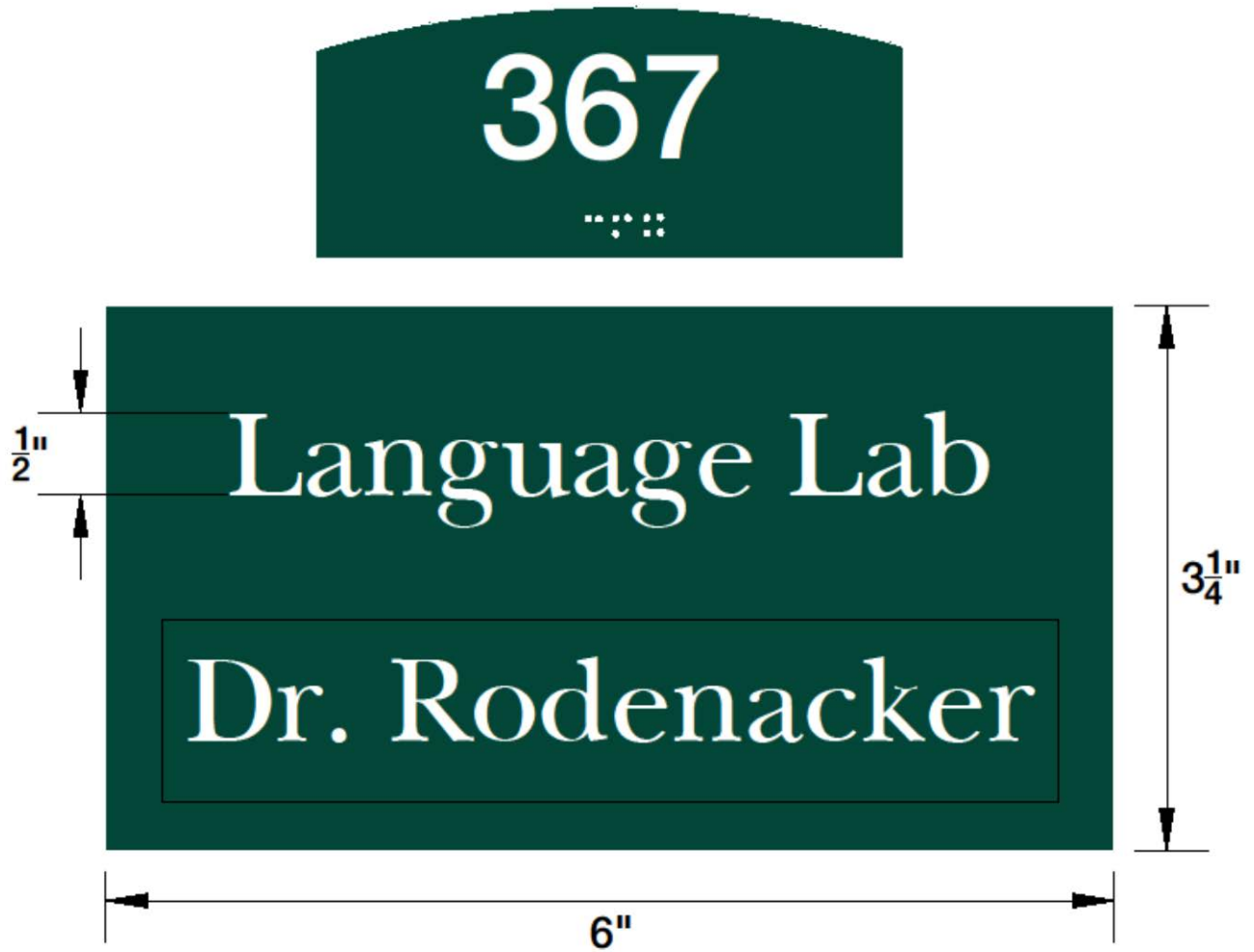
Working Drawings

Single Line Insert- H



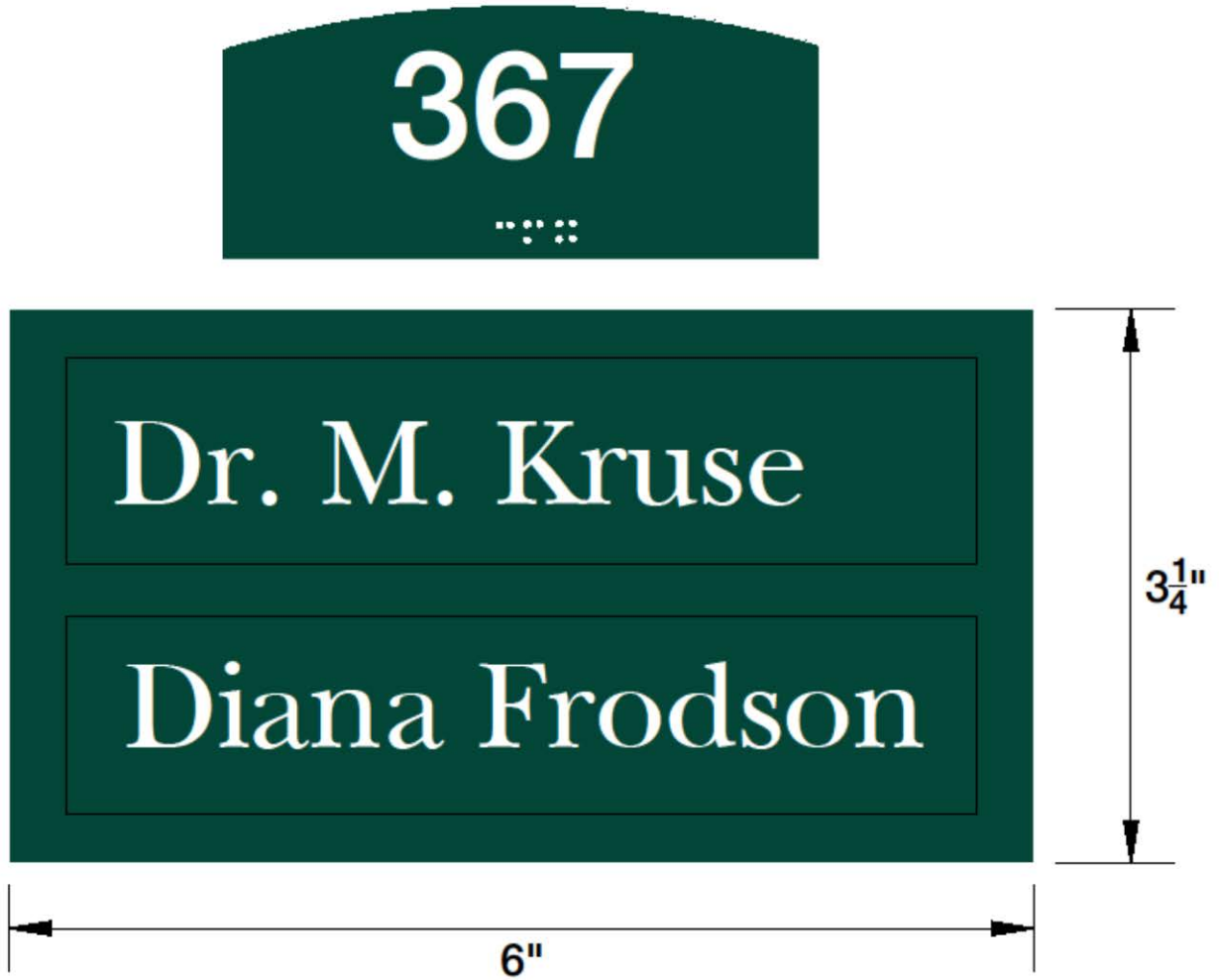
Working Drawings

Single Line Plaque with Insert- I



Working Drawings

Multi Line Insert- J



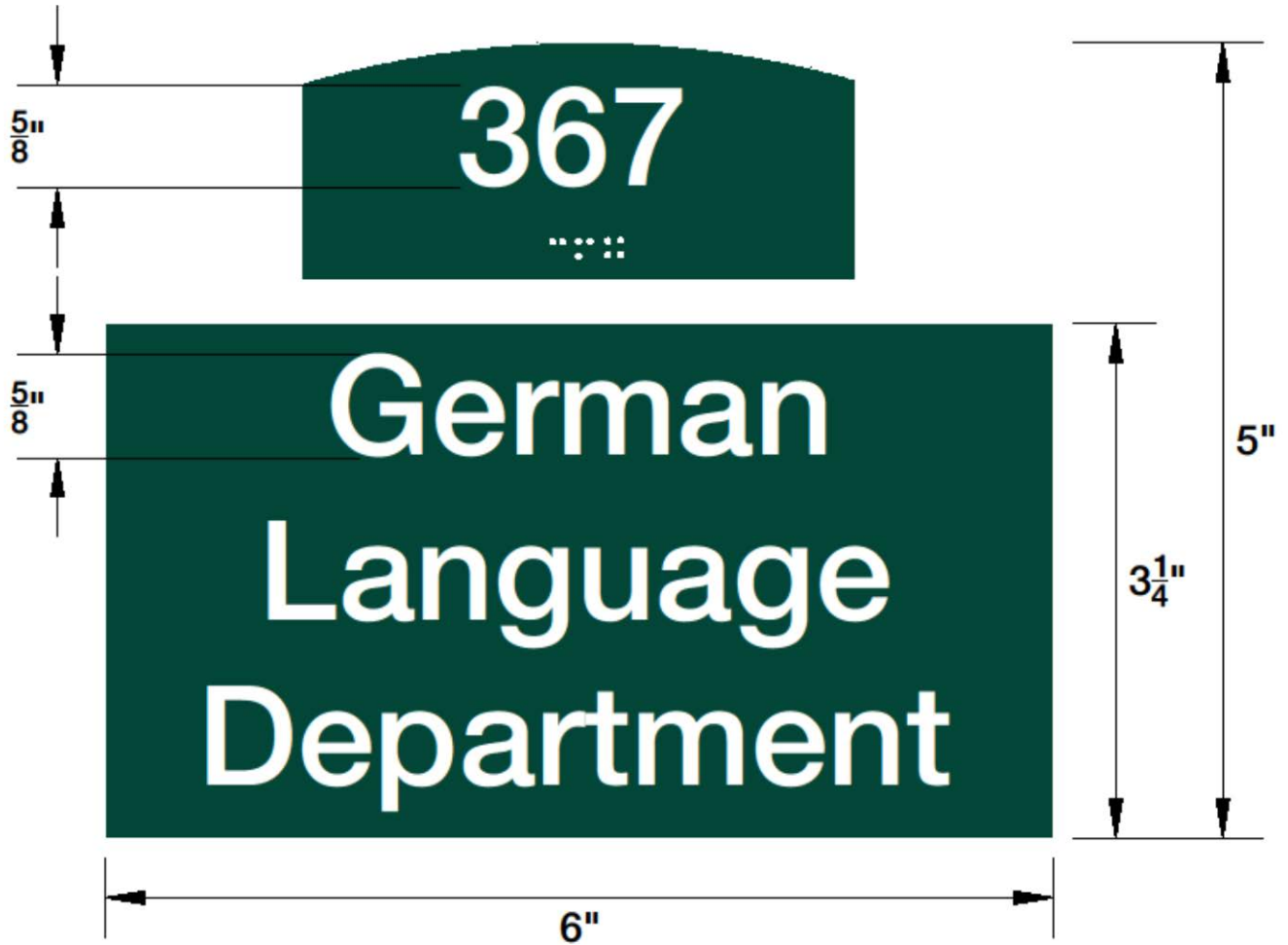
Working Drawings

Conference Room Vacancy



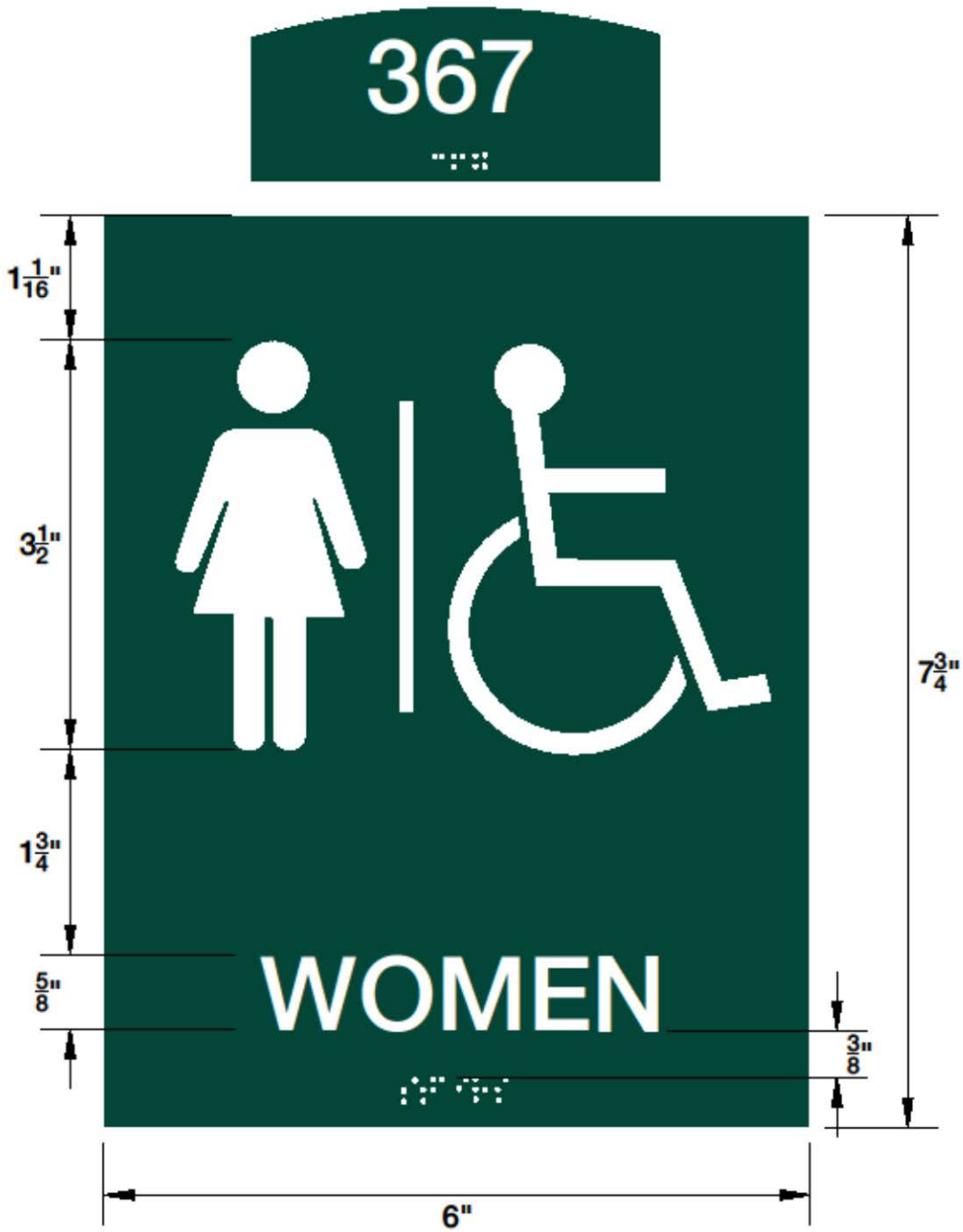
Working Drawings

Small Plaque- K



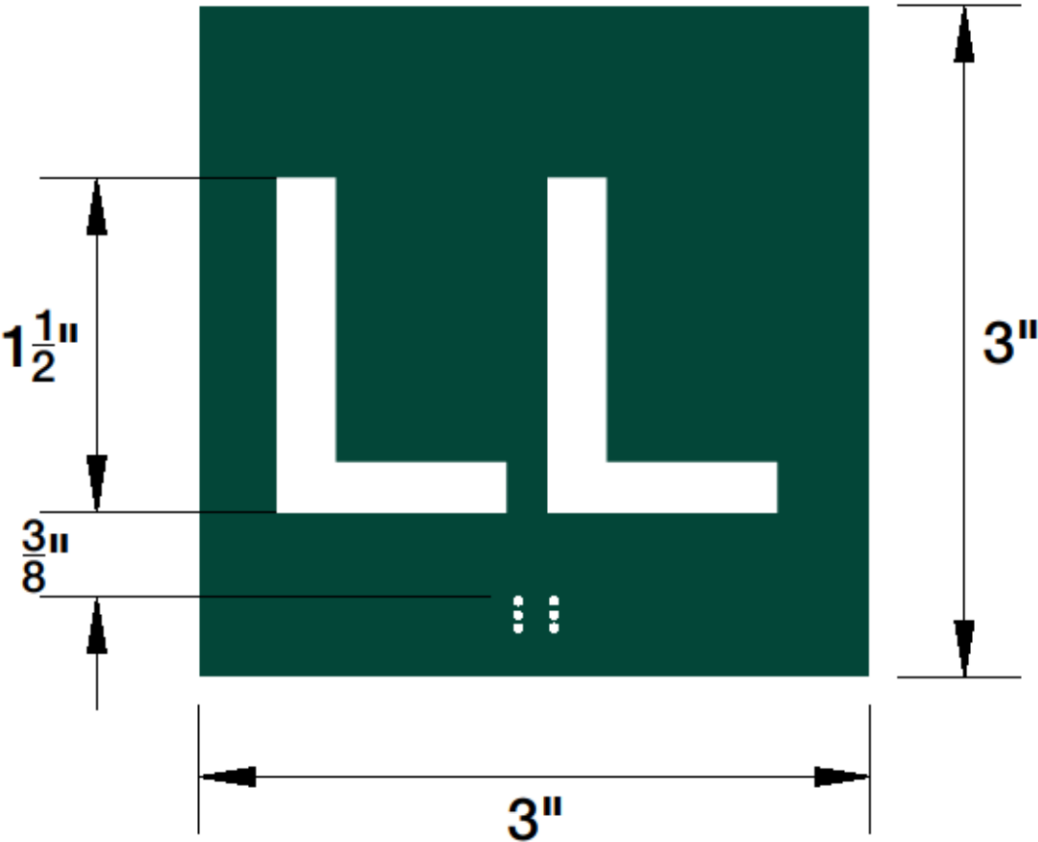
Working Drawings

Toilet Room Sign- L/M- ADA



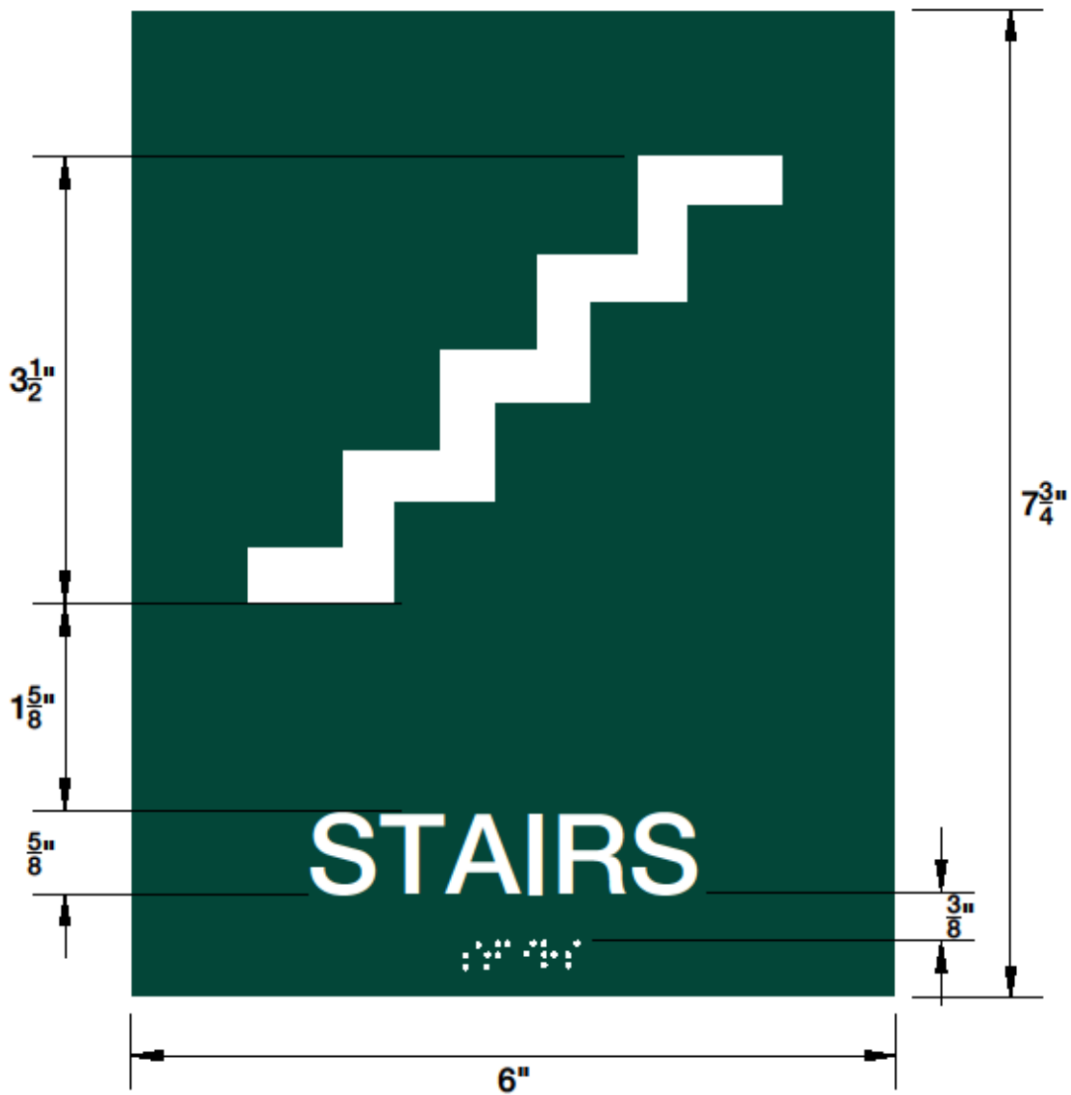
Working Drawings

Floor Number- N



Working Drawings

Stairs Access- O



Working Drawings

"In Case of Fire..." - P



Working Drawings

General Statement Signs- M,Q,R,S,T,U,V,W,X



Working Drawings

Department Signs

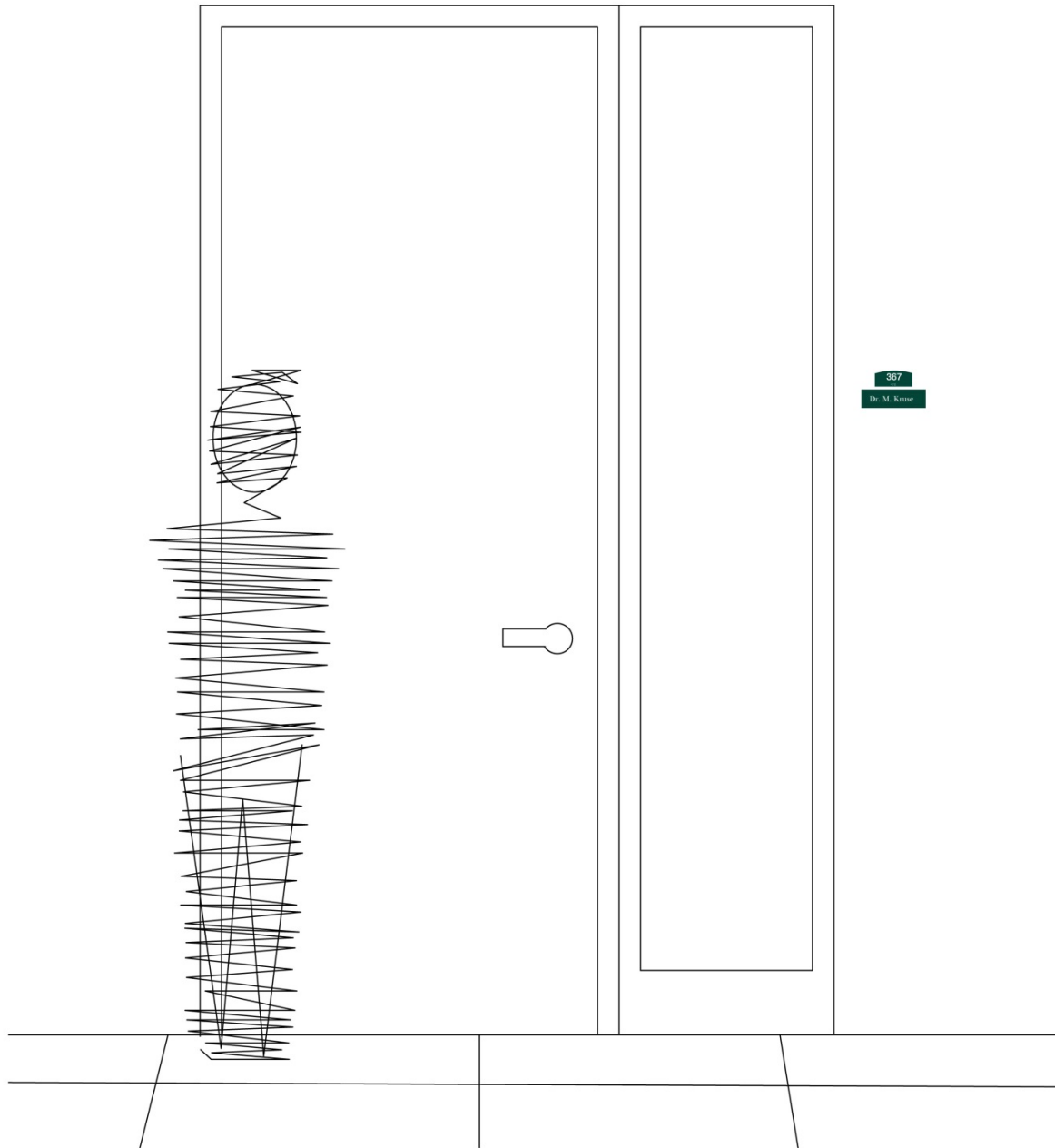


Working Drawings

Restroom Flag Sign



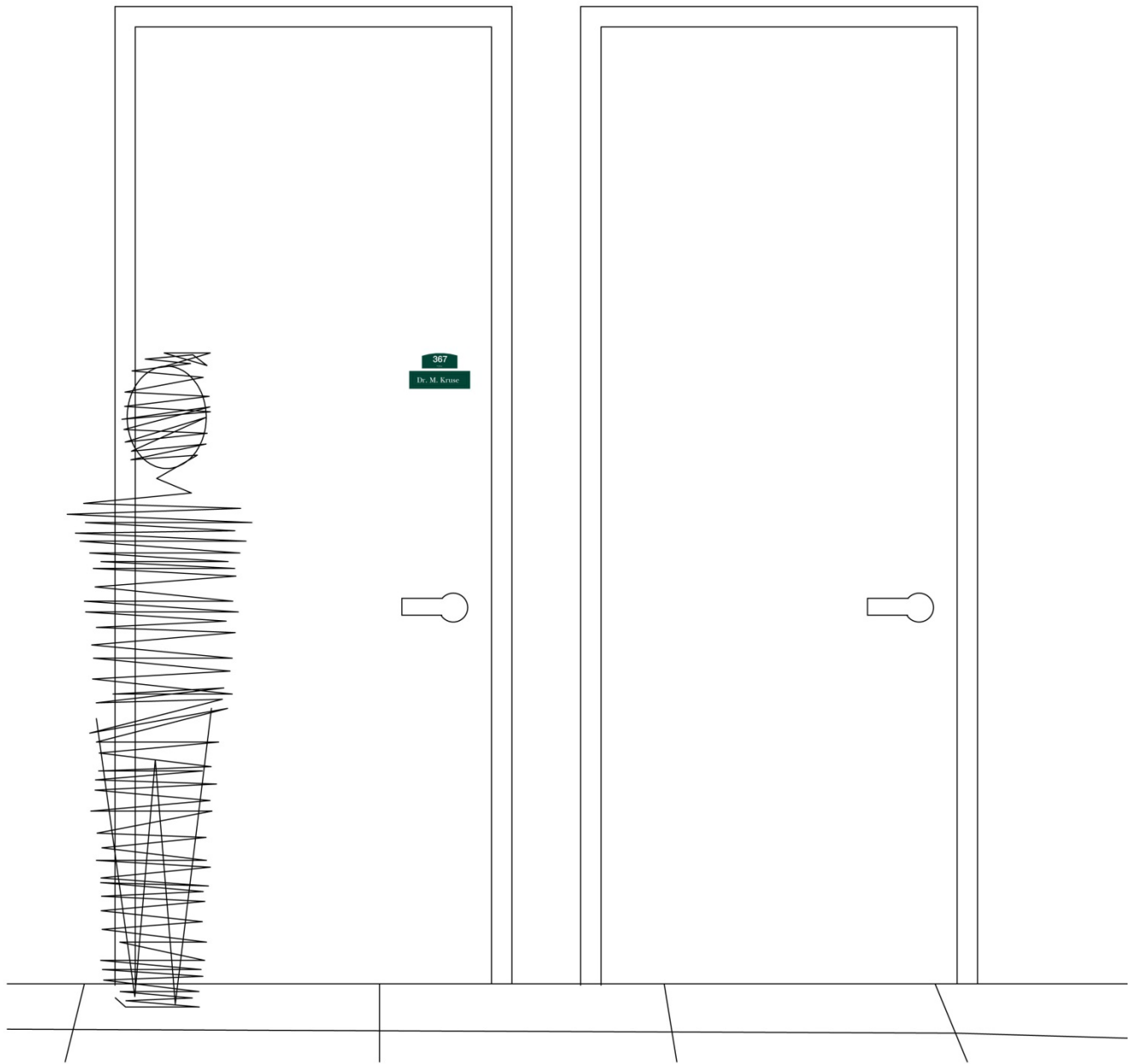
Appendix – ADA Special Mounting



Mounting Around Sidelights

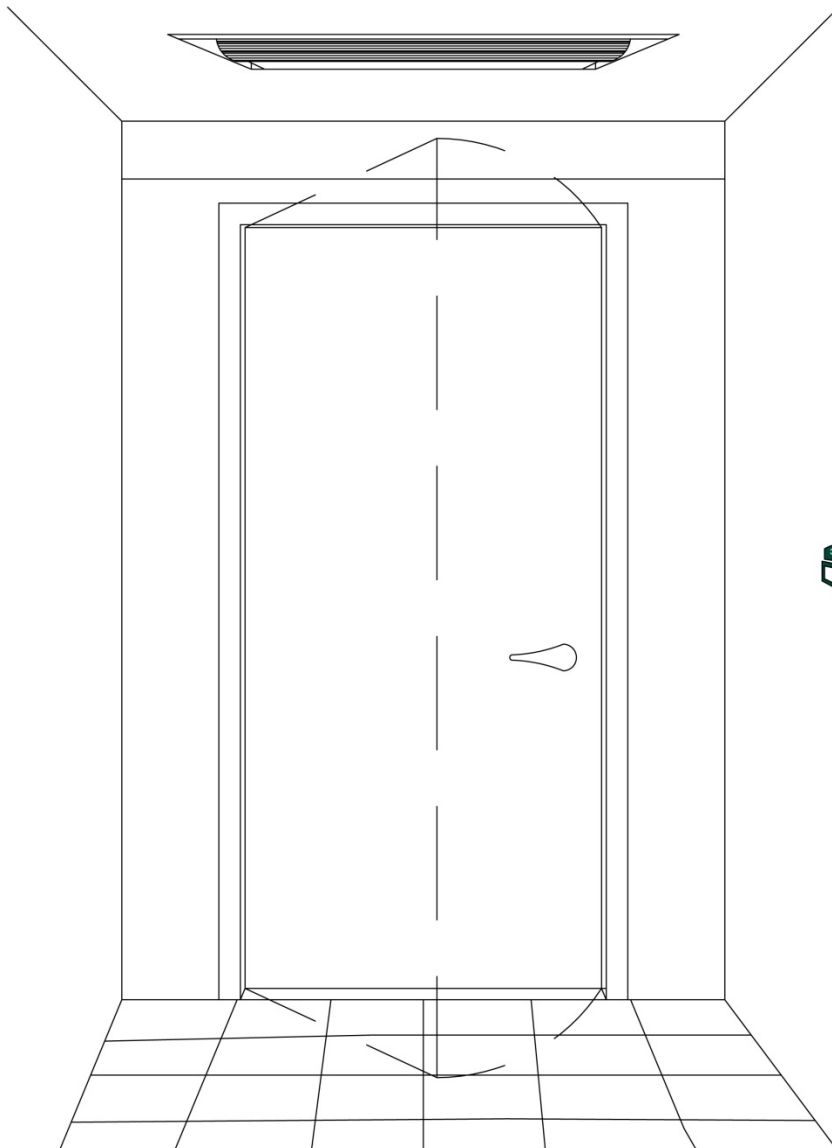
Per ADA guidelines, where there is a sidelight adjacent to the latch side of the door, the sign should be mounted on the nearest wall surface adjacent to the latch side of the door.

Appendix – ADA Special Mounting



Mounting Where Space is Limited

Where two doors are side by side, or where a corridor ends in three doors and there is no adjacent wall surface on the latch side, the suggested solution per ADA guidelines is to mount the plaques on the door itself above the latch swing.

Appendix – ADA Special Mounting**Mounting Where Space is Limited**

Where a door has no adjacent wall surface clear of the swing, ADA suggests that the sign should be mounted at a sufficient distance from the door to allow a person to safely stand there. ADA suggests a clear dimension of 18" from the nearest point of the door swing to the nearest point of the sign. The intent of this regulation is that a sight impaired or blind person should be able to safely read the sign from a close distance, without being struck by the opening door.



Ohio University
Architecture, Design and Construction Standards
Appendix 12.1: Site Furnishings

BENCHES

1. Bench A
 - a. Manufacturer: Landscape Forms, Inc.
 - b. Model #: Scarborough
 - c. Areas Used: Paved
 - d. Color: PANTONE® 3308 C
2. Bench B
 - a. Manufacturer: Du Mor, Inc.
 - b. Model #: Bench 105 (105-60D or 105-80D)
 - c. Areas Used: Where needed
 - d. Finish: Douglas Fir/Bronze
3. Bench C
 - a. Manufacturer: Du Mor, Inc.
 - b. Model #: Bench 56 (56-60D or 56-80D)
 - c. Areas Used: Where needed
 - d. Finish: Douglas Fir/Bronze

BICYCLE RACKS

1. Bicycle Rack A
 - a. Manufacturer: Creative Pipe
 - b. Series: Thunderbolt
 - c. Model #: TB-7 Length 62"
TB-9 Length:86"
TB-11 Length: 110"
TB-13 Length: 134"
 - d. Areas Used: As needed
 - e. Finish: Galvanized
2. Bicycle Rack B
 - a. Manufacturer: Brandir
 - b. Series: Ribbon Rack
 - c. Model #: (# of bicycles) 05
07
09
11

- d. Areas Used: As needed
- e. Finish: Galvanized
- 3. Bicycle Rack C
 - a. Manufacturer: Columbia Cascade
 - b. Series: CycLoops
 - c. Model #: 2170-5-G
2170-7-G
2170-9-G
2170-11-G
2170-13-G
 - d. Areas Used: As needed
 - e. Finish: Galvanized

PICNIC TABLES

- 1. Table A
 - a. Manufacturer: Du Mor, Inc.
 - b. Model #: 75-60D
 - c. Areas Used: Where needed
 - d. Finish: Douglas Fir and Bronze
- 2. Table B
 - a. Manufacturer: Du Mor, Inc.
 - b. Model #: 76-24D
 - c. Areas Used: Where needed
 - d. Finish: Douglas Fir and Bronze

WASTE RECEPTACLES

- 1. Receptacle A
 - a. Manufacturer: Landscape Forms, Inc.
 - b. Model #: Scarborough; without Ash Urn
 - c. Areas Used: Entrances to buildings
 - d. Color: Ivy
- 2. Receptacle B
 - a. Manufacturer: Du Mor, Inc.
 - b. Model #: 70-22D
 - c. Areas Used: Landscaped areas



Ohio University
Architecture, Design and Construction Standards
Appendix 12.1: Site Furnishings

- d. Color: Douglas Fir

ASH URNS

- 1. Ash Urn A
 - a. Manufacturer: Victor Stanley, Inc.
 - b. Model #: S-20
 - c. Areas Used: Entrances to buildings
 - d. Color: PANTONE[®] 3308 C

-----END OF SECTION-----

REVISION DATE: 03-23-12



Ohio University (OU)
Architecture, Design and Construction Standards
Appendix 23.1 –Direct Digital Control (DDC)
Building Automation Systems (BAS)

I. APPLICATION

1. This Design Standard is NOT a Construction Specification. Its purpose is to define Ohio University's Design Standard to the parties that are involved in planning, design and construction of OU facilities.
2. The Engineer/Designer shall use this standard to develop Project Specification for Direct Digital Control (DDC)/Building Automation System (BAS).
3. This Standard shall apply to all buildings and utility distribution systems on the main OU campus (Athens).
4. This Standard may also apply to other OU's buildings and utility distribution systems located outside of the main OU campus.

II. BACKGROUND & SET-UP

The use of DDC/BAS systems at Ohio University has been hampered by the difficulties associated with interconnecting systems from different manufacturers to one another and to the campus Energy Management and Controls System (EMCS).

To overcome this, Ohio University has established that henceforth all installations of digital building automation and control equipment shall support communications via the BACnet standard. This standard provides the communication and interoperability requirements for BAS system components to be supplied to Ohio University.

Because the University's systems have evolved over many years and involve products from multiple vendors and, in several cases, multiple generations of control systems from single vendors, meticulous attention must be given to the seamless integration of the old and the new.

The objectives of this integration include:

- Providing a mechanism for competitive procurement of building control products;
- Assisting in meeting the University's energy conservation and environmental protection goals;
- Improving the operational systems available to OU Facilities Management.
- Reducing, where possible, Facilities Management operating costs;



Ohio University (OU)
Architecture, Design and Construction Standards
Appendix 23.1 –Direct Digital Control (DDC)
Building Automation Systems (BAS)

- Providing an infrastructure for optimizing performance in a Responsibility Cost Management (RCM) environment.

The objectives shall be met by the use of (where possible) the existing using widely-accepted data communication standards and practices. The primary purpose of the system is to provide dynamic control, economical operation and operational information of the equipment.

When this system is installed it will aid the Engineer/Ohio University team in certifying that the contractor has installed and setup the system to Engineer's design intent. Compliance by this Standard is mandatory before OU will accept the mechanical and electrical portion of the Project.

Compliance with this standard is mandatory. The Engineer shall develop Division 230900 Specification based on this standard.

In November 2014, the University virtualized any and all servers being used by the Controls systems on-campus, using the VMWare View Virtual Desktop Infrastructure (VDI). Therefore, all Servers being used for DDC/BAS are now virtual.

Existing virtual servers at Ohio University:

- a. Delta Controls enteliWEB and ORCAview EMCS
- b. Honeywell Enterprise Buildings Integrator (EBI)
- c. Automated Logic Controls WebCTRL Server

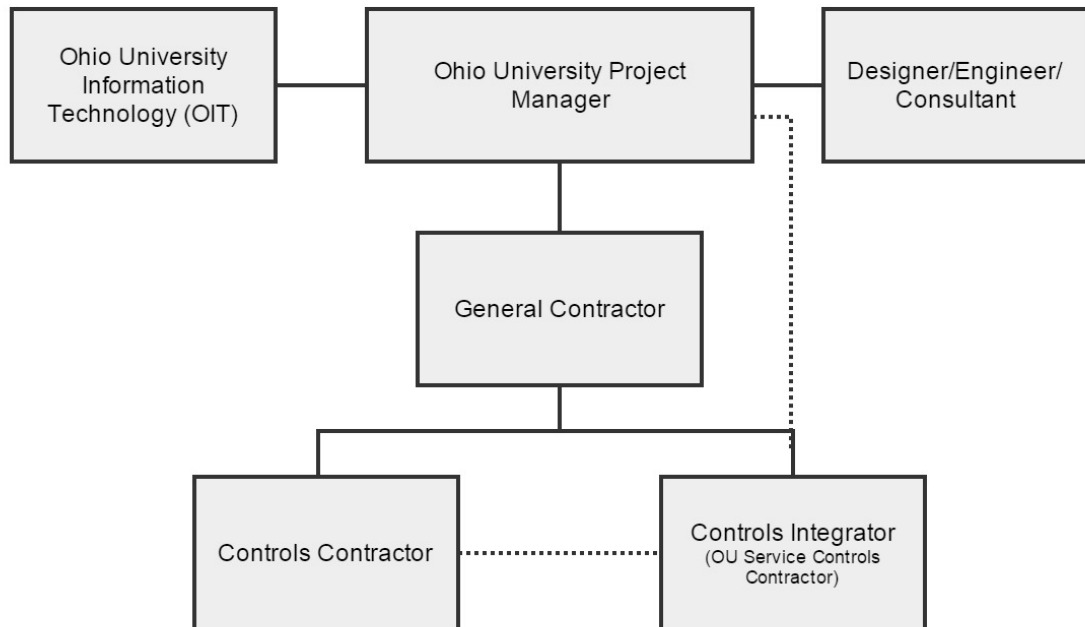
The University's front end (Operator's Interface) is Delta Controls EMCS, enteliWEB. The Contractor must use one of the existing virtual servers supplied by OIT at Ohio University's Computer Services Building. Contractor is responsible for ensuring compatibility of current installed virtual server with work to be performed on all projects. The key to compatibility with existing Delta Controls EMCS, enteliweb is BACnet.

The controls contractors authorized to do the controls work at Ohio University are:

- a. Product – Automated Logic. Installer - Limbach Company
- b. Product – Honeywell Comfort Point. Installer – Honeywell International, Dublin, Ohio Branch
- c. Product – Delta Controls. Installer – Building Control Integrators (BCI).

III. TEAM RESPONSIBILITIES

- A. Ohio University currently uses BCI – Delta Controls - as the DDC/BAS Controls Integrator. Our preference is that for every project the controls contractor and the controls integrator contractor shall be separate entities hired and overseen by the General Contractor.
- B. The General Contractor shall hire under a separate contract, the Ohio University’s Controls Integrator to connect the controls provided under the contract with the existing Building Automation System (BAS) front-end, enteliWEB, a web-based system provided by Delta Controls. It shall be the responsibility of the Controls Contractor to coordinate all work with Ohio University’s Controls Integrator. The Controls Contractor shall integrate the ASHRAE standard 135, BACnet/IP control network with the existing or Controls Integrator’s system over the Ethernet connection.



- C. Contact the Ohio University Facilities Management for the control vendor contacts. It is intended and required that the Design Engineers work with these prequalified vendors to develop the most efficient system design.

- D. Early in the design phase of the project, the Engineer/Designer is responsible to review BAS application and equipment with the Ohio University Project Manager and other OU staff. The primary purpose of the control system is to provide dynamic control, economical operation and operational information of the equipment. When this system is installed it will aid the Engineer in certifying that the contractor has installed and setup the equipment to Engineer's design intent. The BAS is the foundation to OU's requirement for utility billing and for measurement and verification of specific equipment. The Engineer/Designer shall be responsible to provide the scope of work for the BAS system with building level system drawings, schematics and sequences of control.
- E. The Controls Contractor shall program the building controllers and the Contractor's existing DDC/BAS server for the Ohio University Campus. The Controls Contractor shall program all graphic displays on this server for all systems and controlled devices for the project. The graphic displays at the existing graphic work station shall illustrate the depiction of the device, sensor and control point location. The graphic displays shall display dynamic sensor values in engineering units.
- F. The Control Integration Contractor shall update the existing campus Delta Controls EMCS enteliWEB server. The Controls Integration Contractor shall provide seamless interconnection to the existing Delta Controls enteliWEB . The Controls Integration Contractor shall program the Delta Controls EMCS, enteliWEB server to locally log trend data at the building. The Control Integration Contractor shall build customized graphic displays at the existing Delta Controls enteliWEB graphic workstation.
- G. Ohio University Information Technology Coordination (OIT)
- a. The Contractors shall request through the Ohio University's Project Manager, a log in account to be set up to the control's virtual desktop/machine as "OHIO guest account".
 - b. OIT will receive request and provide contractor guest access to the server.
 - c. Privileges will be granted to VDI workstation and vendor supported server.
 - d. The University shall provide VPN access to the virtual server upon request by Contractor to OIT for work related to project.

IV. SYSTEM REQUIREMENTS

- A. Ohio University requires all building automation controls (DDC/BAS) to be of the type that supports native BACnet protocol and all components shall be approved by the BACnet Testing Laboratory.
- B. The Architect/Engineer shall ensure that the proposed design of the BAS for the project captures the total building environmental control and utility billing information and follows LEED (or similar) requirements.
- C. The Architect/Engineer in conjunction with the Commissioning Agent and/or OU Project Manager (Depending on size of Project) will develop a Measurement and Verification Plan that will identify all sensors that need to be recorded for trend or data extraction.
- D. In addition, the General Contractor shall contract with Controls Integrator to integrate the energy and utility management systems from the project to the existing campus system using Delta Controls EMCS, enteliWEB, and Earthright Dashboard in accordance with Division 330900 Utility Metering Standards.
- E. The system shall be a direct digital control system utilizing electric actuation, and pneumatic only if approved.
- F. For monitoring and programming purposes, the new controls will be tied into the existing building automation system. These will be referred to as the Front Ends, or Virtual Workstations. Connection will be done by the following method.
 - a. Systems will be tied into the existing servers at Ohio University.
 - b. Vendor shall provide the means for networking communications through CAT-5 connection provided by the University.
 - c. BACnet implementations shall be functionally verified on BOTH the EMCS installed as part of project (Delta/Honeywell/ALC) located on a Virtual Machine and the Delta Controls enteliWEB EMCS located also on a University's Virtual Machine hosted by OIT. All controls Virtual Machines are hosted and managed by OIT on the University's Virtual Desktop Infrastructure (VDI).
- G. License Agreement for Software:
 - a. If required, a software licensing agreement shall be executed between Control Contractor and University authorized signatory before the software is distributed.

b. If this software is a more recent version than the Universities', this agreement shall include the latest upgrade for the University's Front end.

H. The system shall be modular in nature and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, Building Controls, Application Controllers, expansion modules and operator devices.

V. DDC/BAS REQUIREMENTS

For each project the following systems shall be provided with DDC/BAS controls and integration into the existing systems at OU:

A. Electrical Components, Devices, and Accessories

1. Listed and labeled as defined in NFPA 7- Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. DDC System Components

1. Shall comply with ASHRAE Standard 135

C. BAS shall comply with, and be listed at time of bid for the following Underwriters Laboratories Standards:

1. UL 916 for Energy Management Equipment, per category PAZX for Energy Management Equipment.
2. UL 864 for Control Units for Fire-Protective Signaling Systems, per category UUKL for Smoke Control Systems Equipment.

D. Metering

1. Steam mass flow (if necessary)
2. Steam Condensate
3. Electric Substation, Distribution, Building or Load Centers, sub metering
4. Chillers

5. Chilled Water Systems
6. Hydronic Heating Hot Water Systems
7. Domestic Hot Water Open Loop (if necessary)
8. Domestic (potable) Cold Water (if necessary)
9. Natural Gas (if necessary)
10. Trending all metering points as noted in Design Standards 330900.

E. HVAC systems

1. VAV Box Control
2. Hot Water Unit Heaters
3. Hot Water Circulation Pumps
4. Hot Water Heat Exchangers
5. Ventilation Systems
6. Exhaust Systems
7. AHU Air handling units, constant volume, variable volume , 100% outdoor
8. Laboratory Exhaust Systems
9. CO₂ Demand Control
10. Stand Alone Chiller Plants
11. Stand Alone n Heating Hot Water Plants
12. Steam/Hot Water Boiler

VI. DDC/BAS CONTROLS FUNCTIONS

- A. Space sensors, discharge air sensor, return air sensor, mixed air sensor, damper controls.

B. Fresh Air Controls:

1. A permanent monitoring system to ensure that ventilation systems maintain design minimum airflow requirements. CO2 levels shall be monitored at the front end.

C. All occupied spaces shall have BACnet space temperature sensors, with an occupancy button and a warmer/ cooler adjustment. Provide humidity sensors where applicable.

D. Chiller plant optimization controls to interface with the control package provided by the chiller manufacturer. At the minimum, Controls shall have the following points: Chilled water supply temperature, chilled water return temperature, condenser water supply temperature, condenser water return temperature, indoor air temperature, outdoor air temperature and chillers start/stop enable chiller set point reset.

E. Include any temperature and/or pressure sensors that will provide enough information to complete thermodynamic picture of the project. For example when connecting to the central chilled water distribution system the Engineer shall include: temperature sensors, pressure sensors on the supply and return. Also include a flow transducer. Submit BTU meters calculations for the water extracted from the distribution system. See 330900 Utility Metering standard.

F. Day-night setback program: provide software to limit the rise or drop of space temperature during unoccupied hours. Whenever the space temperature is above (or below for heating) the operator assigned temperature limit, the system shall be enabled until the temperature is within the assigned temperature limit.

VII. EXECUTION

A. Installation shall be performed by trained employees of manufacturer's installation and service organization. The control system design and installation shall be supervised by an applications engineer in the employ of the manufacturer.

B. Critical Alarming set up in the BAS Workstations (referred to in the documents as critical messaging sent to destination workstation) shall also be integrated to the data center at the Computer Services Center. This work shall be coordinated through Ohio Information Technology (OIT).

C. All BACnet intrinsic alarming shall be set up to be disabled. All alarming shall be setup in the existing Delta Controls central graphic workstation. OU HVAC and Controls staff have final say whether or not the alarms meet the University Requirements.

- D. The system shall be modular in nature and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, building controls, application controllers, expansion modules and operator devices.
- E. The General Contractor, on behalf of the controls contractor and/or controls integrator, shall coordinate with the Ohio University Project Manager to contact OIT for all network cabling, conduits, network switches, routers to ensure that a complete and functional network system is in place. Standard mode of connection shall be Ethernet or BACnet over IP unless approved otherwise by the University.
 - 1. OIT furnishes network drops and all network cabling to the network drops and switches. Unless installed by OIT, switches and routers are not allowed to be installed on the OU network by the vendor. The fee for the OIT work and devices will be determined by OIT.
 - 2. Network drops no longer in use by vendor device/s must be returned to OIT.

VIII. SUBMITTALS

- A. Record ("As-built") Drawings:
 - 1. At the completion of the project as-built drawings shall be submitted to the University, showing conduit size and location, cable and wire identification, panel and sensor locations, and device layouts with panels, branch circuit numbers, and wiring diagrams typical field point wiring and for each specific variation, and data trunk typical field point wiring and for each specific variation and data trunk.
 - 2. The Controls Contractor shall install a copy of the DDC/BAS controls shop drawings on the campus web server.
 - 3. The DDC/BAS contractor shall provide as part of shop drawings a complete block DDC/BAS diagrams showing all logic, set points and control schedules. The contractor shall reference design document sections, and paragraphs to note which portions of the diagram depict the control sequence.
 - 4. A complete points list with range and scale for electrical and engineering units shall be provided as part of the shop submittal.
 - 5. BACnet devices, controllers, control valves and sensors with the associated BACnet naming conventions.
 - 6. Wiring schematic and sequence of operation that has been installed.



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Appendix 23.1 –Direct Digital Control (DDC)
Building Automation Systems (BAS)

B. Approved Materials Submittals

- a. All Control System Component Warranties including but not limited to:
 - i. Device, Controllers, Sensors, Control Valves, Software, Wiring, and the entire Controls System.

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER

-----END OF SECTION-----

REVISION DATE: 08-07-15

Voice and Data Communication Pathways and Spaces

I. Scope

- A. These specifications are to be used for all new and remodeling projects which will consist of voice and data communication systems.
- B. It shall be stated in the general contract that OIT personnel will be allowed to work in the building to install communications cabling and equipment during the construction of other trade activities.
- C. In addition to the below specifications, all installation and design work will be performed in accordance with ANSI/TIA/EIA-J-STD-607A, BICSI and NEC standards.

II. Definitions

- A. OIT – Office of Information Technology division of Ohio University. **OIT is responsible for and provides the installation and maintenance of all voice and data communications at Ohio University.**
- B. Entrance Facility – Once the cable enters the building it will be terminated at the entrance Facility. This is the area where the communication cables transition from outdoor cable to indoor cable.
- C. MTR (Main Telecommunications Room) - This will be the room where the communication cables from the Entrance Facility will terminate. The MTR may be used as a TR on its designated floor.
- D. TR (Telecommunications Rooms) - These will be the rooms where all the station cables will terminate on each floor. Each TR will be terminated in the MTR.
- E. Riser cable - This type of cable is generally ran vertically throughout the building to connect the TR's with the MTR.
- F. Station cable - This type of cable is generally ran horizontally throughout the building to connect the individual room jack with TR's.
- G. Computer Lab Cabinet - Used to accommodate large amounts of computers in one area.

III. Specifications

A. Project Management

- 1) OIT needs to be involved in the initial planning of all telephone and data communication needs.
- 2) OIT will need, as early as possible, a set of blue prints showing the MTR, TR, telephone and data jack locations; a furniture layout of the building; and a set of general specifications, that we may keep. Rooms need to be identified as to their particular use, and special blocking required (for example in multi-media or video-conferencing rooms) will be specified to the Architect for inclusion in the construction framing.
- 3) OIT needs to be notified two months before the drop ceiling installation is started. This will allow us to order our supplies and give us plenty of time to start installing cable.
- 4) OIT needs to be notified when the interior wall painting is completed. This will allow us to install our telephone and data jacks before the furniture is moved in.
- 5) OIT needs a contact person to relay any telephone and data jack changes.
- 6) Any alterations to these specifications will need to be approved by an OIT representative.

B. Conduit

- 1) Conduits from each room will stub out into the hallway above the drop ceiling, if acceptable by code. Otherwise, conduit will be stubbed above drop ceiling or to nearest drop ceiling area.
- 2) Conduits will be temporarily capped to keep out various construction debris.
- 3) A pull string will be installed in each conduit that exceeds 10 feet.

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- 4) Two, reamed or bushed, 4" conduits will be installed from the MTR into the main utility tunnel or if there is not a tunnel present, to an area of the building where the communications cable will enter the building. The conduit must extend into the tunnel or outside the building as designed by OIT representatives.
- 5) All conduits running to the telephone jack in each room will be 3/4" in diameter.
- 6) Pull boxes will be installed if:
 - a. conduit run exceeds 90'
 - b. There is a ninety degree bend in conduit 2" or larger.
- 7) In the hallways there will be a minimum of one 12" cable tray or two 6" cable trays. Recommend using Cablofil #CF105/200 cable tray and grounded according to ANSI/TIA/EIA-J-STD-607-A and NEC code.
- 8) There will be three, reamed or bushed, 2 1/2" conduits stubbed from the hallway into the TR or if there is a cable tray installed in the hallway, it may extend into the TR, if allowed by code.
- 9) There will be four, reamed or bushed, 2 1/2" conduits stubbed from the hallway into the MTR or if there is a cable tray installed in the hallway, it may extend into the MTR, if allowed by code.
- 10) If the electrical contractor is to fire seal all conduits and sleeves, the fire seal will be such that the conduits can be easily re-entered at a later date.
- 11) All 90 degree bends will be long sweeps.

C. Raceway

- 1) All raceways will have an appropriate spacing for each required communication cable and outlet unit.
- 2) All raceways with built-in outlets will use cutouts that will accommodate the Ortronics Series II modular jacks and/or the series II single gang faceplate. Recommended raceway is Wiremold V4000 with V4050 device mounting plate.

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If electrical service is in the same raceway, there must be code approved separation from the communication cable.

- 3) All raceway applications shall be approved by OIT prior to specification.
- 4) Only metallic raceway will be installed.

D. Receptacle Boxes

- 1) All telephone receptacle boxes in each room will be 4" * 4" with a mud ring or plaster ring installed to reduce the 4" * 4" opening to a 2" * 4" opening, unless otherwise noted.
- 2) All communication outlets mounted in the floor will be duplex or quad receptacle type cutouts, unless specifically designed to fit Ortronics series II jacks or Ortronics track jacks. There will be a separation from electrical service as specified by code. All outlets in floor will have some type of hinged or spring loaded cover to protect the jack while not in use. We recommend the Wiremold RC3ARTTC poke thru system.
- 3) All surface mounted receptacle boxes will be metallic only. Recommend using Wiremold #V5747.

E. Entrance Facility

- 1) The Entrance Facility will be located as close as possible to the communications cable entering the building. Cable shall not exceed 50' from buildings point of entry Per NEC code 800.48.
- 2) The Entrance Facility will not be located in the same room or in close proximity to a high voltage transformer, elevator switch gear, large electric motor or any other type of high EMF producing devices.

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- 3) The Entrance Facility location will have a 4' x 8' piece of 3/4" fire rated plywood or plywood painted with a fire rated paint, specified by code, attached to the wall vertically in the space provided.
- 4) There will be a minimum of two 4" conduits or cable tray from the buildings point of entry to the Entrance Facility location. there will be a minimum of two 4" conduits or cable tray connecting the Entrance Facility to the MTR. The cable tray and/or conduits shall be terminated at the Entrance Facility plywood.
- 5) There will be a floor to ceiling clearance height of 8' 4" with no obstructions (e.g. piping, lights, drop ceiling, duct work, etc.)
- 6) The communications grounding system will be built in accordance with ANSI/TIA/EIA-J-STD-607-A and NEC code. In addition the electrical sub panels serving the MTR, TR's and Entrance Facility will be surge protected and all grounding to steel will be CAD welded. Also, all backbone ground wire will be a minimum of 1/0. The system is to be designed by an L.P.I Certified Master Installer/Designer.
- 7) The Entrance Facility will have one 125 Volt AC 20amp outlet. The circuit shall be used only for communication use only.
- 8) The Entrance Facility will be well illuminated with fluorescent lighting fixtures. Minimum lighting conditions will be 540 lux (50 footcandles) when measured at 3' above the floor level.

F. MTR

- See Appendix DG.5 MTR ROOM

- 1) The MTR room size will be a minimum of 12' x 12' unless directed otherwise by OIT.
- 2) There will be a floor to ceiling clearance height of 8' 4" with no obstructions (e.g. piping, lights, drop ceiling, duct work, etc.)

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- 3) The communications grounding system will be built in accordance with ANSI/TIA/EIA-J-STD-607-A and NEC code. In addition the electrical sub panels serving the MTR and TR's will be surge protected and all grounding to steel will be CAD welded. Also, all backbone ground wire will be a minimum of 1/0. The system is to be designed by an L.P.I Certified Master Installer/Designer.
- 4) The MTR will have a 4' x 8' piece of 3/4" fire rated plywood or plywood painted with a fire rated paint, specified by code, attached to the wall in the MTR horizontally with the top edge 6' from the floor. *This plywood backboard will be provided and installed by OIT.*
- 5) The MTR will be located as close as possible to the cable entering the building, but not in the same room or in close proximity to a high voltage transformer, elevator switch gear, large electric motor or any other type of high EMF producing devices.
- 6) The MTR's air conditioning will be 12,000 BTUs or larger or otherwise be maintained a consistent 70°F room temperature. OIT is to be notified how the Architect or Engineer plans to maintain the temperature of this room.
- 7) The TR's on the next floor will be directly above the MTR below, if at all possible.
- 8) The MTR will have a minimum of four quad 125 Volt AC 20amp outlets. There will be a total of two circuits in the room. Each quad outlet will have a separate circuit on each side (e.g. circuit 1 would be on the duplex outlet on the left side and circuit 2 would be on the duplex outlet on the right side). All outlet covers will be marked with the circuit breaker and breaker box ID. These circuits shall be used only for communication circuits and will be connected to the emergency backup generator, if available.
- 9) The MTR will be well illuminated with fluorescent lighting fixtures. Minimum lighting conditions will be 540 lux (50 footcandles) when measured at 3' above the floor level.

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- 10) Floors will be VCT tile or sheet flooring.
- 11) All walls will be painted.
- 12) The TR must be positioned so that the cable length from the TR to the room jack does not exceed 250 feet.
- 13) The MTR will have its own key (provide by OIT) and direct access to the main hallway.
- 14) There will be no water pipes, drain pipes, high power electrical conduits, electrical panels, steam lines, hot pipes, etc. in or through the MTR.
- 15) No sprinkler type fire suppression will be installed in the MTR. The room will be constructed in a manner that will not require sprinklers.
- 16) There will be a fire/smoke detector installed in this room. The detector will be tied into the building fire alarm system.
- 17) The communications grounding system will be built in accordance with ANSI/TIA/EIA-J-STD-607-A and NEC code. In addition the electrical sub panels serving the MTR and TR's will be surge protected from transient voltage and all grounding to steel will be CAD welded. Also, all backbone ground wire will be a minimum of 1/0.
- 18) Only OIT approved equipment and/or personal will occupy the room.
- 19) Entrance door will swing out of room.

G. TR

- See Appendix DG.4 TR ROOM

- 1) The TR's size will be a minimum of 8' x 8' unless directed otherwise by OIT.

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- 2) There will be a floor to ceiling clearance height of 8' 4" with no obstructions (e.g. piping, lights, drop ceiling, duct work, etc.)
- 3) Each TR will have a 4' * 7' piece of 3/4" fire rated plywood or plywood painted with a fire rated paint, specified by the local fire code, attached to the wall in the TR horizontally with the top edge 6' from the floor. *This plywood backboard will be provided and installed by OIT.*
- 4) The TR must be positioned so that the cable length from the TR to the room jack does not exceed 250 feet.
- 5) The TR's air conditioning will be 5,000 BTUs or the TR room shall otherwise be maintained at a constant 70°F room temperature (per TR room note.)
- 6) All TR's will be located directly above each other on their respective floors if at all possible, but not in the same room or in close proximity to a high voltage transformer, elevator switchgear, large electric motor or any other type of high EMF producing devices.
- 7) The TR will have a minimum of four quad 125 Volt AC 20amp outlets. There will be a total of two circuits in the room. Each quad outlet will have a separate circuit on each side (e.g. circuit 1 would be on the duplex outlet on the left side and circuit 2 would be on the duplex outlet on the right side). All outlet covers will be marked with the circuit breaker and breaker box ID. These circuits shall be used only for communication circuits and will be connected to the emergency backup generator, if available.
- 8) All TR's will have two sleeved 4" core drilled holes drilled through the floor directly underneath the plywood and into the TR directly below. These sleeves will protrude 1" above the floor. Each sleeve will be reamed or bushed. If the TR's are not stacked, there will be two 4" conduits connecting TR to MTR. These sleeves and/or conduits shall be installed by the construction contractor for OIT to utilize.
- 9) All TR's will be well illuminated with fluorescent lighting fixtures. Minimum lighting conditions will be 540 lux (50 footcandles) when measured at 3' above the floor level.

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- 10) Floors will be asphalt tile or linoleum.
- 11) All walls will be painted.
- 12) All TR's will have their own key (specified by OIT) and direct access to the main hallway.
- 13) There will be no water pipes, drain pipes, high power electrical conduit, electrical panels, steam lines, hot pipes, etc. in or passing through the TR's.
- 14) No sprinkler type fire suppression will be installed in the TR's. The room will be constructed in a manner that will not require sprinklers.
- 15) There will be a fire/smoke detector installed in this room. The detector will be tied into the building fire alarm system.
- 16) The communications grounding system will be built in accordance with ANSI/TIA/EIA-J-STD-607-A and NEC code. In addition the electrical sub panels serving the MTR and TR's will be surge protected from transient voltage and all grounding to steel will be CAD welded. Also, all backbone ground wire will be a minimum of 1/0.
- 17) Only OIT approved equipment and/or personal will occupy the room
- 18) Entrance door will swing out of room.

H. Computer Lab Cabinets

- 1) Computer Lab Cabinets require a space of 77" wide x 25" deep x 72" high. The actual dimensions of the cabinet are 27"x 25"x 72", but once the front and back doors are fully open, it will be 77" wide.
- 2) They require a dual 125 Volt AC outlet on two separate circuits installed in or next to cabinet.
- 3) All cabinets will be floor mounted.
- 4) All cabinets will be positioned against a wall or near a large channeled ceiling pole to accommodate cabling into cabinet.



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I. Miscellaneous

- 1) For temporary telephone and data services the contractor can utilize Verizon or Ohio University for telephone/data service, and will be required to pay appropriate charges for these services.
- 2) OIT would like to have a secure temporary storage room on the site at the earliest convenience of the contractor for large projects.
- 3) All cabling pathways will be unobstructed and accessible at a later date.
- 4) All work shall be in accordance with ANSI/TIA/EIA-J-STD-607-A, BICSI and NEC standards.

Ohio University Representative

Date

Project Name

-----END OF SECTION-----

REVISION DATE: 03-23-12

SINGLE SOURCE PRODUCT

- N/A

NOT PERMITTED PRODUCTS

- N/A

REQUIREMENTS:

SITE MAINTENANCE

- The contractor shall be responsible for the maintenance of the site during the construction period. This includes responsibility for the following:
 - Daily trash cleanup, both construction debris and general litter, whether generated as a result of the construction process or not.
 - Maintenance of all grounds inside the construction fence or boundaries.
 - Mowing, watering and maintenance of these grounds in good, safe and esthetically pleasing condition until the date of acceptance by Project Manager. (This date can but does not necessarily coincide with the date of substantial completion of the constructed facility.)
 - Streets and sidewalks shall be maintained clean and free of debris and mud.
 - Erosion control measures shall be in place prior to commencing ground disturbance work.
 - Contractor to supply all barricades, barriers and traffic control devices.

TOPSOIL

- Topsoil shall have the following characteristics:
 - All topsoil must be approved by the Project Manager before the installation.
 - 3% or greater organic matter content
 - Topsoil shall be free of stones greater than 1", sticks and extraneous material, and aggregates must be less than 5% by volume in composition.
 - Minimum surface depth to be 4" in lawn area, 12" in shrub beds
 - Grade lawn areas to a smooth, free draining, even surface with a loose, moderately coarse texture. Roll, scarify, rake and level as necessary to obtain true, even lawn

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Appendix 31.1: Grounds

surfaces and fill depressions as required to drain. Correct irregularities in the surface resulting from tillage operations to prevent the formation of the depressions or water pockets.

- Once topsoil is placed and final grade is established, the University Project Manager, along with a University Grounds Manager, shall approve the final grading prior to seeding.
- Backfilling of trenches shall be done in lifts not exceed 6", with the backfill tamped after the placement of each lift. (move to Division 31: Earthwork)
 - a. Subsurface shall be scarified or tilled to a depth of 4" immediately prior to the placement of topsoil.
 - b. Removed topsoil that is not to be reused in the final grading shall be transported to a storage site on the Ohio University grounds and become the property of the OU grounds Maintenance Department.
 - c. Once topsoil is placed and final grade is established, the Project Manager shall approve the final grading prior to seeding.

SOD

- Sod requirements are as follows: (For specifics applications, refer to the Project Manager)
 - Sub-surface preparation for sod application shall be the same as indicated above for topsoil applications.
 - Sod shall be Turf Type Tall Fescue with 5%-10% Kentucky Bluegrass. The name of the actual turf grass cultivar contained in the sod shall be submitted to the Project Manager for approval prior to installation.
 - Sod shall be rolled after installation
 - Fertilizer shall be spread on the subsurface immediately prior to sod installation.
 - Consultant is required to review all fertilizer recommendations with the Project Manager.

- All sod shall be laid within 24 hours of its cutting.
- Sod shall be pegged on all slopes greater than 3:1.
- The contractor shall be responsible for proper watering for 2 weeks from the date of completion of sod placement. Owner will then accept the installation of the sod and be responsible for the maintenance.

STRAW/MULCH

- Straw/mulch shall be clean and free of all noxious weeds.
- Straw/mulch on steeply sloped areas will require securing.
- Mulch shall be shredded pine bark or hardwood to be a 3" depth

SEEDING

- The approved mix changes from time to time as preferences and availability change. Contact the Project Manager during the planning of any site work for seed mix.
- Seeded lawns are accepted by Project Manager after 97% coverage is achieved, and after 2 mowings.

LANDSCAPE PLANTING

- All plants to be watered at the time of placement
- All trees 1 ½" or larger shall be staked.
- Thin barked trees (crab apple, beech, maple, etc.) shall be wrapped and secured with bio-degradable twine.
- Trees shall not be placed where they will interfere with buildings, important signage, lighting (create dark areas at night) or where their roots or branches will interfere with existing or contemplating utilities.

TREE PROTECTION STANDARDS

- The design professional and contractor shall use due diligence in the protection of the existing trees and shrubs on Ohio University Property.

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- If there is any question as to whether limbs can be removed, bark damage or root damage during excavation, the Project Manager shall be notified immediately to make recommendations on the situation.
- Fencing: protection area to follow the ratio of 1' radius per 1" tree diameter at breast height (dbh). Posts to be steel channel posts spaced 8'-0" o.c. with standards snow fencing or orange polyethylene construction fencing, exposed height above grade 4'-0".
- No construction activities are to occur within the protected area. The protected area is not to be used for the storage of construction materials, nor is it to be driven over with any vehicle or equipment.
- Where it is not practical to stay out of the tree protection area, largest possible protected area is to be designated, and appropriate measures are to be used to minimize damage to the trunk, limbs, and roots or each tree as follows. Required measures may include:
 - The trunk is to be temporarily wrapped or boarded around to protect against damage from being hit by operating equipment. Protective materials shall not be nailed to the tree.
 - All reasonable efforts are to be made to minimize root damage.
 - Minor roots (less than 2" diameter) that must be severed are to be clean cut with a saw. Major roots (2" diameter or more) are not to be severed unless specifically authorized by the Project Manager. Boring under major roots should be practiced where practical.
 - Roots exposed for more than 2 days are to be protected from desiccation.

SPRINKLERS AND WATERING

- Planting Beds
 - New installations should provide water hydrants or other watering provisions within 100' of planting beds.
- Irrigation Equipment
 - Utilize the following standard materials unless otherwise directed by the OU Project Manager:
 - a. Rainbird Satellite Compatible Irrigation Systems shall be utilized as the basis for design. Limit the "approved equal" if possible.
 - Rainbow, Toro or Hunter heads may be utilized, and all heads shall be on swing joints.
 - Installation
 - a. All underground sprinkler piping shall be installed with tracer wire. Coil tracer leads at the feed source.

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- b. Sprinkler piping shall be PVC, Schedule. 40, ASTM D1785. Joints shall be ASTM D2855 solvent weld with ASTM D2564 solvent cement. Above 4" shall be Schedule. 80.

STANDARD EQUIPMENT

- This section details the standard materials commonly utilized by Ohio University.
 - Trash Urns—
 - Bicycle Racks—
 - Drinking Fountains—

 - Parking Lot Bumpers—
 - a. Tire bumpers shall be installed with adequate set-back distance for larger cars and trucks.

LANDSCAPE MASONRY MORTAR COLOR

- This section will detail the process of selection of brick, mortar, stone or buffed concrete surfaces.
 - Utilize Buff colored mortar. Lay up a panel with the proposed materials for the University project manager to review.

DIVISION 33 UTILITIES

- Manhole lids shall be identified as STORM SEWER, SANITARY SEWER, and for combined, SEWER. Provide drains in all manholes.
- Catch basins shall be back plastered on interior. They shall be provided with inverts and shall be large enough for easy cleaning. Manholes shall not be used for catch basins or yard basins.
- Sewers shall be laid on an even grade from manhole to manhole. Double strength sewer tile shall be used when loading is heavy and under all roads. Slip seal or plastic joints shall be used on clay sewer pipe. Grease traps shall be provided where needed

-----END OF SECTION-----

REVISION DATE: 03-23-12

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I. EXECUTIVE SUMMARY

A. OVERVIEW

Ohio University will be metering total building utility consumption. This will be accomplished through the continuous monitoring of utilities via the Building Automation System (BAS) and the energy dashboard overlay (enteliWEB). The monitoring system, outlined in this Standard, is designed to provide accessible and accurate key performance metrics to inform the maintenance and operations team regarding the performance of campus buildings and central utility plants (CUPs). Service categories to be monitored are (more detailed list and instructions to follow):

- Electricity
- Steam/Condensate
- Heating Hot Water
- Chilled Water
- Natural Gas
- Domestic Cold Water
- Domestic Hot Water

This Utility Metering Standard provides a guideline for the necessary tools, communications standards, and techniques used to measure and record energy and water performance for OU buildings. This Standard also outlines the required implementation practices such as the methods for measuring and reporting building utility usage. The Building Automation System and Energy Dashboard (enteliWEB) will be used to collect, store and display the required utility data. See Diagram 1 for system architecture. The remaining goals of this Standard includes:

1. Define the parameters that need to be measured and the associated data to be stored for long-term use/review.
2. Identify the general locations, types and characteristics of the measurement devices, and whether the devices need to be added, calibrated and/or connected to the BAS.
3. Indicate quality assurance measures and procedure for calibration of measurement devices.
4. Describe the method for establishing the baseline energy performance.
5. Define and distinguish the Team's Roles and Responsibilities.
6. Define the appropriate metrics and naming conventions that should be trended via the BAS and energy management dashboards.

B. SUMMARY

1. All planned utility interruptions shall be coordinated with the OU calendar and the OU Project Manager. Be aware that specifications and coded notes (site plans) should indicate that new service requirements and utility shutdowns require a minimum of ten (10) business days' notice in advance of the event.
2. Where natural gas flow meters currently exist, or are included for new buildings (meters owned and maintained by Columbia Gas of Ohio), no additional metering by OU need be installed to measure building natural gas volume.
3. All boilers included in new projects to be fired with natural gas and/or diesel oil, shall have the fuel supply metered by an OU metering system.
4. Where domestic water flow meters currently exist, or are included for new buildings (meters owned and maintained by the City of Athens), no additional metering by OU need be installed to measure building water volume. If a LEED project, OU water flow meter will be installed and linked to BAS.
5. Contractor(s) and sub-contractor(s) shall purchase only Underwriters Laboratories listed equipment, assemblies, and materials.
6. All water chillers included in new projects shall have the electric and/or steam supply, and the chilled water BTU production metered.
7. All new chilled water tap connections into the OU main loop district chilled water system shall have BTU energy meters installed.
8. All new electric service drop connections into the OU Primary 69 KV systems shall have an electric meter installed. If additional sub-metering is required for cost (and energy) allocation purposes, the metering shall be done using a multi-point meter.
9. All renewable energy projects shall follow this set of standards and have the utilities metered.
10. Install the necessary metering equipment to measure the total building energy and water use and sub-metering to meet LEEDs M&V requirements. Systems, if requested by Ohio University team, are also to be designed to provide equipment needed to measure the utility consumption of individual tenants (auxiliaries) within the building. These auxiliaries are defined as areas occupied by campus dining, athletics, and residence life.
11. The metering system shall become part of an existing campus-wide Delta EMS utility metering system (enteliWeb) to collect, store, and analyze information from all advanced meters, rendering Ohio University accurate and automated metering of its facilities' energy and water flows. Meter data acquisition shall be carried through the Building Automation System using BACnet MS/TP and/or the following output signals: 4-20 mA or 0 to 10 VDC.

- a. MODBUS over MS/TP shall only be acceptable if written approval of communication capability is provided by the Controls Contractor to the BAS local controller.
 - b. The utility meter to local BAS controller communication verification shall take place before meter is approved and purchased.

12. Temporary utility service requirements may be metered; this shall be determined on a case-by-case project basis (prior to the project bid). Temporary electric, steam, and water revenue utility meters shall be provided/installed/maintained by the primary construction contractor, and utility rates agreed to prior to bid. Due to the high costs of domestic water and sewer, particular attention is given to projected utility consumption. If the OU Project Manager does not foresee large utility usage for the project, this requirement may not be used. Dysfunctional metering installations / systems are subject to estimated billing and back charges by OU Facilities.

II. MEASUREMENTS AND METRICS

A. UNIT DEFINITIONS:

kW	Kilowatt(s) (electrical demand) accounting for voltage, amperage, and power factor
kW-hr	Kilowatt hours (aka kWh - electrical consumption) accounting for kW demand
scf	Standard cubic feet (natural gas)
scfm	Standard cubic feet per minute (natural gas)
gpm	Gallons per minute (water flow)
10 ² gallons	100 gallons (aka deca-gallons – water consumption)
°F	Temperature in degrees Fahrenheit
BTU	British Thermal Units (energy)
10 ³ BTU	1000 BTU (aka kBTU)
BTU/hr	Energy rate
Ton	12,000 btu/hr (rate of water measurement)
Ton-Hour	Average tons of chilled water used in an hour
Lbs/hr	Pounds per hour (steam)
ΔT	Temperature differential in °F

B. ABBREVIATIONS AND SYSTEMS:

BAS	Building automation system
CUP	Central utility plant
enteliWEB	Delta server for data aggregation and graphic display
Earthright	Energy/Water Dashboard for displaying existing utility/submeter data stored in the BAS system (a web application)

C. CONTINUOUS MEASUREMENT AND TRENDING REQUIREMENTS

1. Building

- a. Main Electric Power Consumption
- b. One (1) Standard single point kWh electrical sub-meter
- c. Multi-point electrical sub-meters/panels (if deemed necessary by OU designated PM)
- d. Chilled water (CHW) energy metering equipment
- e. Heating hot water (HHW) energy metering equipment (if necessary)
- f. Domestic hot water (DHW) energy metering equipment (if necessary)
- g. Steam Condensate metering equipment
- h. Steam metering equipment (if necessary)
- i. Domestic water metering equipment
- j. Domestic water sub-metering (if necessary)
- k. Natural gas pressure and temperature compensated metering equipment
- l. Natural gas sub-meter (if necessary)

2. Central Chilled Water Plant

- a. Chilled water plant consumption
- b. Chilled water plant demand
- c. Chiller electrical power demand
- d. Chiller electrical power consumption
- e. Chiller Plant Chilled Water BTU production (building)
- f. Chiller tonnage production (per chiller)
- g. Chilled water flow rate (building)
- h. Chilled water flow rate (per chiller)
- i. Chilled water supply temperature (to building)
- j. Chilled water return temperature (from building)
- k. Chilled water supply temperature (per chiller)
- l. Chilled water return temperature (per chiller)
- m. Chilled water pump electrical power
- n. Cooling tower fan electrical power (per tower)
- o. Condenser water supply temperature (to chiller plant)
- p. Condenser water return temperature (from chiller plant)
- q. (Condenser water flow rate) – if required
- r. Condenser water pump electrical power
- s. Cooling tower make-up water flow rate
- t. Cooling tower make-up water consumption

3. Central Steam Plant

- a. Natural gas pressure and temperature compensated flow rate

- b. Natural gas pressure and temperature compensated usage
- c. Natural gas pressure and temperature compensated usage (per boiler)
- d. Fuel oil (or alternative fuel source) usage (per boiler)
- e. Steam production (per boiler)
- f. Steam production (steam plant)
- g. Condensate return flow rate (steam plant)
- h. Condensate return flow (steam plant)

4. Process loads

- a. Kitchen natural gas flow rate
- b. Kitchen natural gas consumption
- c. Data center power demand
- d. Data center power consumption

III. COMMUNICATIONS

A. INTEGRATION TO DDC CONTROL SYSTEM

1. Meter Communication

- a. All Meters contributing to the total project utility consumption shall have digital-output capability for remote and automated meter reading
- b. Provide a BACnet network allowing communication from the meters' data heads/output to the existing Ohio University Energy Metering & Monitoring Database (enteliWeb).
- c. All metering devices are to be connected to the existing building automation system network. Data communication networks should be connected to existing, secured data networks. The MAC Address and IP Address are provided by OIT where applicable. Trend data will be archived in a database from field equipment in time intervals of no less than once per day. See Section VI – Metrics and Reporting for specific trending details.
- d. The BAS building controller shall accept the meter input. Each meter shall have a communication port and successful communication to BAS local controller. Communication protocol required is BACnet MS/TP.
- e. MODBUS over MS/TP or BACnet over IP shall only be acceptable if written approval of communication capability is provided by the Controls Contractor to the BAS local controller.
- f. The utility meter to local BAS controller communication verification shall take place before meter is approved and purchased.

2. Environment

- a. Data Head hardware shall be suitable for the conditions ranging from -29°C to 60°C.

Data Heads used outdoors and/or in wet ambient conditions shall be mounted within waterproof enclosures and shall be rated for operation at conditions ranging from - 29°C to 60°C.

3. Building BAS Controller

- a. The building BAS controller, also referred to as the “data logger, shall maintain all data in the event of a power loss for at least 72 hours.
- b. The building controller shall be collecting from all meters and their points at 15 minute intervals.
- c. Storage on the field equipment will be reset once the data is exported to allow for trending if communication is disrupted. Data will be uploaded once communication is reestablished.
- d. Blank or null values in the database will be replaced with actual data.
- e. Calculations and other metrics will be updated once the controller data is uploaded. This overall system update to check for new data should be automated to run once a day.

4. Front End

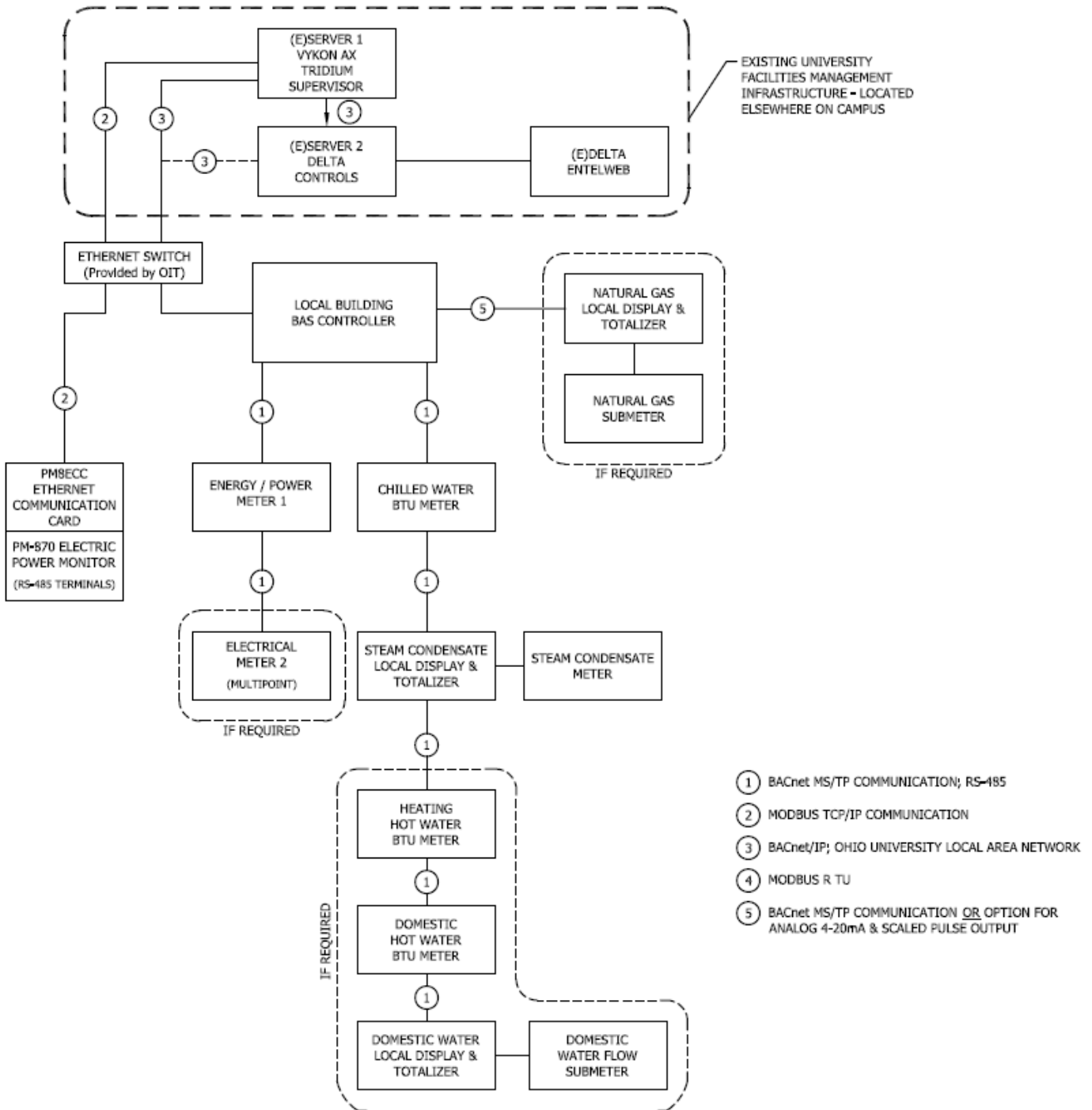
- a. All data will be stored in a database file format on Ohio University’s existing VYKON AX Tridium Server for direct use by third-party application programs (e.g., Energy Information System [EIS] or for SQL database export) AND all data shall be integrated into Ohio University’s existing Delta Controls Energy Management System, enteliWeb.
- b. Sufficient data storage capacity will comprise at least three years of data for all data points.
- c. The data will be fully contained in a single file or table for each point/trend. Data will not span multiple files or database tables. Users can have the option to modify the start and end dates for exporting files depending on third-party program requirements to evaluate the data.
- d. Meter communications wiring shall be shown on the construction documents.
- e. Metering data will be added to the appropriate display pages in the Building Automation System front end.

5. Communication Networks and Data Storage Requirements

- a. To be coordinated with the Ohio University Information Technology (OIT) team. See Team Responsibilities Section VI.

6. Naming Conventions in BAS System

- a. See Appendix D for Naming Conventions to be followed.



1 **DIAGRAM**
METERING & COMMUNICATIONS ARCHITECTURE N.T.S.

IV. METERS/HARDWARE/DEVICES

A. GENERAL

1. The meter shall be installed to manufacturers' guidelines and any questions regarding the installation shall be referred to the local meter representative for confirmation prior to installation.
2. All equipment, including but not limited to temperature sensors, BTU computer and the meter must have at minimum a two-year warranty. Refer to specific utility function and meter for more strict warranties.
3. Calculations, equations, and/or methodology used to determine the size of the flow meter shall be supplied to Ohio University for acceptance.
4. Meter must be installed per the manufacturer's specifications and approval from Ohio University must be obtained before installing the flow meter to ensure it is installed per the manufacturers' guidelines.
5. All flow meters will be considered for approval on the basis of life cycle cost analysis and performance history at OU by the OU Project Manager and Facilities Team.
6. Certificates of calibration for the hydronic energy distribution meter with water or other liquids available in the calibration facility, as well as a certificate of calibration conformance for the transmitters in accordance to NIST shall be provided.
7. Power, where needed, shall be obtained from a dedicated 20 Amp circuit in the nearest local building electrical panel unless otherwise stated.

B. ABBREVIATIONS AND SYSTEMS:

1. General

- a. Meter shall accumulate electrical energy consumption (kW-Hr) and peak real power demand (demand kW) information to front end, carried through the Building Automation System.
- b. Under Base Bid, provide products as specified here, manufactured by Electro Industries/Gauge Tech, Eaton, General Electric, Square D, Siemens, or approved equivalent.
- c. The Main Electrical Distribution Switchboard shall be metered with an electronic power and energy meter. This meter shall be referred to as Meter 1.
- d. If additional sub-metering is required for cost (and energy) allocation purposes, the metering shall be done using a multi-point meter. This meter or meters, if necessary, shall be referred to as Meter 2.

2. Electrical Meter 1

a. Type

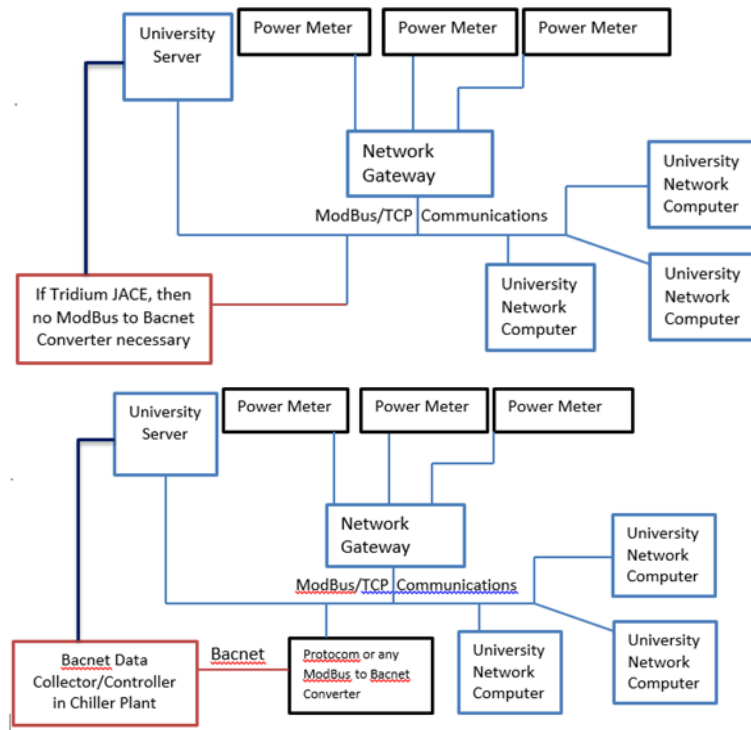
- i. The meter shall be a traceable revenue meter, which shall contain a utility grade test pulse allowing power providers to verify and confirm that the meter is performing to its rate accuracy.
- ii. The Real Power and Energy Meter shall be fully electronic with multi-line backlit LED display showing measured parameters on local display.

b. Measurements & Accuracy

- i. The power meter shall perform the measurements listed in Appendix A and B.
- ii. The power meter shall perform to the accuracy standards listed in Appendix B.
- iii. The measured energy consumption shall be retained in non-volatile memory for the life of the product warranty.
- iv. The power meter shall have separate control power inputs such that it may be powered from a different service than it measures.
- v. Data logging capability to protect data in the event of a power failure. The meter shall have a real-time clock that allows for time stamping of all the data in the meter when log events are created.

c. Communications

- i. The power meter shall communicate to the local building automation system controller using the BACnet MS/TP protocol at speeds from 9600 to 115,200 baud (no parity) or Modbus Driver on the Local Building Controller (BAS) to convert Modbus power meter to BACnet.
- ii. The meter shall provide a BACnet Device object by following three options below:
 - a. Option 1: Modbus Driver on the Local Building Controller (BAS) to convert Modbus power meter to BACnet
 - b. Option 2: See diagram below.



c. Option 3: See diagram below.

d. Quality

- i. The meter shall be UL listed and CE marked.
- ii. The product shall have a 4-year warranty.
- iii. The power meter shall have a Certificate of Calibration with NIST traceable test data.

e. Acceptable product is Electro Industries/GaugeTech, Model or approved equal:

- i. Shark®200-60-10-V2-D2-INP100S-X.

3. Electrical Meter 2 – If determined as necessary

- a. Multi-Point Metering Unit (or units) sufficient to sub-meter the HVAC equipment, lighting loads, or any other electricity-consuming devices associated with the building. Multi-Point Energy Meter shall monitor kW and kWh for the equipment

- and shall accumulate total energy consumption in kWh of the equipment.
 - b. All specifications of Electrical Meter 1, except is not required to be utility grade.
 - c. Accuracy and Measurement requirements can be found in Appendix B.
4. Instrument Transformers
- a. General
 - i. Power Supply to the meter shall be no greater than 120 V.
 - ii. Appropriately sized and NEMA rated Instrument Transformers shall be used to step down Voltage to 120 V for power supply to the meter.
5. Current Transformers (CT's)
- a. The current transformers (CT's) shall be standard 5A secondary and conform to the ANSI Standard accuracy class for metering service of 0.3 or better (revenue metering) with burden B-0.1 to B – 2.0 (with burden equal to or greater than that of the installed meter and any other connected equipment).
 - b. CTs secondary wiring length shall be minimized. The contractor/engineer shall calculate the additional burden of CT wiring and shall ensure that the total burden of the meter and associated wiring is within the rating of the CTs at the intended accuracy class of 0.3 or better.
 - c. CT accuracy class shall be sufficient for use in revenue metering with burden equal to or greater than that of the installed meter and any other connected equipment. Split core and solid core CTs are permitted but must conform to accuracy specifications.
 - d. Rope Coil-Type CTs must be approved by Ohio University Project Manager and Facilities Team.
6. Potential Transformers (PT's)
- a. Voltage inputs from standard instrument potential transformer with 120 volt secondary output. The power meter shall support PT primaries through 3.2 MV.
 - b. Where system voltages are below 480/277, no potential transformers are required.
 - c. Where potential transformers are used, they shall be protected by fuses on the primary and secondary sides.
 - d. Potential transformers shall be instrument transformers of suitable accuracy for revenue metering and shall supply only meters and protective relays. Control power transformers shall not be used as metering potential source.
 - e. Fuses shall be class CC or as recommended by the meter manufacturer.

C. CHILLED WATER SYSTEM METERING

1. Chilled Water (CHW) BTU Metering: Each system shall include an electromagnetic flow meter and a BTU energy meter. The BTU energy meter shall include two temperature sensors, a BTU processor and

network communication compatible with the University's BAS.

2. Acceptable Manufacturer or OU approved equal:
 - a. Onicon (See Section X, Details and Drawings: Detail C).
 - i. Electromagnetic Meter F-3200 Series.
 - a. Standard – 0.4% of Reading Accuracy
 - ii. Onicon System 10 BTU Meter with Communication Card with BACnet MS/TP.
 - a. System-10 BTU Meter is sold complete with and temperature sensors.
 - iii. Based on installation location, the following thermowell kits shall be purchased:
 - a. Brass kit for threaded steel pipe (3/4" – 2 1/2")
 - b. Brass kit for welded steel pipe (3/4" – 5")
 - c. SS kit for welded steel pipe (5 1/2" and up)
 - d. Note: Thermowell installation kits and flow meters are purchased separately.
3. Show meter installation details on drawings showing straight upstream and downstream distances. Meter location shall be clearly shown on the layout drawings. Submit meter sizing data for approval.
4. Condenser Water Metering: Meters for Condenser Water shall be Onicon F-3200 series as specified for chilled water above or Onicon F-3500 series Insertion Electromagnetic type. Meters shall be provided with installation kit supplied by the manufacturer.

Prior approval shall be obtained from the Project Manager before specifying any meter for condenser water.

D. HEATING HOT WATER METERING AND DOMESTIC HOT WATER METERING

1. Heating Hot Water (HHW) and/or Domestic Hot Water (DHW) BTU Metering System: Each system shall include an electromagnetic flow meter and a BTU energy meter. The BTU energy meter shall include two temperature sensors, a BTU processor and network communication compatible with the University's BAS.
2. The heating hot water meter/domestic hot water metering system shall measure the total BTUs delivered and used at the building.
3. Hot water energy meters shall be installed on the primary hot water supply piping after the isolation valves from the primary hot water system. Each flow meter shall be accompanied by a temperature transmitter in both the primary hot water supply and return piping.
4. Hot water meters shall be of the ELECTROMAGNETIC meter type, and shall meet the following requirements:
 - a. The flow sensor turndown shall be no less than 15 to 1.

- b. Meter shall be sized to read at mid-point for the nominal designed system load. Meter shall not be sized for maximum capacity of the installed system. Heating hot water meter location shall be clearly shown on piping drawings with manufacturers piping recommendations noted.
 - c. Meter shall be suitable for 200°F fluid operating temperature (25% warmer than the highest operating temperature of the heating system at OU).
 - d. Meter rating shall be 25% higher than the fluid's operating pressure or 25% higher than the piping system's safety valve set pressure, whichever is higher.
 - e. Meter flanges shall be Class 150 or higher, if required by the piping system's temperature and pressure class.
 - f. Meter shall be suitable for installation in ambient conditions ranging from -29 to 60 degrees C.
 - g. PTFE linings are required for hot water applications as per manufacturer recommendations.
5. Hot Water Temperature Sensors: Resistance Temperature Device (RTD).
- a. Temperature sensors shall be wet bath calibrated, matched and paired to a minimum accuracy of 0.15° F as a set. Sensors shall include a certificate of calibration to a nationally recognized standard (NIST).
 - b. Temperature sensors shall be for high temperatures up to 200°F
 - c. If meter is being installed via hot tap, valves shall be Class 150.
 - d. The nominal size of the sensor shall match the size of the pipe where the flow sensor will be installed. The primary element shall comply with applicable standard codes such as but not limited to ISO, ASME.
 - e. Immersion sensor shall be provided with a separable thermowell. Pressure rating of well is to be consistent with the system pressure in which it is to be installed.
 - f. Thermowells shall not be mounted closer than ten (10) pipe diameters upstream or five (5) pipe diameters downstream from flow element and must meet the manufacturer's specifications.
 - g. Stainless steel thermowells shall be used above 5" line sizes.
6. Flow Computer
- a. The flow meter and temperature sensors shall be coupled to a BTU meter flow computer.
 - b. The flow meter shall have at minimum a two-year warranty.
 - c. Flow Meter/BTU Calculator shall provide the outputs listed in Appendix A and B.
 - d. The flow computer shall communicate as stated in the Communications Section III.
7. Acceptable Manufacturer or OU approved equal:
- a. Onicon (See Section X, Details and Drawings: Detail D for Data Sheets).
 - i. Electromagnetic Meter F-3000 Series.
 - a. Standard – 0.4% of Reading Accuracy

- b. Onicon System 10 BTU Meter with Communication Card with BACnet MS/TP.
 - i. System-10 BTU Meter is sold complete with temperature sensors.
 - ii. Temperature sensors shall be for high temperature applications up to 200°F.
 - iii. Based on installation location and application, the following thermowell kits should be purchased:
 - a. Brass kit for threaded steel pipe (3/4" – 2 1/2")
 - b. Brass kit for welded steel pipe (3/4" – 5")
 - c. SS kit for welded steel pipe (5 1/2" and up)
 - d. Note: Thermowell installation kits and flow meters are purchased separately.

E. STEAM/CONDENSATE METERING

1. Steam consumption for the entire building shall be totalized by a condensate meter that shall be installed at the condensate return pump station. The meter shall have a mechanical non-resettable totalizer scaled in gallons (or 10² gallons for higher usage buildings). Meter shall also have a pulse/contact signal read by the Building Automation System controller in units of 10 or 10² or 10³ gallons and totalized in gallons or 10² or 10³ gallons. The Building Automation System controller shall report directly onto the BACnet MS/TP or BACnet/IP network to the building automation system local controller. Coordinate with BAS contractor.
2. Basis of design of Condensate Meter shall be a wetted ultrasonic flow meter design. A 1" (one inch) meter shall be used, handling flows from 0.07 – 35 gpm.
3. If maximum flow is greater than 35 gpm, a turbine flowmeter design shall be used. A 1" (one inch) meter shall be used, handling flows from 4 – 55 gpm and designed for high temperatures of at least 250°F.
4. Output shall be tied to the Building Automation System local controller via BACnet MS/TP or BACnet/IP Communications. Coordinate with BAS contractor.
5. Meter totalizer display shall be located in a readable location, three to five feet off finished floor. Mounting position shall be horizontal.
6. Meter shall be installed downstream of a vented condensate receiver as indicated on Condensate Metering Standard Detail (See Section X, Details and Drawings: Detail A)
7. Post metering run piping shall incorporate a spring loaded, self-seated check valve to prevent backflow leakage.

- a. Acceptable Make/Model shall be Metraflex BSN0100 or equivalent.
- 8. Condensate pump discharge piping shall contain anti-siphon elements.
- 9. Condensate metering applications shall be pumped and not gravity fed.
- 10. The meter shall be installed to manufacturers' guidelines and any questions regarding the installation shall be referred to the local meter representative for confirmation prior to installation.
 - a. At minimum, allow for 24-inches of straight 1-inch pipe upstream of the meter; and 12-inches of straight 1-inch pipe downstream of the meter unless additional straight run is specified by specific meter requirements.
- 11. Meter shall be valved to allow verification of check valve leakage and to allow calibration using a 32 gallon trash can in new building installations unless an insertion ball valve can satisfy the verification requirement.
- 12. Bronze Couplings associated with the purchased meter shall be installed.
- 13. Transmitter Outputs:
 - a. Analog output for Flow Rate (gpm)
 - b. Dry contact closure for Totalized Pulse in Gallons (10² gallons per pulse)
- 14. Acceptable Manufacturer or OU approved equal.
 - a. For maximum condensate flow equal to or less than 35 gpm:
 - i. Onicon (See Section X, Details and Drawings: Detail B for Data Sheets).
 - a. 1" Wetted Ultrasonic for Steam Condensate.
 - i. F-4600
 - b. System-40 Network for Local Display and Totalizer with Communication Card with BACnet MS/TP.
 - c. System specifically set-up for condensate measurement.
 - ii. Onicon (See Section X, Details and Drawings: Detail A for Data Sheets).
 - a. 1" Single Turbine Meter for Steam Condensate.
 - i. Tuned down to 5 microsiemens of conductivity.
 - ii. All SS wetted components.
 - b. Onicon D-100 Network Display and Totalizer with Communication Card with BACnet MS/TP.
 - c. System specifically set-up for condensate measurement.
 - b. For maximum condensate flow rate greater than 35 gpm:
 - ii. Onicon (See Section X, Details and Drawings: Detail A for Data Sheets).
 - a. 1" Single Turbine Meter for Steam Condensate.
 - i. Tuned down to 5 microsiemens of conductivity.
 - ii. All SS wetted components.
 - b. Onicon D-100 Network Display and Totalizer with Communication Card with BACnet MS/TP.
 - c. System specifically set-up for condensate measurement.

F. STEAM METERING

1. IF NOT AN OPTION TO INSTALL CONDENSATE METER based on piping or system set-up, a steam meter with BTU system meter will be considered for the application. Approval must be given by the Facilities Management Team and Design Team Project Manager.
 - a. Basis of design of steam meter shall be Vortex Shedding Technology with no moving parts.
 - b. All steam meters will be considered for approval on the basis of life cycle cost analysis and performance history at OU.
 - c. Steam energy meters shall be installed on the primary high pressure side of the incoming service, prior to the PRV station. Steam is considered to be slightly superheated, so energy metering must compensate for temperature and pressure.
 - d. Steam meters shall have a flanged connection at both the meter and outside the reducers before transitioning to the meter line size.
 - e. Meter shall have an integral temperature sensor and pressure compensation installed per manufacturers' specifications. External pressure sensor shall be optional superheated steam applications.
 - f. Meters shall be designed to manufacturers' specifications for the actual load (lb/hr) and pressure (psi) for the application.
 - g. The flow meter shall have at minimum a two-year warranty.

2. Flow Computer
 - a. The flow computer shall be integral to the steam meter and will be capable of outputting the following information via BACnet communication:
 - i. Mass Flow Rate (lb/hr)
 - ii. Mass Total (lbs)
 - iii. Energy Rate (BTU/hr)
 - iv. Energy Total (BTU)
 - v. Temperature (°F)
 - vi. Pressure (PSI or PSIA)

 - b. Communications
 - i. The flow computer shall communicate as noted in Communications Section III.

 - c. Acceptable Manufacturer or OU approved equal:
 - i. Onicon (See Section X, Details and Drawings: Detail E for Data Sheets).
 - a. F-2600 Vortex Shedding Steam Meter
 - i. For Saturated and Superheated Steam Applications
 - ii. Integral mass flow computer
 - a. Integral pressure transducer to provide instantaneous pressure.
 - b. System specifically set-up for specific occurrence saturated steam metering.

- d. In Applications with little to no straight pipe run, the following steam meter and flow computer shall be permitted or OU approved equal:
 - i. Veris Accelabar (See Section X, Details and Drawings: Detail F for Data Sheets).
 - a. Flow Meter:
 - i. Accelabar Flow meter
 - ii. 150# flanged ends
 - iii. Direct Mount Head with Integral Manifold
 - iv. Integral RTD for Compensation
 - b. DP Transmitter:
 - i. Foxboro IDPP10ALLO1F
 - ii. 0-200 in Range
 - iii. LCD
 - iv. 4-20mA Output
 - c. Flow Computer:
 - i. Communications: BACnet MS/TP
 - ii. KEP SUPERTROL II
 - iii. Liquid Heat BTU Computer
 - iv. LCD Display
 - v. MS811Wall Mounted NEMA 4 enclosure—with ES749 mounted on door
 - vi. 85 to 276 VAC Power
 - vii. Onboard diagnostics
 - viii. Differential pressure,
 - ix. RS485 serial port to terminal block connector
 - x. Power Supply / DIN Rail Mounted / 115 VAC to 24VDC @ 1 AMP
 - xi. All components mounted in enclosure.

G. DOMESTIC POTABLE WATER METERING

- 1. Domestic Potable Water Meter shall conform to the requirements and policies of the City of Athens, OH, Department of Public Utilities, and the AWWA as referenced. Meter installed shall read in cubic feet consistent with the City of Athens, OH, requirements or as required by the authority having jurisdiction.
- 2. Domestic water supply shall be metered using the water meter approved by City of Athens.
- 3. Building sub-metering for Domestic Potable Water
 - a. Shall be a wetted ultrasonic flow meter for pipe size less than 2”.
 - b. Shall be a turbine style flow meter for pipe size greater than 2”, if ultrasonic wetted not available.
 - c. Materials which will be wetted shall be made from non-corrosive materials and shall not contaminate water.

- d. Minimum operating flow velocity shall be at least 0.1 feet per second.
- e. Accuracy: $\pm 1\%$ of reading over 25:1 turndown
 $\pm 2\%$ of reading over 100:1 turndown
- f. All water meters shall be installed per manufacturer recommendations regarding straight pipe run before and after the flow meter.
- g. Include particulate strainer, isolation valves and bypass line.
- h. Local Totalizer Display
- i. Remote register shall be provided when the meter location prevents direct reading of the meter register from a standing position on grade or finished floor. Remote register shall be installed at 4' to 5' above grade or finished floor. Remote register shall be compatible with the installed meter, shall be from the same manufacturer, and shall have a straight reading odometer type display.
- i. All water meters to be installed inside a building shall be supplied with an index capable of providing a dry contact closure pulse for monitoring water consumption. The dry contact closure pulse will be read and totalized by the Building Automation System in gallons or 10^2 gallons for buildings with higher usage.

4. Meter Location

- a. Easy access shall be provided to meters for maintenance, repairs, and meters shall be flanged and valved to permit convenient replacement or calibration of metering.
- b. Meter shall be able to be removed and re-calibrated without system shut down.
- c. Equip each flow meter with a metal identification tag indicating the size, location, GPM and meter reading for the GPM specified.

5. Communications

- a. Meter shall have digital-output contact closure or pulse capability for remote and automated meter reading. The digital output shall be integrated into the Building Automation System local building controller up to Ohio University's existing Energy Management System (enteliWeb).

6. Power

- a. Meters shall have standard 24 VDC power supply.

7. Warranty

- a. Meter shall have two-year warranty.

8. Manufacturer:

Subject to compliance with requirement, provide product by one of the following, with registration in gallons:

- a. Onicon
- b. Badger
- c. Sensus
- d. Neptune Water Meter Co.
- e. Approved Equal by OU.

For Onicon (See Section X, Details and Drawings: Detail G for Data Sheets).

- a. Wetted Ultrasonic Flow Meter for Domestic Water
 - i. F-4600
 - ii. Local Totalizer & Display
 - iii. Meters must be approved for domestic water applications and be lead free and/or have all SS wetted components.
 1. Onicon System 40 to communicate the rate and total consumption into the BAS with BACnet MS/TP.
 2. System specifically set up for domestic water measurement.

H. NATURAL GAS METERING

1. Gas supply shall be metered using the natural gas meter provided by the utility system providing the gas (Columbia Gas)
2. For sub-metering at the building:
 - a. Natural gas consumption for the entire building or portion of building, depending on application, shall be totalized by a natural gas meter that uses thermal dispersion technology and is temperature and pressure compensated.
 - b. Output signals shall consist of the following: (1) analog 4-20mA output and (1) scalable pulse output for totalization. The meter shall be paired with a network communication device and display for direct reporting onto the BACnet MS/TP network into the local building controller.
 - c. Basis of design of Natural Gas Meter shall be an insertion thermal mass flow meter.
 - i. Low pressure thermal mass flow meter shall be designed with a maximum pressure of 50 PSIG and maximum high temperature of 200°F.
 - ii. Meter shall be an insertion meter, “hot tap”, and installation hardware kit shall be ordered from the same manufacturer as the metering manufacturer.

d. Communications

- i. Output shall be tied to the building automation system local controller via BACnet MS/TP or BACnet/IP Communications. Coordinate with BAS contactor
- ii. Connect gas meters to local building controller using RS485 or CAT5e cabling depending on communications protocol.
- iii. Coordinate installation with the installer of the Delta Controls System. The following gas meter information shall be programmed into the BAS system controller:
 - a. Uncorrected CFM
 - b. Corrected CFM (SCFM)
 - c. Temperature
 - d. Pressure
- iv. Transmitter Outputs:
 - a. Analog output for Flow Rate (SCFM)
 - b. Corrected Volume Total
 - i. The ranges will be determined during design selection depending on application.
 - ii. The corrected Volume Total will be 10² SCF or 10³ SCF based on manufacturers' recommendations.
 - c. Pressure
 - d. Temperature

e. Location and Requirements

- i. Meter shall be located in a readable location, three to five feet off finished floor. Mounting position shall be horizontal.
- ii. The meter shall be installed to manufacturers' guidelines for un-obstructed straight pipe before the meter and after. A flow conditioner may be required to meet these conditions. Any questions regarding the installation shall be referred to the local meter representative for confirmation prior to installation.
- iii. Meter shall be able to be removed and re-calibrated without system shut down. Provide a loop around with cutoff. Provide a shop drawing for approval before fabrication.
- iv. Install wall mount cabinet for display. See appendix/detail for installation detail. Provide breaker for power disconnect.

3. Acceptable Manufacturer or OU approved equal:

- a. Onicon (See Section X, Details and Drawings: Detail H for Data Sheets). Insertion Thermal Mass Flow
 - i. Meter F-5100 Series Meter shall have local display for totalization
 - ii. Meter shall have scalable pulse output for totalization with 4-20 mA analog output.
 - iii. System specifically set-up for low pressure natural gas.

V. METRICS AND REPORTING

A. Building-Level Metrics Summary

The minimum number and type of building-level metrics to be aggregated and available for display on the enteliWEB and Earthright dashboard are defined in Appendix A. As described in Section V, measured data shall be compiled at the BAS and used to generate the metrics below.

A. Building and Equipment-Level & Accuracy Metrics Summary

The minimum equipment-level metrics to be available for display on the energy dashboard are defined in Appendices A, B and C.

VI. TEAM RESPONSIBILITIES

A. Summary Table of Responsibilities

Company and Points of Contact	Task
Ohio University Project Manager	<ul style="list-style-type: none"> • Coordinates Utility Metering plan • Coordinates integration meetings • Coordinates IT drops and Ethernet ports with OIT, Building Automation staff and Controls Contractor • Approves Monitoring and Data Collection Verification Report
Ohio University Executive Director of Facilities or designated representative (ex. Director of Utilities)	<ul style="list-style-type: none"> • Approves the Utility Metering Plan for each project. • Assists with decision for additional sub-metering for tenant billing • Reviews the Monitoring and Data Collection Report.
Ohio University Designated Commissioning Agent	<ul style="list-style-type: none"> • Keeps meeting minutes of integration meetings • Approves/accepts location and installation of meters. • Evaluates measured data on local meter displays and front-end for accuracy • Completes and submits to OU PM the Monitoring and Data Collection Verification Report
Designer/Consultant/Architect/Engineer of Project (working on behalf of Ohio University)	<ul style="list-style-type: none"> • Develops Scope of Work & Proposed Budget to present to OU Project Manager • Prepares and reviews Utility Metering Plan with Project Manager • Authors the specification for the utility meters & energy dashboard
General Contractor	<ul style="list-style-type: none"> • Responsible for coordinating all contractors listed below. • Provide a list and recommendations for ongoing device calibrations & maintenance procedures • Required submittals, etc.

HVAC/Mechanical Contractor:	<ul style="list-style-type: none"> • Mechanical installation of all meters except electric meter. • Coordinate with electrical contractor for the electrical requirements of the meters.
Controls Contractor/Controls Integrator	<ul style="list-style-type: none"> • Connections to the BAS building-level controller • Coordinate before installation all new BACnet names and address with the OU Facilities Controls shop • Accurate set-up of enteliWEB and Earthright dashboard front-end • Data storage and archiving in Tridium server
Electrical Contractor	<ul style="list-style-type: none"> • Install electrical/power meters and associated equipment. • Confirm with Controls Contractor correct wiring required to the BAS building-level controller.

B. Description of Team’s Roles and Responsibilities

1. Early in the design phase of the project, the Designer is responsible to review metering application and equipment with the Ohio University Project Manager and other OU staff, if applicable, to determine if additional sub-metering equipment is required for utility billing or for measurement and verification of specific equipment prior to finalizing project specifications and drawings. The Designer shall be responsible to provide the scope of work for the metering and the potential cost of the entire building metering solution and submit to the Project Manager.
2. The OU Project Manager shall coordinate integration meetings to ensure the exact utility metering specification and scope is understood. These meetings shall include (at a minimum) the Architect/Engineer, OU designated Project Manager, and the Executive Director of Facilities or department representative. Minutes shall be kept of the meetings by the Commissioning Agent (or project equivalent).
3. The HVAC/Mechanical Contractor shall furnish and complete the mechanical installation of the specified meters and confirm with the electrical contractor the correct electrical requirements of the meters supplied by the contractor.
4. The Electrical contractor shall furnish and complete the electrical installation of the specified electrical/power meters and confirm with the Controls Contractor the correct wiring required to the Building Automation System controller in the building.

5. The Controls contractor shall coordinate before installation all new BACnet names and address with the OU Facilities Controls shop. The controls contractor shall coordinate all IP address with the OU Information Technology Networking Department through the OU Project Manager.
6. The Controls Integration Contractor shall be responsible of integrating all utility metering and sub-metering points and integrating and trending the points ACCURATELY, and setting up the building and meter graphics in the enteliWEB application and the Earthright Dashboard front-end
7. BACnet MS/TP is preferred. MODBUS or other means of communication shall only be acceptable if written approval of communication capability is provided by the Controls Contractor to the BAS local controller.
8. The utility meter to local BAS controller communication verification shall take place by the Controls contractor before meter is approved and purchased.
9. The Designer/Architect/Engineer shall to ensure that the proposed design of the utility meter for the project captures the total building utility load and follows LEED (or similar) requirements.

VII. IMPLEMENTATION PLAN

A. Data management

1. All Utility Metering data and long-term trending capabilities will be handled by the Niagara system database residing on a virtual server. The format and intervals for data storage for each measured value shall be configured as indicated herein.
2. The database shall include internal data checking capabilities which are capable of identifying missing data. For periods of less than 6 hours, the missing data shall be calculated using an interpolation technique. For longer periods, the missing time periods shall be populated using data from the previous week. The system shall report on the exact interval data which has been interpolated.

A. Energy dashboard

1. This Utility Metering Plan needs to be coordinated with the content that is needed for the energy dashboard utilizing the existing energy dashboard at Ohio University, *Earthright*. The dashboard is managed and set-up by Ohio University's service contract integrator, Building Controls Integrators (BCI).

B. Quality assurance and verification of installation

2. Successful implementation of Utility Metering relies on complete and accurate data. Therefore, the associated sensors and meters needs to be installed and verified to be accurate. The following outlines

the process to help ensure the quality of measurement and monitoring devices, BAS and the Energy Dashboard.

a. Owner approval of the plan.

- i. Design incorporation.
- ii. Meter/Device Selection
- iii. Submittal review.
- iv. Contractor installation.
- v. Design team site visits.
- vi. Commissioning.
- vii. Evaluation of data, comment and determination of corrections if applicable.
- viii. Contractor corrections (as applicable) with commissioning observation.

B. Documentation

3. Data sheets and catalog literature for the utility meter, transmitters, RTD temperature sensors / transmitters, and flow computer must be sent to OU for evaluation.
4. Drawings for interconnections and installation of metering systems shall be submitted for review and approval prior to installation.
5. A/E drawings shall indicate all metering components; these shall be made available for review. The metering and monitoring requirements must be clearly defined by Design Development phase. Proceed further after approval of these requirements.
6. Flow computer program setup parameters shall be provided as a written hard copy, and as a Windows-based electronics file.
7. Certificates indicating the conformance of the energy distribution meter per applicable standards shall be supplied.
8. Certificates indicating calibration of the energy distribution meter (with water or other liquids available in the calibration facility) shall be provided. A certificate of calibration conformance for the transmitters (in accordance with NIST) shall be provided.
9. The manufacturer or contractor shall furnish OU Facilities group with an installation, operation, and maintenance manual for the energy distribution meter (including all components), and a program manual for the flow computer.
10. The A/E or contractor shall submit closeout drawings to OU for review.

C. Verification of Installation

1. Monitoring and Data Collection Verification Report

- a. In order to ensure accurate data collection it must be verified that installed monitoring system is functioning as intended. Below is the template that shall be used to generate a Monitoring and Data Collection Verification Report, for the purpose of confirming the completion of each item.

System or End Use	Data Type	Collection Technique	Calibration & Installation Verified By
System type (e.g., electric, chw, steam, natural gas, domestic water, etc.)	e.g., kW, kWh, cfm, gpm	Sensing device type (e.g., temperature sensor, electric meter, etc.)	Staff Initials w/ Date

2. Verification of the monitoring capabilities will consist of:

- a. Verification that the point is being monitored and is calibrated. Check that a calibrated hand held instrument reads the same (within tolerances) as the reading in the building automation or lighting control system.
- b. Verification that the control system is set up to monitor the point at the needed frequency, that the BAS system can provide the required data manipulations and the enteliWEB energy dashboard is formatted indicated herein, and that the proper data transfer is confirmed from point-to-point.

D. Ongoing device calibration

- 1. The Contractor shall provide manufacturer’s recommendations for meter calibrations associated with project, frequency of calibration and maintenance and any special maintenance requirements.

E. Warranty

- 1. The manufacturer / supplier of the specified equipment shall guarantee for twenty-four (24) months from owner’s acceptance, that the equipment shall be free from defects in design, workmanship, and materials.
- 2. Should a component fail to perform as specified, or prove to be defective in service during warranty period, the manufacture shall promptly repair or replace the defective part at no cost.

VIII. APPENDICES

A. Appendix A: Measured Totalized Values – Building Level

1. BUILDING LEVEL METRICS

Category	Description	Demand Unit	Consumption Unit	Interval
Electrical				
	Total electrical demand from building meter(s)	kW	-	5 min
	Total electrical consumption from building meter(s)	-	kWh	Daily
Chilled Water				
	Total CHW Energy Consumption of the building (if from central plant)	-	10 ³ BTU	Hourly
Heating Hot Water				
	Total Heating Hot Water Consumption of the Building (if from central plant)	-	10 ³ BTU	Hourly
Domestic Hot Water				
	Total DHW Energy Consumption of the Building (if from central plant)	-	10 ³ BTU	Hourly
Condensate				
	Total Condensate Consumption for Building (if steam from central plant)	-	10 ² Gallons	Hourly
	Total Steam Consumption for Building (converted from condensate consumption)	-	10 ³ BTU	Daily
Natural Gas				
	Total natural gas demand from building meter(s) – as required	10 ² SCF	-	5 min
	Total natural gas consumption from building meter(s)	-	10 ² SCFH	Daily
Domestic Water				
	Domestic water meter(s) consumption from building meter(s)	-	10 ² Gallons	Daily
Energy Consumption				
Total Energy Consumption per Building	Building totalized energy consumption (All utilities supplying building – CHW, Steam, Electric, Natural Gas, HHW, DHW, etc.)	-	10 ³ BTU	Daily, Annualized

Total Energy Consumption per Square Foot	Building totalized energy consumption divided by the total building square footage.	-	10 ³ BTU /sf	Daily, Annualized
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2. UTILITY CONSUMPTION / COST – BUILDING LEVEL METRICS

Category	Description	Demand Unit	Consumption Unit	Interval
Total Energy Consumption per Square Foot	Building daily energy consumption divided by the total building square footage	-	10 ³ BTU /sf	Daily, Annualized
Total Water Consumption per Square Foot	Building daily water consumption divided by the total building square footage	-	10 ² Gallons/sf	Daily, Annualized
Utility Cost				
Total Energy Cost per Square Foot	Building monthly energy cost divided by the total building square footage	-	\$/sf	Monthly, Annualized
Total Water/Sewer Cost per Square Foot	Building monthly water/sewer cost divided by the total building square footage	-	\$/sf	Monthly, Annualized

3. CHILLED WATER PLANT – BUILDING LEVEL METRICS

Category	Description	Units	Interval
Chilled Water Plant			
Chilled Water Production Demand	Sum of chilled water production as reported by chiller control panel	tons	5 min
Chilled Water Production	Chilled water ton-hours summed daily	ton-hours	Daily
Chilled Water Production Cost	Cost to produce 1 ton of chilled water	\$/ton	5 min

Chiller Efficiency	The efficiency for each chiller	kW/ton	5 min
Chiller Plant Efficiency	Sum of CHW equipment demand (chillers, chilled / condenser water pumps, cooling tower fan) divided by the tons of capacity generated by the system	kW/ton	5 min
Total Cooling Tower Efficiency	Total cooling tower power consumption divided by tons of capacity	kW/ton	5 min
Chilled Water Delta-T	Temperature difference between incoming supply and outgoing return	°F	5 min
Cooling Tower Make-up Water	Make-up water consumption rate by cooling towers	GPM	5 min
Cooling Tower Make-up Water Consumption	Make-up water consumption by cooling towers	Gallons	5 min

4. MISCELLANEOUS EQUIPMENT – BUILDING LEVEL METRICS

Category	Description	Units	Interval
Data center power demand	Data center power demand	kW	5 min
Data center power consumption	Data center power consumption	kWh	Daily
Well water Production	Water produced from on-site well	Gallons	Daily

B. Appendix B: Measured Values & Accuracy Tables

Reporting Accuracy: Listed below are minimum acceptable reporting accuracies for all values within the below minimum turndown envelope reported by the meters required for the project:

Measured Variable	Units Measured	Minimum Turn-Down of Meter	Reporting Accuracy
Electricity	V, A, W, etc.	n/a	±0.5% of measured value
Current Phase A	Amps		±0.5% of measured value
Current Phase B	Amps		±0.5% of measured value
Current Phase C	Amps		±0.5% of measured value
Current N Mean	Amps		±0.5% of measured value
Voltage Phases AB	Volts		±0.5% of measured value
Voltage Phases BC	Volts		±0.5% of measured value
Voltage Phases CA	Volts		±0.5% of measured value
Power Factor Mean	%		±0.5% of measured value
Demand Real Power	kW		±0.5% of measured value
Energy Total (Electrical Consumption)	kWh		±0.5% of measured value
Domestic Water Flow (if applicable for sub-metering)	GPM	20:1	±2.0% of measured value
Domestic Water Consumption (if applicable for sub-metering)	10 ² gallons		±2.0% of measured value
Heating Hot Water (HHW)/Domestic Hot Water (DHW) Temp Supply	° F		Supply and return temp sensors should be matched to within 0.15° F, traceable to NIST
HHW/DHW Temp Return	° F		Supply and return temp sensors should be matched to within 0.15° F, traceable to NIST
HHW/DHW Flow Rate	GPM		±0.5% of measured value

HHW/DHW Energy Consumption Rate	BTU/HR	20:1	±2.0% of measured value
HHW/DHW Energy Consumption	10 ³ BTU		±2.0% of overall measured value.
Natural gas flow	SCFH	As required by utility	As required by utility provider.
Natural Gas Consumption	10 ² or 10 ³ SCF (Corrected temp & psi)	As required	As required by utility provider.
Natural Gas Consumption (Sub-Metering)	10 ² or 10 ³ SCF (Corrected temp & psi)	As required	±1.0% of measured value from 500-7000 SFPM, ±2% from 100-500 SFPM.
Condensate Flow	GPM	20:1	± 2.0% of measured value
Condensate Consumption	10 ² gallon		± 2.0% of measured value
Steam flow <i>(if deemed necessary by OU)</i>	BTU/HR		±1.5% of measured value (mass)
Steam Temperature	Degrees F		±0.1% of measured value
Steam Energy Consumption <i>(if deemed necessary by OU)</i>	10 ³ BTU		±2.0% of measured value
Chilled Water Temp Supply	Degrees F		Supply and return temp sensors should be matched to within 0.15° F, traceable to NIST±0.5% of measured value
Chilled Water Temp Return	Degrees F		Supply and return temp sensors should be matched to within 0.15° F, traceable to NIST
Chilled Water Flow	GPM	15:1	±0.5% of measured value
Chilled Water Demand Flow Rate	BTU/HR		±0.5% of measured value
Chilled Water Total Consumption (BTU Computer)	10 ³ BTU		±2.0% of overall measured value.

C. Appendix C: Measured Values Tables - Central Utility Plants

Chilled Water Total Plant Level Metrics:

Category	Location	Device	Equip.	Demand Unit	Consumption Unit	Interval
Plant Power Demand	Plant	Electric Meter	Plant	kW	-	5 min
Plant Power Consumption	Plant	Electric Meter	Plant	-	kW-hr	15 min
Plant Energy Rate BTU/hr	Plant	BTU Meter	Plant	BTU/hr	-	5 min
Total Plant BTU	Plant	BTU Meter	Plant		10 ³ BTU	15 min
Plant CHW Tons	Plant	BTU Meter	Plant	Tons	-	5 min
Plant CHW Production	Plant	BTU Meter	Plant	-	Ton-Hours	15 min
Plant CHW Flow Rate	Plant	Flow meter	Plant	GPM	-	5 min
Plant CHW Supply Temperature	Plant	Temp Sensor	Plant	°F	-	15 min
Plant CHW Return Temperature	Plant	Temp Sensor	Plant	°F	-	15 min
Condenser Water Plant Make-up Water Flow	TBD	Flow meter	Plant	GPM	-	15 min
Condenser Water Plant Make-up Water Consumption	TBD	Flow meter	Plant	-	10 ² Gallons	15 min

Chilled Water Plant Equipment Metrics:

Chiller Power Demand	Chiller Control Panel	Current transducer	Per Chiller	kW	-	5 min
Chiller Power Consumption	Chiller Control Panel	Current transducer	Per Chiller	-	kW-hr	15 min
Chiller CHW Production	Chiller Control Panel	-	Per Chiller	tons	-	5 min
Chiller CHW Production	Chiller Control Panel	-	Per Chiller	-	Ton-Hours	15 min
Chiller Evaporator LWT	Chiller Control Panel	Temp sensor	Per Chiller	°F	-	15 min
Chiller Evaporator EWT	Chiller Control Panel	Temp sensor	Per Chiller	°F	-	15 min
Chiller Condenser LWT	Chiller Control Panel	Temp sensor	Per Chiller	°F	-	15 min
Chiller Condenser EWT	Chiller Control Panel	Temp sensor	Per Chiller	°F	-	15 min
Chiller Evaporator Flow Rate	Chiller Control Panel	Flow meter	Per Chiller	GPM	-	5 min
Chiller Condenser Flow Rate	Chiller Control Panel	Flow meter	Per Chiller	GPM	-	5 min
Primary Chilled Water Pump Power	Plant Optimization Package	Current transducer	Per Pump	kW	-	5 min
Secondary Chilled Water Pump Power	Plant Optimization Package	Variable frequency drive	Per Pump	kW	-	5 min
Chilled Water Differential Pressure	Chiller Control Panel	Pressure Sensor	Per Chiller	psi	-	15 min
Cooling Tower Fan Power	Variable frequency drive	Variable frequency drive	Per Tower	kW	-	5 min

D. Appendix D: BAS Naming Conventions

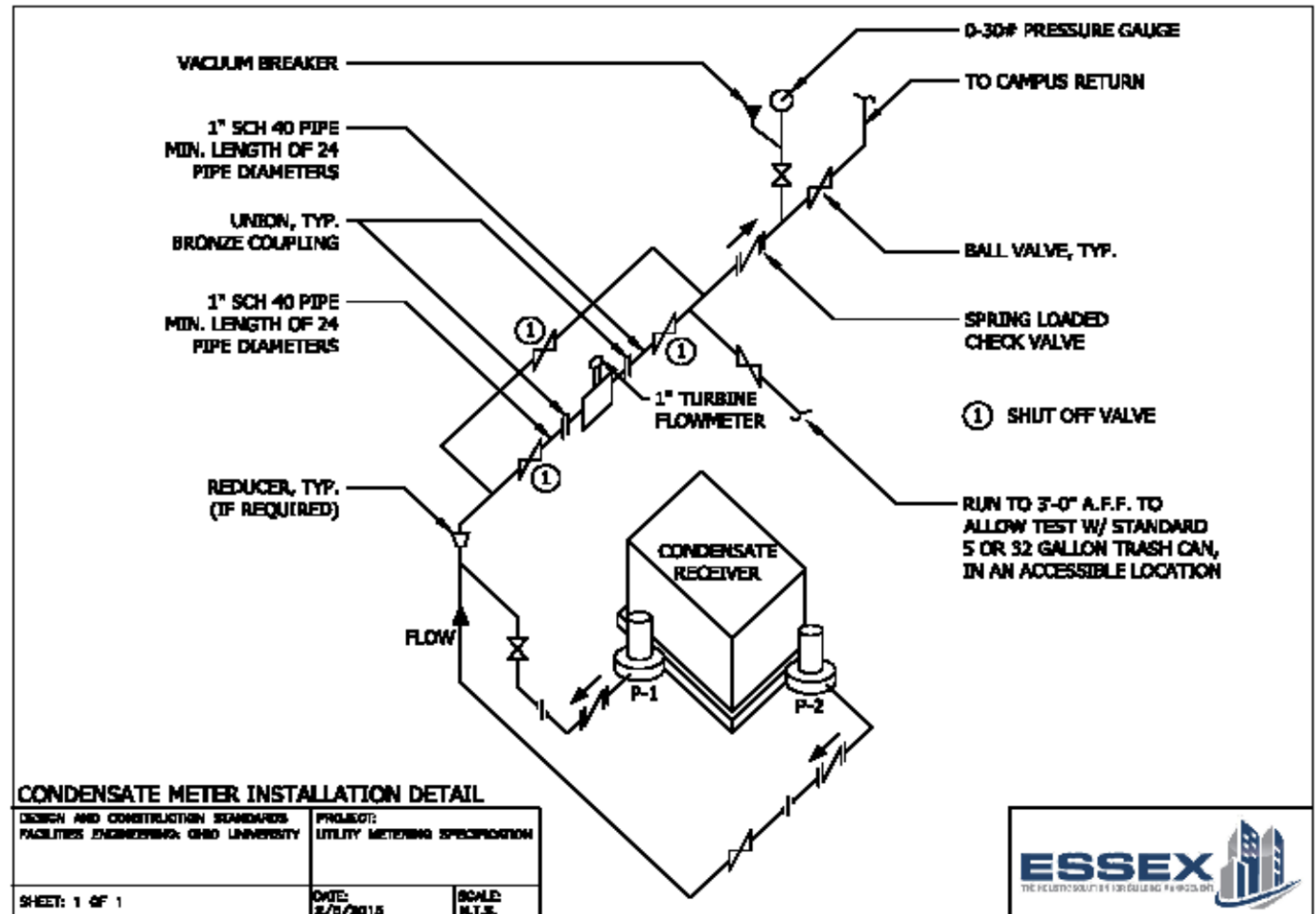
Meter Type	Point Name	Units	Description
<u>CHILLED WATER METERING</u>			
CHW BTU Meter A			
	"Building"_CHWA_SupplyT	°F	
	"Building"_CHWA_ReturnT	°F	
	"Building"_CHWA_DeltaT	°F	
	"Building"_CHWA_Flow	or GPM	
	"Building"_CHWA_EnergyRate	BTU/HR	
	"Building"_CHWA_TotalEnergy	10 ³ BTU	
<i>If second CHW BTU Meter in same building</i>			
CHW BTU Meter B			
	"Building"_CHWB_SupplyT	°F	
	"Building"_CHWB_ReturnT	°F	
	"Building"_CHWB_DeltaT	°F	
	"Building"_CHWB_Flow	GPM	
	"Building"_CHWB_EnergyRate	BTU/HR	
	"Building"_CHWB_TotalEnergy	10 ³ BTU	
<i>If third CHW BTU Meter in same building</i>			
CHW BTU Meter C			
etc.	"Building"_CHWC_SupplyT	°F	
	"Building"_CHWC_ReturnT	°F	
	"Building"_CHWC_DeltaT	°F	
	"Building"_CHWC_Flow	1/S or GPM	
	"Building"_CHWC_EnergyRate	BTU/HR	
	"Building"_CHWC_TotalEnergy	10 ³ BTU	
<u>HEATING HOT WATER METERING</u>			
HHW BTU Meter A			
	"Building"_HHWA_SupplyT	°F	
	"Building"_HHWA_ReturnT	°F	
	"Building"_HHWA_DeltaT	°F	
	"Building"_HHWA_Flow	1/S or GPM	
	"Building"_HHWA_EnergyRate	BTU/HR	
	"Building"_HHWA_TotalEnergy	10 ³ BTU	

<u>HEATING HOT WATER METERING</u>			
DHW BTU Meter A			
	"Building"_DHWA_SupplyT	°F	
	"Building"_DHWA_ReturnT	°F	
	"Building"_DHWA_DeltaT	°F	
	"Building"_DHWA_Flow	1/S or GPM	
	"Building"_DHWA_EnergyRate	BTU/HR	
	"Building"_DHWA_TotalEnergy	10 ³ BTU	
<u>STEAM METERING</u>			
STEAM BTU Meter A	"Building"_STEAMA_Temp	°F	
	"Building"_STEAMA_Pressure	PSI	
	"Building"_STEAMA_FlowRate	LBS/HR	
	"Building"_STEAMA_FlowTotal	LBS	
	"Building"_STEAMA_EnergyRate	BTU/HR	
	"Building"_STEAMA_TotalEnergy	10 ³ BTU	
<u>CONDENSATE METERING</u>			
CONDENSATE Meter A	"Building"_CONDENSATEA_Flow	1/s or GPM	
	"Building"_CONDENSATEA_Total	10 ² gallons	
<u>DOMESTIC WATER METERING</u>			
DOMESTIC WATER Meter A	"Building"_DWA_Flow	1/s or GPM	
	"Building"_DWA_Total	10 ² or 10 ³ gallons	
		<i>***based on installation and scaling</i>	
<u>NATURAL GAS METERING</u>			
NATURAL GAS Meter A	"Building"_NATGASA_Flow	SCF per minute	
	"Building"_NATGASA_Total	10 ² or 10 ³ SCF	
		<i>***based on installation and scaling</i>	
<u>ELECTRIC/POWER METERING</u>			

ELECTRIC Meter A	"Building"_ELECA_kWh	Kilowatt hours	Energy delivered and received
	"Building"_ELECA_kW	Kilowatts	Real power, average all phases; peak demand
	"Building"_ELECA_PF	%	Power factor, average all phases
	"Building"_ELECA_CurrentA	Amps	Current Phase A
	"Building"_ELECA_CurrentB	Amps	Current Phase B
	"Building"_ELECA_CurrentC	Amps	Current Phase C
	"Building"_ELECA_CurrentN	Amps	Current N Mean
	"Building"_ELECA_VoltageAB	Volts	Voltage Phases AB
	"Building"_ELECA_VoltageBC	Volts	Voltage Phases BC
	"Building"_ELECA_VoltageCA	Volts	Voltage Phases CA

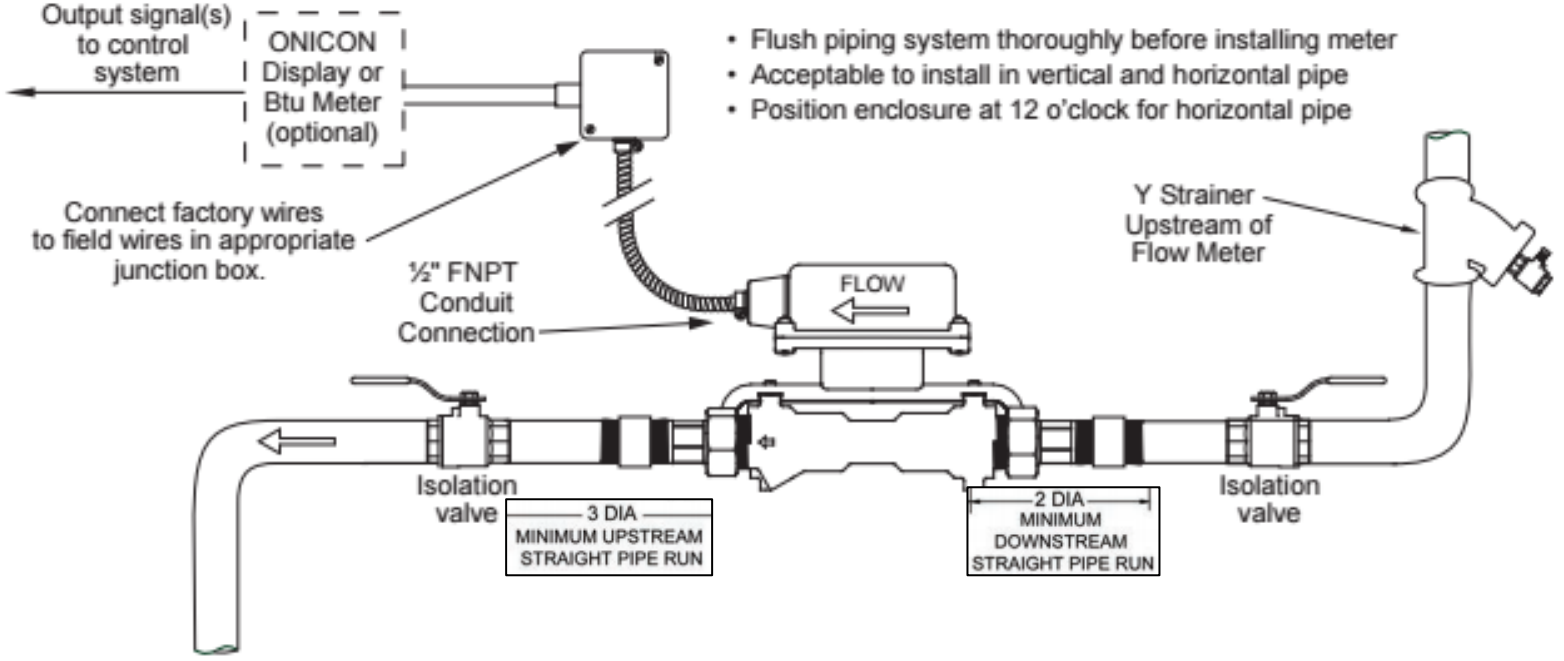
IX. DETAILS/DRAWINGS

A. CONDENSATE METER INSTALLATION DETAIL FOR TURBINE FLOW METER (greater than 35 g)

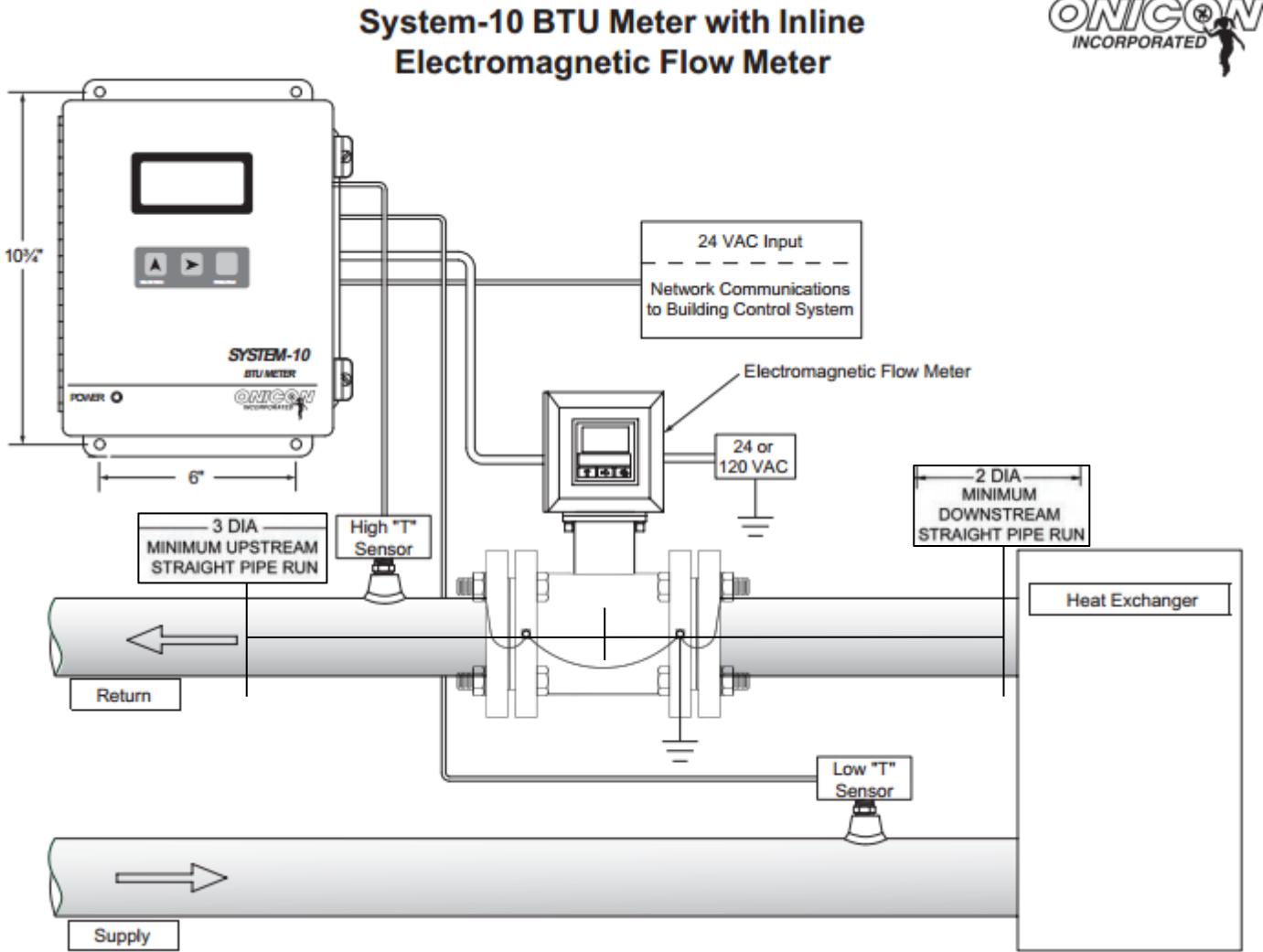


B. CONDENSATE METER INSTALLATION DETAIL FOR WETTED ULTRASONIC FLOW METER (less than or equal to 35 gpm)

TYPICAL METER INSTALLATION
(New construction or scheduled shutdown)



C. CHILLED WATER ENERGY METERING EQUIPMENT DETAIL (INLINE ELECTROMAG METER)

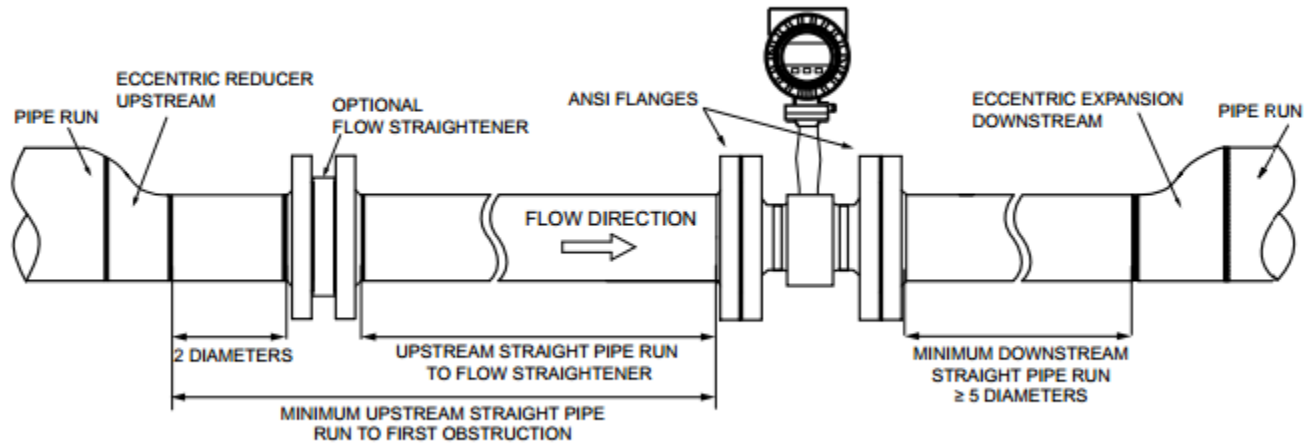


D. HEATING HOT WATER & DOMESTIC HOT WATER ENERGY METERING EQUIPMENT DETAIL

To be provided by manufacturer based on installation application for individual project.

E. STEAM FLOW METER INSTALLATION DETAIL (WITH STRAIGHT RUN AVAILABLE)

Inline Vortex Flow Meter



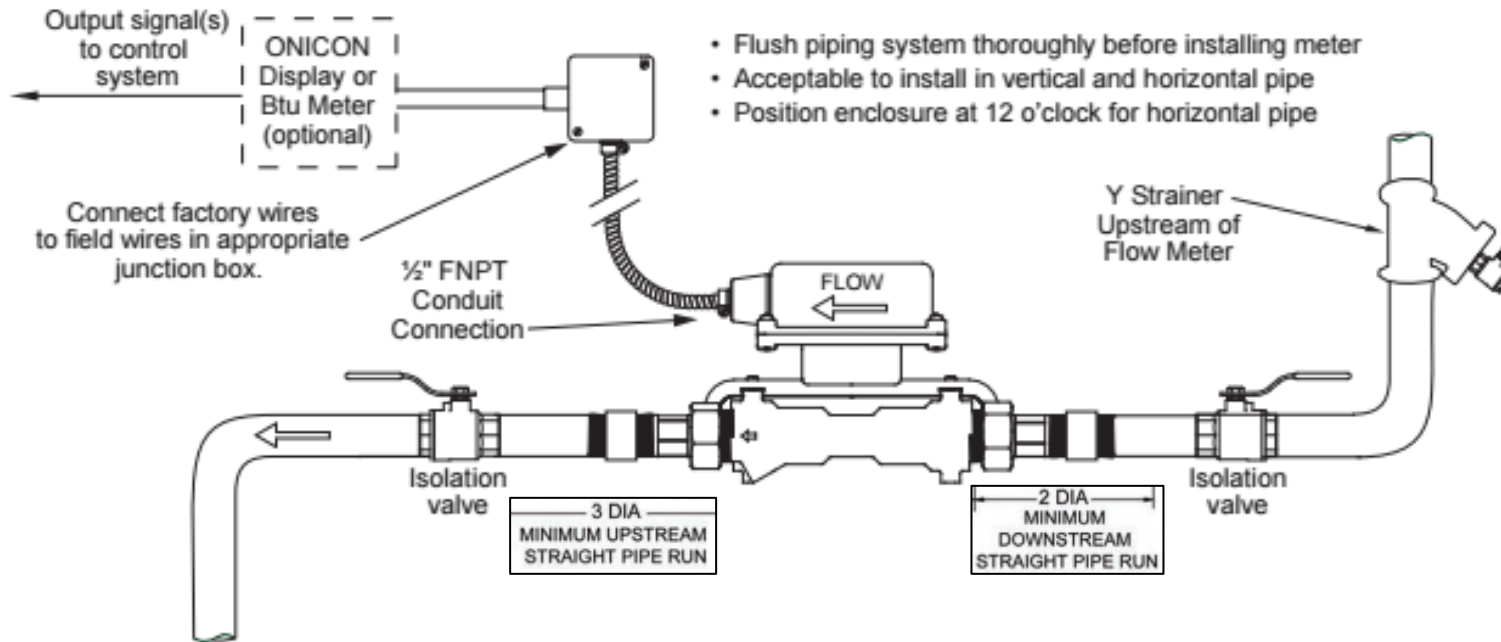
F. STEAM FLOW METER INSTALLATION DETAIL (WITH NO STRAIGHT RUN AVAILABLE)

To be provided by manufacturer based on installation application for individual project.

G. DOMESTIC WATER FLOW SUBMETER & DISPLAY INSTALLATION DETAIL (WETTED ULTRASONIC)

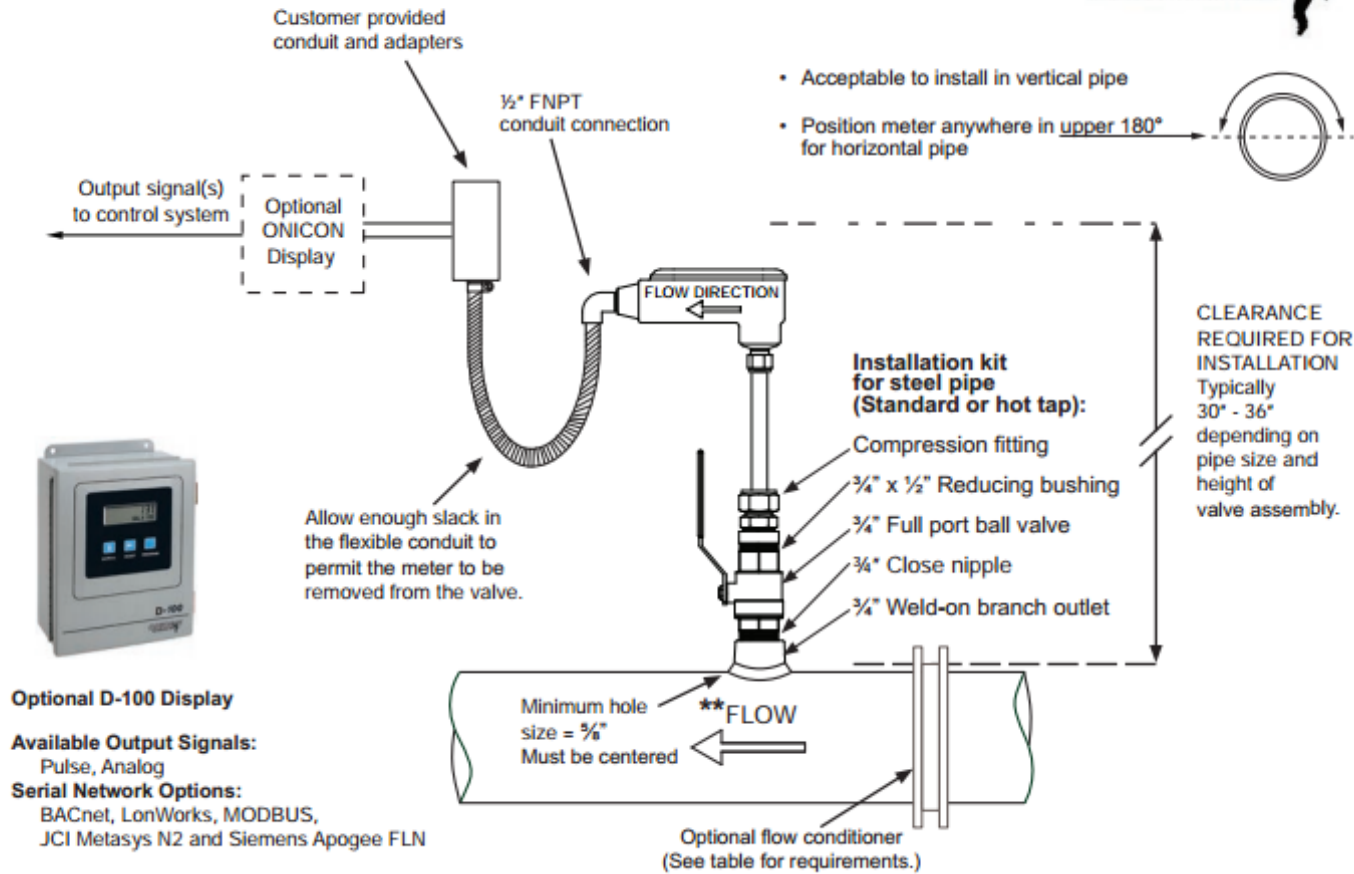
TYPICAL METER INSTALLATION

(New construction or scheduled shutdown)



NATURAL GAS FLOW SUBMETER & DISPLAY INSTALLATION DETAIL

F-5200 TYPICAL INSERTION METER INSTALLATION



Optional D-100 Display

Available Output Signals:

Pulse, Analog

Serial Network Options:

BACnet, LonWorks, MODBUS,
JCI Metasys N2 and Siemens Apogee FLN

Example	Minimum Required Upstream Diameters				Minimum Required Downstream Diameters	
	No Flow Straightener	With Flow Straightener			No Flow Straightener	With Flow Straightener
		A	C	C'		
1	10 D	N/A	N/A	N/A	5 D	5 D
2	15 D	10 D	8 D	2 D	5 D	5 D
3	30 D	15 D	13 D	2 D	5 D	5 D
4	10 D	N/A	N/A	N/A	5 D	5 D
5	20 D	10 D	8 D	2 D	5 D	5 D
6	50 D	25 D	23 D	2 D	5 D	5 D

D = Internal diameter of channel.

O.U. Underground Locate Work Order

Color Codes: Red = Electric, Orange = Phone/Cable TV, Yellow = Gas, Blue = Water, Green = Sewer, White = Proposed Excavation

CONTRACTOR IS STILL RESPONSIBLE FOR OUPS REPORTING AS REQUIRED

Contractor Information (performing the work):

Contact Phone Number: _____

Company Name: _____

Contact Name: _____

Contact E-Mail Address: _____

Excavation Description:

Required Attachment with this Form: Small Scale Drawing with Limits of Excavation

Address/Location of Work: _____

Project Name: _____

OU Project Manager: _____

Type of Work: _____

Date of Excavation: _____

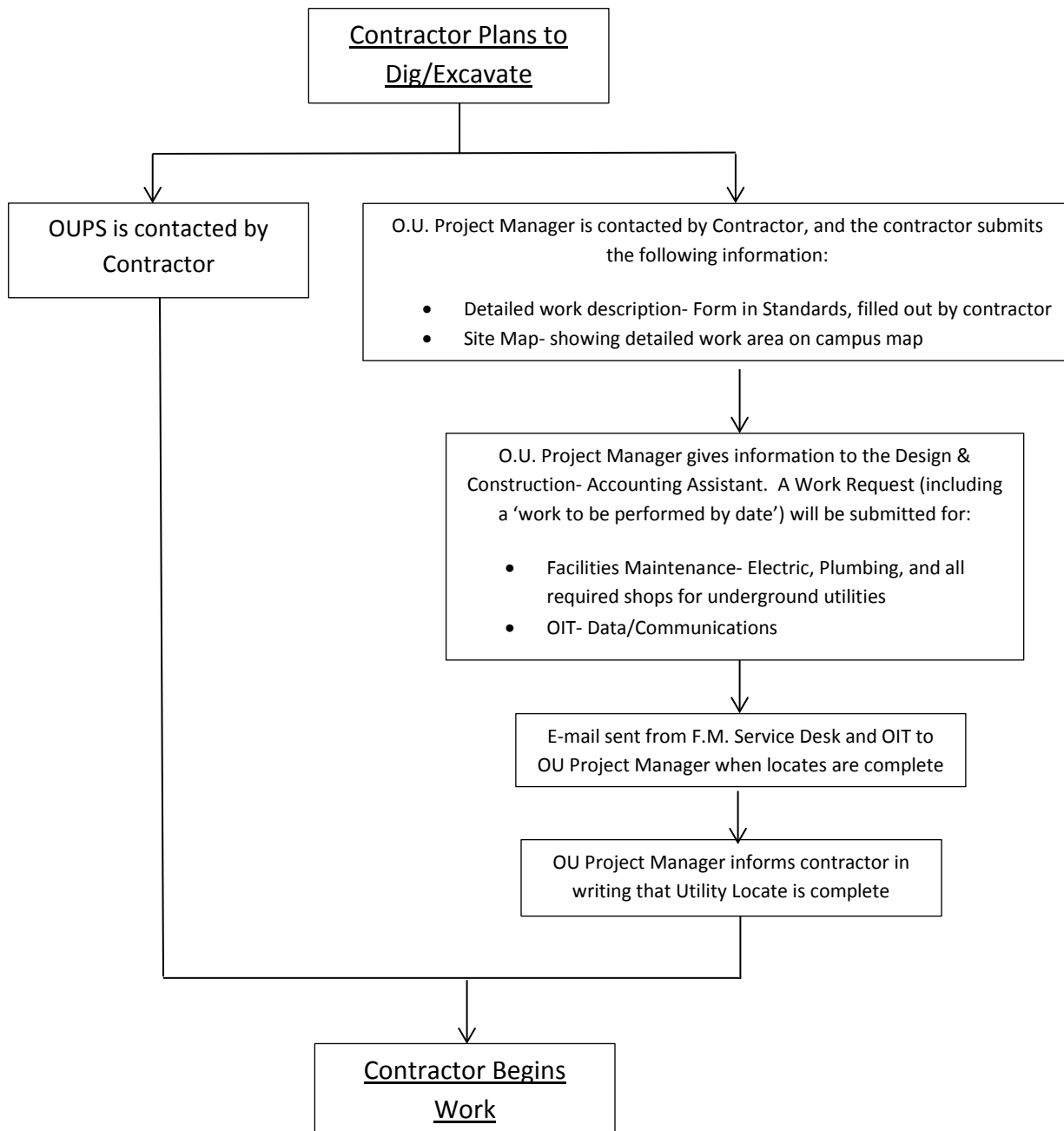
Start Time of Excavation: _____

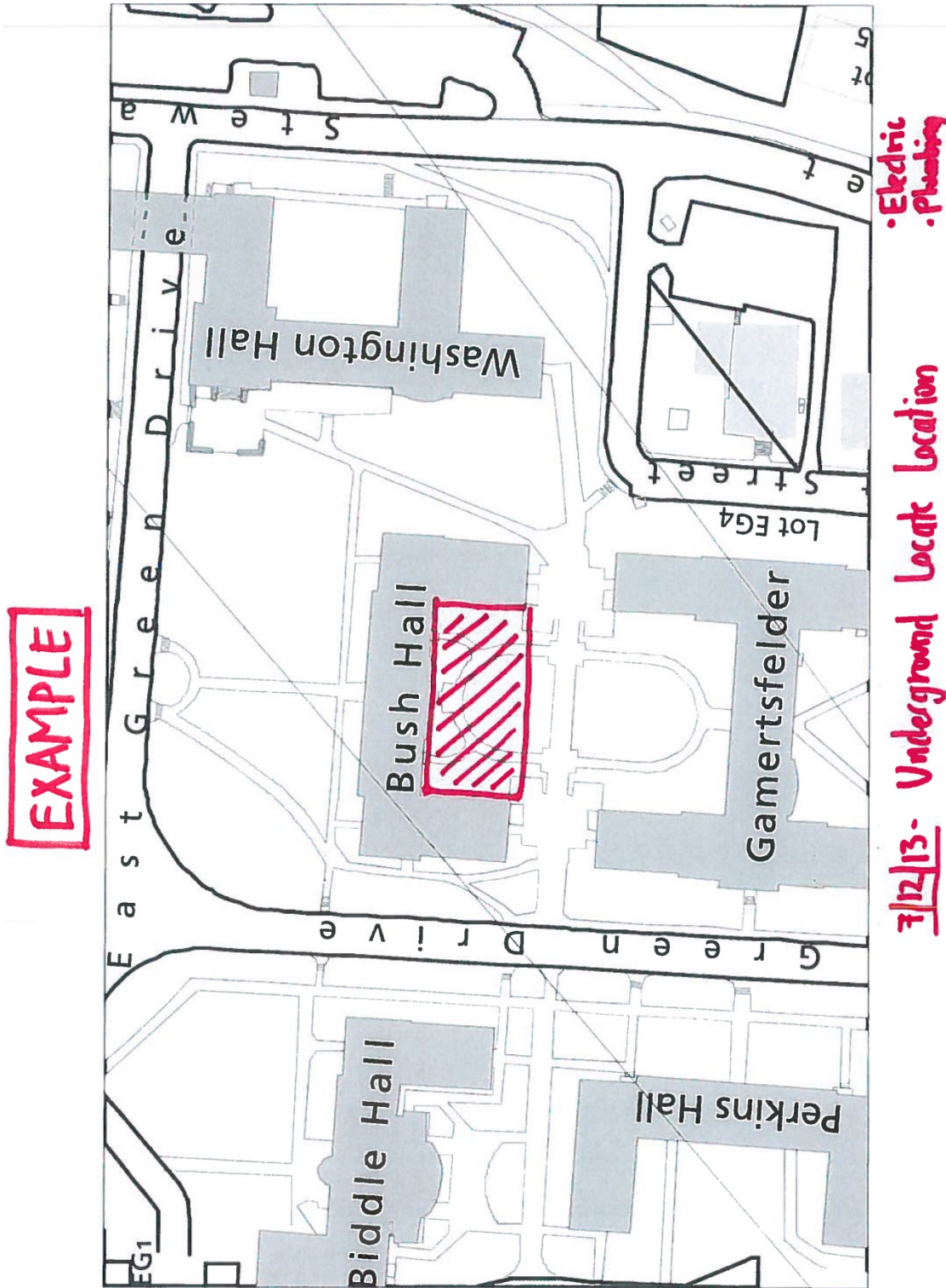
Means of Excavation: _____

Comments: _____

NOTE: CALL (740) 593-2911 IN THE EVENT A UTILITY IS HIT DURING EXCAVATION

Underground Utility Locating- Process Summary





Environmental Health & Safety Programs/Procedures/Manuals

Arsenic (Inorganic) Program
Asbestos Management Program
Biosafety Program Manual
Bloodborne Pathogen
Chemical Hygiene Program
Confined Space Entry Program
Fall Protection Program
Fire Protection Systems Impairment Procedure
Food Permit Procedures
Hazard Communications Program
Hazardous Materials Management Manual
Hot Work Program
Lead Program
Lock Out/Tag Out Program
Noise Control & Hearing Conservation Program
Personal Protective Equipment Program
Radiation Lab Procedure Manual
Respiratory Protection Program
Shelter in Place Procedure
Thyroid Scan Procedure
White Powder (Emergency Response) Procedure

Issued by:	Joe Adams
Date Effective:	January 2011