

DESIGN & ENGINEERING GUIDELINES

FOR ARCHITECTS AND ENGINEERS

Prepared by:



Revision date January 28, 2022

REVISIONS

ARCHITECTURAL REVISIONS

Relative to the previous issue, new information will be in **red text**. Obsolete or revised language will be struck out –~~removed text example~~. Minor edits such as misspellings or format corrections will not be tracked.

MEP REVISIONS

When edited, Mechanical, Plumbing, Fire Protection, Electrical, Fire Alarm and Tele-data are replaced in their entireties without annotation. The September 11, 2019 guidelines included the first issue of Kent State OUA master specifications. Consultants must use these documents as the starting point for all MEP project specifications.

PUBLICATION HISTORY

January 2018 –baseline publication

February 2019 –revision one

1. Division 00 Introductory Information –Fire Department, Audio Visual
2. Division 02 –tree protection
3. Division 08 UFM Openings –remove Onity Locks
4. Division 10 –Toilet Compartments and reduced sight lines. Fire Extinguisher cabinets.
5. Division 14 –Elevators maintenance and O&M requirements
6. Appendix –Added Fire Department diagrams; added Tree Protection details

September 11, 2019 –revision two

1. Division 00 Introductory Information –Lactation Room
2. Division 06 Custom Casework- PVC edge banding for horizontal and vertical surfaces
3. Division 08 UFM Openings –added Wi-Fi Locks
4. Division 09 Finishes -updated Carpet, added LVT to Resilient Flooring
5. Division 10 –Toilet Accessories -changing stations and folding seats
6. Division 14 –Elevators keying
7. Added MEP Spec Instructions and Design Guidelines
8. Division 21 -Added Kent State Master Specs for Fire Suppression
9. Division 22 -Added Kent State Master Specs for Plumbing
10. Division 23 -Added Kent State Master Specs for HVAC
11. Division 26 -Added Kent State Master Specs for Electrical
12. Division 27 -Added Kent State Master Specs for Communications
13. Division 32 -Clarified concrete reinforcement
14. Appendix –updated Toilet Accessories; updated Door Access Control details. Added Site Lighting Details. Added Universal Restroom layout.

February 2020 -revision three

1. Division 32 -Revised new lawn mulching to be hydroseed only. Straw is not allowed.

January 2022 -revision four

1. Division 00 – OUA MEP Masterspecs introduction
2. Division 00 -Digital Signage clarifications
3. Division 00 -Audio Visual Layout clarifications
4. Division 00-Scope of Services: added Construction Additional Services items
5. Division 00 -prevailing wage rates will be referenced by website link only.
6. Division 02 -added arborist requirements and clarified tree protection
7. Division 08-Residence Services Hardware clarifications
8. Division 08-UFM: skylight fall protection clarifications
9. Division 08-UFM: hardware clarifications
10. Division 12 -deleted cigarette urns
11. Appendix: added door hardware cut sheets
12. Appendix: added fire alarm/sprinkler elevator requirements flow chart
13. Appendix: added drinking fountain cut sheet
14. Appendix: added Master Equipment List template
15. MEP Masterspec revisions
 - a. Section 237000 -Added Needlepoint Bipolar Ionization requirements.
 - b. Section 250000 – Added CO2 sensor clarifications.

INTRODUCTORY INFORMATION

GENERAL DESCRIPTION

These guidelines are arranged as Outline Specifications per CSI nomenclature. They also include a series of briefs that detail various design areas that span sections and disciplines. The appendix includes sketches that illustrate details from these briefs or other areas from the guidelines. These guidelines are applicable across all project delivery method types. **All work** is subject to the Contract General Conditions and Supplemental Conditions as published by the State of Ohio. Division 01 specifications shall follow Kent State University Office of the University Architect templates and be produced by the A/E. The A/E's office standards do not justify deviation from the performance required by this Outline Specification Guide.

The Outline Specification divides work per a multiple prime delivery method. These guidelines are applicable across all project delivery method types. For methods other than multiple prime, the General Contractor, Construction Manager at Risk or Design Builder is ultimately responsible for separating the scopes of work. For those methods, the "prime contractor" noted in the Outline Specifications should be a designated "trade package."

ABBREVIATIONS

OUA = Office of the University Architect

UFM = University Facilities Management

OUA MEP Masterspecs

These Master Specifications are provided by Kent State University for use by the A/E to incorporate into projects. The intent of the Master Specifications is to formalize University requirements and standards for materials, equipment, and installations to provide continuity across projects. The Office of the University Architect (OUA) is referenced in the Designer's Notes for coordination purposes. Coordinate relevant items with the University's Project Engineer and/or Manager in these instances as applicable.

The A/E is to use these specifications as a starting point for all Kent State Projects. Not all specification sections provided will be needed for every project. The A/E shall select on the sections applicable to the project. Specification sections noted with an "x" after the specification number are not full specifications but rather an outline of requirements that the A/E is to incorporate into their own specification section to capture specialties and requirements of Kent State University. These are typically for more complex pieces of equipment that will likely require in-depth review with OUA during design.

The list of available specification sections is not inclusive of all specifications that may be needed for a complete project. The A/E shall supplement Kent State's master specifications with their own while including requirements of other relevant Master Specification sections as applicable.

The master specifications are to be reviewed and edited to suit the project. These specification sections do not relieve the A/E of their professional responsibility to review, edit, and fully understand the documents. The A/E is ultimately responsible for the specification sections and must review any deviations, concerns or questions with OUA.

Editor Notes are included to help guide the A/E of options to select.

Designer's Notes are also included at the end of many specification sections. These are specific design requirements to be reviewed and/or incorporated into the documents. These notes are from Kent State's Master Design Guidelines and shall be retained in their entirety on all design review submissions. The Designer's Notes shall be deleted from the final version of the specifications issued for bidding.

DESIGN BRIEFS

GREEN BUILDING DESIGN

1. All new buildings and major remodels should obtain LEED Silver Certification.
2. If OUA decides on a per-project basis not to pursue LEED Certification, the design parameters of the project must still follow LEED requirements for a Silver Certification.

ENHANCED ADA DESIGN

1. All projects shall meet ADA/ANSI 117.1 accessibility guidelines.
2. Kent State University is committed to providing "enhanced accessibility" throughout our facilities.
3. At least one major entrance shall have door operators with proximity readers.
4. At least one grouping of restrooms shall have door operators with proximity readers.

RESTROOM DESIGN

1. Walls shall be designed as full height ceramic tile with a non-white grout.
2. Toilet partitions should be a solid HDPE with stainless steel hardware.
3. All restrooms shall meet ADA/ANSI 117.1 accessibility guidelines.
4. In a building, at least one set of multiple stall restrooms shall have automatic door operators with push-button actuators and proximity readers.
5. Lavatory countertops shall have an undercabinet skirt that covers the exposed piping.
6. Restrooms shall provide XCEL hand dryers finished with an approved KSU sustainability graphic. Coordinate electrical requirements. These dryers shall be semi-recessed and have a solid-surface wall material extending from wall base to recess kit.
7. The layouts shall account for a paper towel dispenser location even if not installed with the project.
8. The layout shall accommodate the typical KSU UFM free standing trash receptacles.
9. Refer to plumbing specifications for approved fixtures. Drop-in stainless lavatories are preferred for housekeeping.
10. Refer to electrical specifications for rough-in requirements for faucet and flush-valve controls.

11. Refer to appendix for a list of currently furnished toilet room accessories. All KSU furnished accessories shall be scheduled for contractor installation.
12. All buildings shall strive for a Universal Restroom facility. Refer to KSU policies. The Universal Restroom serves as both a family restroom and a gender-free restroom.
13. Universal restrooms shall provide a urinal, changing table, folding seat, shelves and hooks.

LACTATION ROOM

1. All Lactation Rooms shall meet ADA/ANSI 117.1 accessibility guidelines.
2. Provide a sink/countertop within the room.
3. Coordinate door access requirements with OUA.
4. Coordinate chair selection and layout with OUA.
5. Provide a changing table.
6. Provide paper towels, soap dispenser, hand sanitizer, and trash/recycling receptacles within the space.
7. Refer to Division 10 and appendix for toilet accessory standards.

HEALTH AND WELLNESS SPACES

1. Kent State University is committed to employee wellness.
2. All new construction and major remodels shall provide a single use shower facility.
 - a. The room shall be fully accessible.
 - b. Provide a lavatory and countertop.
 - c. Provide an accessible transfer shower.
 - d. Provide coat hooks
 - e. Provide lockers.
 - f. Location is typically adjacent to Lactation Room to share plumbing.

HOUSEKEEPING REQUIREMENTS

1. Projects shall be reviewed with UFM for Housekeeping needs. The project design shall incorporate appropriately sized spaces to store all housekeeping equipment. This should be decided during Design Development. Housekeeping spaces are separate from Building Maintenance spaces.

UFM MAINTENANCE AND ATTIC STOCK

1. Each building shall have appropriate storage space for maintenance items such as HVAC filters, light bulbs and other routine maintenance items.
2. The project design shall provide or designate the storage areas for all attic stock provided through a project. Technical specifications typically call out a percentage for the contractor to provide. This should be quantified as a number of palettes or cartons or other storage medium to ensure proper planning.
3. Mechanical rooms should not be planned as general building storage areas.

ABATEMENT MONITORING

1. Each project should be reviewed with OUA and Environmental Health and Safety for exact needs.
2. In general, work within an occupied building will require constant air quality monitoring outside the work zone to ensure KSU personnel safety. The contractor is responsible for safety within the construction zone.
3. All projects require air quality clearances before non-abatement workers may enter a containment area.

FIRE ALARM DESIGN

1. For projects that are utilizing an existing system, the existing fire alarm vendor shall be engaged during the design process. Actual fire alarm shop drawings shall be created during the Construction Documents phase and submitted as part of the original building plan review application.
2. Shop drawings shall indicate how many (if any) additional strobes and/or speakers can be added to each circuit. Often times, the State Fire Marshal inspection indicates a coverage issue.

COORDINATION WITH CITY OF KENT FIRE DEPARTMENT

1. Review drawings shall be provided to the City of Kent FD at the 50% Construction Document mark. All comments from the City of Kent will be reviewed with OUA prior to incorporation in the documents.
2. The following are items that should be reviewed with City of Kent FD:
 - a. Exterior strobe location
 - b. PIV and FDC location
 - c. Knox Box location –including elevators
 - d. FA Panel (new construction)
3. Construction logistic plans shall be reviewed for continued FD access during construction.

TOUCH SCREEN DIGITAL SIGNAGE

1. Projects utilizing digital signage require coordination between OUA, KSU Tele-productions and KSU IS departments.
2. Risevision is the current system utilized by KSU Teleproductions. No alternate systems will be accepted. **Risevision can be touch screen or non-screen depending on the needs of the project.**
3. Locations and requirements shall be established before the end of Design Development.
4. **Refer to appendix for typical TV mounting bracket. Coordinate final mount selection with KSU Tele-productions for detailing of appropriate blocking. Mounts are furnished and installed by Kent State.**

AUDIO VISUAL LAYOUTS

1. Projects utilizing audio visual systems require coordination between OUA, KSU Classroom Technologies and KSU IS departments.
2. Locations and requirements shall be established before the end of Design Development.
3. Refer to appendix for AV rough-in details for boxes and pathways.
4. Coordinate final mount selections with KSU Classroom Technologies for detailing of appropriate blocking. Mounts are furnished and installed by Kent State.

EXTERIOR PIPE RAILS, BOLLARDS AND MISCELLANEOUS METALS

1. All post installations shall include a flared silicone sealant bead to prevent water, snow or ice from pooling around the base of the post. See detail_____

SCOPE OF SERVICES

GENERAL DESCRIPTION

The A/E shall follow the respective Exhibit B from their service agreement. These exhibits vary based on the chosen delivery method.

DESIGN PROCESS

1. The A/E shall provide an overall schedule that includes review time for OUA.
2. The A/E shall document and provide meeting minutes for all Design Meetings from Program Verification through Construction Documents.
3. The A/E shall develop technical specifications and drawings concurrently throughout the design process. The Design Development submission should include product cut sheets for all basis of design equipment and fixtures for OUA review.
4. The A/E shall develop the front end specifications from the templates provided by OUA. These include the State of Ohio Division 00 Procurement Documents and the Kent State University OUA Division 01 General Requirements.

PRODUCT SPECIFICATIONS

1. Projects shall utilize a complete project manual and three part specifications per CSI format unless otherwise agreed to with OUA.
2. Three manufacturers for each product should be specified (with the exception of standard products or systems as directed by OUA).
3. Specified manufacturers must be provided unless a substitution of equivalent value and performance is approved by the A/E in writing and issued by addendum prior to receipt of bids. Refer to the General Conditions for substitution request procedures and cut-off dates.
4. Single manufacturers, when specified, are products or systems which the University maintains with its existing parts inventory or uses exclusively due to contract or service agreements.
5. The following list of certifications and other submittals is required as a minimum, in addition to guarantees, to assure quality of materials and workmanship; review all items in the specifications with OUA and add to this list as directed by OUA:

1. **General Contract**

Reinforcing steel	Mill certificate
Insulating concrete decks	Manufacturer's certificate
Face brick	Efflorescence test results
Masonry restoration	Subcontractor's record of experience
Steel joists	Manufacturer's certificate
Metal decking	Manufacturer's certificate
Caulking and sealants	Subcontractor's record of experience
Metal windows	Performance reports
Reflective insulating glass	Performance reports
Finish hardware	Submit samples

	Fire rated ceilings	Installer's certificate
	Resilient flooring and Carpet	Manufacturer's certificate
	Painting	Manufacturer's and installer's certificate
	Fire resistive coatings	Manufacturer's certificate
	Laboratory equipment	Manufacturer's financial statement
	Radiation protection	Installer's certificate
	Elevators	Maintenance service
2.	Plumbing Contract	
	Soil, waste, and vent piping	Inspection certificate
	Underground services piping	Test reports
	Interior piping	Test reports
	Gas service and piping	Recording line charts
	Fire Protection	Test reports
3.	Heating, Ventilating, and Air Conditioning Contract	
	Boilers	Safety and function tests
	Refrigerant lines	Certificate of compliance with USA Standards
	Fan ratings	Test performance seals
	VFD's	Start-Up Installation Test Report
	Air, Water, Hydronic Systems	Balance Reports
4.	Electrical Contract	
	Primary cable installations	High voltage d-e proof tests
	Cable splicing	Installer's certificate
	Lightning protection	U.L. Master Label
5.	Data & Communications	
	Installed Cable System	Cable Certification Test Reports

APPLICATION FOR PLAN APPROVAL

1. The A/E shall prepare a draft of the Application for Plan Approval and Statement of Special Inspections and review the information with OUA before submitting the drawings and specifications for Plan Approval
2. Payment of Fees for the Plan Approval shall be made by the A/E or OUA directly to Industrial Compliance as specified in the A/E's contract.
3. At the start of the project, the A/E shall review the proposed submission date for Plan Approval relative to the proposed Bid Date with OUA. This may vary by delivery method and overall project schedule. When possible, it is preferable to schedule the submittal for Plan Approval so that Partial Plan Approval is completed prior to releasing the Project Documents to Bidders.

BIDDING AND AWARD

1. The A/E shall modify prepare the Solicitation - Notice to Bidders and Advertisement from OUA's template documents. The A/E shall confirm advertising and bid dates with OUA to insure compliance with ORC requirements and coordinate with OUA schedules. Dates for the first advertisement must coincide with the date documents are ready to be purchased by Bidders.
2. The NTB and Ad must contain the date, time and place of the Pre-Bid Meeting. This meeting will

be chaired by the A/E, who will produce minutes of the meeting and issue them as Addendum #1, within 3 days of the Pre-Bid Meeting. Questions, answers, and a list of Attendees from the meeting shall be included in the Addendum.

3. Contractors must purchase the complete set of Bid Documents, unsuccessful Bidders' Documents are not to be sent to OUA, and no refunds will be given.
4. The A/E shall review all Addenda with OUA before release to Bidders. All Addenda shall be printed and sent to Contractors by OUA's designated blueprinting company, who will provide confirmations. The number of Addenda, volume of printing, and delivery expenses shall be kept to a minimum to contain costs. Letter format and partial plans shall be utilized whenever possible to permit for fax and/or email delivery. Express/overnight delivery shall only be ordered after OUA has approved it; the cost of delivery may be assigned to the A/E if prior approval has not been granted.
5. The A/E must consult with OUA regarding the issue of last-minute addenda. OUA reserves the right to determine if the Bid Date will be delayed or to assess and assume the risk of not issuing the addenda.
6. For Multi-Prime or General Contract delivery methods, Pre-Award Meetings will be scheduled by OUA for each Prime Contract. The A/E and OUA will meet with apparent low bidders' representatives to validate that the bid includes all of the contract work. Procedures for bid evaluation and award, as delineated in the Notice to Bidders shall be followed. When successful Bidders have been selected, the A/E shall immediately produce a letter of recommendation for bid award, addressed to OUA.

CONSTRUCTION

1. The A/E shall be on-site weekly for the time stated in their agreement.
2. The A/E will review OAKS procedures as part of the preconstruction meeting.
3. The A/E will review as-built documentation and waste management logs as part of the pay application review process.

CONSTRUCTION ADDITIONAL SERVICES

The following items will be listed as additional services in the A/E agreement:

MEP Equipment Schedule documentation

Material testing for asbestos in new construction

MEP Equipment Schedule: Kent State requires all equipment to have a unique identifier / equipment number for maintenance tracking. Consultants shall provide an Excel document of all equipment listing the following:

1. Equipment ID
2. Description
3. What Equipment serves
4. Manufacturer
5. Warranty Expiration Date / Usage Expiration Vendor PO#
6. Vendor PO
7. Equipment Type
8. Model

9. Serial number
10. Filter size
11. Filter quantity
12. Belt size
13. Belt quantity
14. PM Interval
15. KSU Building (3 letter code)
16. Room Number
17. Floor Location
18. Condition
19. Acc index
20. CxA Y/N
21. Assessment date
22. Acquisition Info date/ Acquired Cost /PO#/Vendor

The Consultant is responsible for filling in items 1,2,3,7,15,16,17,18

Contractors are responsible for filling in items 4,5,6,8,9,10,11,12,13,14,20,22

Kent State is responsible for filling in item 19.

Item 21 is for future post construction use by Kent State.

The spreadsheet template shall be included in the project manual at the time of bidding. Refer to appendix for example.

Material Testing for asbestos in new construction: Kent State engaged PSI to conduct hazardous materials surveys of the existing buildings in 2010. Projects since that date don't have a similar baseline report. The intention is to test scrap materials during construction to generate a similar baseline report for new buildings and major renovations. The intention is not to do destructive testing of new construction.

CLOSEOUT

1. The A/E will review O&Ms in a timely manner.
2. Record drawings will be provided as CAD files, pdfs, and (1) mylar hardcopy for OUA file drawers. Record project manual will be provided as word files and pdfs.
3. Record drawings shall include a separate paint schedule.

PRINTING

1. For Multi-Prime or General Contract delivery methods, the A/E shall use the blueprinting company designated by OUA. This company shall provide printing for Plan Approval Submission (if not submitted electronically), copies of Bid Sets for OUA and the A/E, Addenda, and Conformed Drawings for the Construction Site and Prime Contractors. They shall also provide delivery of the above. Coordinate invoicing requirements with OUA; for projects with local money, invoices will be sent direct to OUA; for state-funded projects, there will be a printing reimbursable allowance in the A/E agreement.

DIVISION 00 –CONTRACTING REQUIREMENTS

Please note: the individual specification numbers may vary slightly between delivery methods. Follow the section numbers as identified under each delivery method's table of contents.

00 01 10 TABLE OF CONTENTS

- 000110.1 The A/E shall edit the Table of Contents to list all technical and front end documents. Coordinate Division 00 with OUA.

00 10 00 SOLICITATION

- 001000.1 The A/E will coordinate the information within this section with the Project Advertisement. Review printing costs for the documents and include within the document.

00 41 16 BID FORM

- 004116.1 The A/E shall modify the Bid Form and coordinate it with other Contract Documents to ensure that all Contract Work is included in the bids, and that the scope of work for each contract is clear and nothing is duplicated or omitted. The A/E shall review the Bid Form with OUA prior to publication.
- 004116.2 The A/E shall include Allowances on the Bid Form by Contract so that those amounts can be added to the total bid amount.
- 004116.3 The A/E shall include Alternates on the Bid Form by Contract so that those amounts can be added to the total bid amount.
- 004116.4 The A/E shall include Unit Prices on the Bid Form by Contract and shall include the estimated quantities so that the unit prices can be extended and those amounts can be added to the total bid amount.

00 73 43 WAGE RATE REQUIREMENTS

- 007343.1 **The standard specification lists the website for the Contractor to review Prevailing Wage Rates. The project manual will not include hard copies of the Prevailing Wage Rates.**

DIVISION 01 - GENERAL REQUIREMENTS

01 11 00 SUMMARY OF THE WORK

- 011100.1 A Specification Section entitled “Summary of the Work” shall be included in the project manual which provides a general description of all work including exterior work is required for each trade. Although brief, this description must be complete enough to indicate the full scope of work for each contract. The proposed use for the building should be explained. Concurrent occupancy of adjacent buildings, or parts of a renovated building should be noted. Specific details and requirements for the project should be noted here. The overall construction schedule and milestone dates should be specified here. Individual specification’s work scope must be coordinated with this overall summary.
- 011100.2 List the separate contracts (or subcontracts) which are involved in the project. Normally, general trades, plumbing, HVAC, and electrical work are the four prime contracts. Additional prime contracts, such as fire protection, building automation systems, teledata and others may be recommended by the OUA. Separate specifications sections and drawings are absolutely required for each of the 4 major prime contracts unless the trade involved will have a total value of less than \$5,000.00.
- 011100.3 If additional work outside the scope of the prime contracts will be performed concurrently with the project, by other contractors or the Owner, advise the contractors that coordination and cooperation with this work will be required.
- 011100.4 University furnished items and any related work required of the prime contractors must be identified. Items to be salvaged or removed from existing structures by the Owner, and items to be salvaged by the Contractor then turned over to the Owner must be identified on the drawings. OUA will advise A/E regarding how/where contractor is to deliver salvaged materials.
- 011100.5 Project conditions such as occupation of buildings, limited scheduling for utility connections, and special events of the University must be defined.

01 21 00 ALLOWANCES

- 012100.1 The general provisions of the contract apply to all work specified under allowances.
- 012100.2 The net cost, including applicable taxes, of all materials and equipment delivered and unloaded at the project site shall be included in the allowance.
- 012100.3 The contractor's handling costs on the site, labor, installation costs, overhead, profit, and

other expenses contemplated for the allowance shall be included in the contract sum, not the allowance.

- 012100.4 The following Allowances are to be considered for inclusion in the specifications unless not applicable to the project, or otherwise directed by OUA. Other Allowances which may benefit the project shall be discussed with OUA.
- Temporary Utility Fuel Allowance
 - Owner's Allowance
 - Final Cleaning
 - Miscellaneous Steel
 - Hardware allowance

01 22 00 UNIT PRICES

- 012200.1 The general provisions of the contract apply to all work specified under Unit Prices.
- 012200.2 Unit Prices shall be employed when exact quantities cannot be determined from the drawings, due to existing or hidden conditions, where appropriate for phased work, or as directed by OUA.
- 012200.3 The A/E must provide estimated quantities for all unit prices so that the unit prices can be extended and included in the total cost of their Bid, and to ensure that funds are set aside for the work. The Bid Form shall be edited to reflect these estimates.
- 012200.4 Unit Prices will be for both added and deducted quantities. Multiple levels of a unit price should be included to allow for quantity-based pricing if large variations in the total quantity, phasing, or change of scope are anticipated.

01 23 00 ALTERNATES

- 012300.1 A limited number of alternates may be used to ensure that the base bid will be within the construction cost estimate and to fully utilize project funds.
- 012300.2 The designation for alternates shall be:
G-1, G-2, etc. for the General Contract.
P-1, P-2, etc. for the Plumbing Contract.
FP-1, FP-2 etc. for the Fire Protection Contract
H-1, H-2, etc. for the HVAC Contract.
BA-1, BA-2 etc. for the Building Automation Contract
E-1, E-2, etc. for the Electrical Contract.
T-1, T-2 etc. for the Technology Contract

Alternates for other prime contracts should be listed in numerical order with the prefix used on the drawings for that contract.

- 012300.4 Alternates for each prime contract must be coordinated with alternates of other prime contracts.
- 012300.5 Deduct alternates are prohibited unless special project conditions exist and require approval by OUA.

01 31 00 PROJECT MANAGEMENT AND COORDINATION

- 013100.1 The Pre-Construction Meeting will be scheduled by OUA after the award of contracts. All successful bidders and the A/E's representative will attend. The A/E's representative will record the meeting and distribute minutes.
- 013100.2 Weekly progress meetings will be scheduled by the A/E's and OUA with the Lead Contractor, other prime contractors, and major subcontractors. The time and day of the meeting will be established by the A/E and OUA in cooperation with the Lead Contractor. The A/E will record the meetings and distribute minutes within 3 working days off the meeting. The frequency of this meeting may be decreased or increased as project conditions warrant. Prime Contractors' authorized representatives are required to attend these meetings.
- 013100.3 Weekly coordination meetings will be scheduled by the Lead Contractor (LC), other prime contractors, and major subcontractors. The time and day of the meeting will be established by the LC. The LC will record the meetings and distribute minutes within 3 working days off the meeting.

01 32 00 CONSTRUCTION PROGRESS DOCUMENTATION

- 013200.1 Project Inspection reports shall be performed in the OAKS system unless otherwise directed. The A/E shall prepare this report and submit to the OUA project manager twice monthly. The reports shall be submitted no later than the 14th and the 28th days of each month. If these dates fall on weekends or holidays, the report shall be submitted on the first working day thereafter. Each project inspection report shall include:
1. Individual prime contractor reports with the percentage of work complete and a short description (i.e. "3rd floor concrete placed", "building under roof", etc.).
 2. Scheduled completion date and weeks ahead or behind schedule.
 3. Total project report including percentage of completion for the total project; scheduled completion date; and weeks ahead or behind schedule. Briefly describe the reasons for variation in the schedule. If the project is behind schedule, describe the methods which will be used to put the project back on schedule.

01 32 16 CONSTRUCTION PROGRESS SCHEDULE

- 013216.1 Construction progress schedule is the ultimate responsibility of the Lead Contractor. The schedule must be prepared according to the specifications regarding content, software, format, project milestone, phases, and completion/occupancy dates. A preliminary schedule will be presented to the other prime contractors for their input. The Lead Contractor will adjust his schedule and present at a following meeting for signature by all prime contractors. After approval by the A/E, and Contracting Authority's representatives, the schedule will be submitted to the Office of the University Architect for approval.

01 33 00 SUBMITTAL PROCEDURES

- 013300.1 Shop drawings and submittals: During production of final specifications, the A/E shall develop a list of required submittals and review the list with OUA for approval. Following contract award, the A/E shall provide this list to contractors. Shop drawings and samples shall be submitted to the A/E as soon as possible after award of contract.
1. The contractor shall submit a schedule to the A/E indicating dates that shop drawings and other requirements will be submitted. Dates scheduled shall not impede the progress of the work. The A/E shall approve the submittal schedule.
 2. The contractor shall submit all initial shop drawing submittals to the A/E by electronic files in PDF format via the OAKS management system unless otherwise specified.
 3. The A/E shall submit all approved shop drawings, equipment operating manuals, parts lists, etc. by electronic files in PDF format via the OAKS management system unless otherwise specified.
 4. Specifications for ornamental work which requires models or patterns, will stipulate that the models or patterns become the property of the University after the work has been installed.

01 40 00 QUALITY CONTROL

- 01400.1 Each contractor will be required to include the cost of services by certain specialists in the bid.
1. The A/E shall observe the performance of these services, review the reports, document results in the project administration records and furnish copies of the reports to OUA.
- 01400.2 Each respective specification section will contain the details of the type service required; methods and frequency of investigations; number and type of reports required; and the method of payment for the specialist's services.
- 01400.3 The following services and others required by the application for plan approval will be

performed by qualified independent testing agencies, who will be contracted by OUA or by the A/E as specified in the A/E's contract.

1. General Contract
 - Soil compaction
 - Piling and caisson inspection and tests
 - Concrete sampling and tests
 - Sound transmission tests
 - Radiation tests
2. Plumbing Contract
 - Supervision of gas piping purging
 - Water piping sterilization
 - Sound control tests
3. Heating, Ventilating, and Air Conditioning Contract
 - Air and water systems balancing
 - Soil corrosion analysis for cathodic protection
 - Sound control tests
4. Electrical Contract
 - Communications systems tests
 - Signaling systems tests
 - Sound control tests

01 45 16 FIELD QUALITY CONTROL PROCEDURES

- 014615.1 Layouts for structure coordinates, site improvements, utilities, elevations, etc. shall be performed by a licensed engineer or surveyor employed by the contractor performing the work. This information shall be verified periodically as the work progresses.
- 014615.2 The GC will establish all grade lines, levels, and bench marks.
1. Sturdy batter boards at all corners of the building will be maintained by the GC.
 2. Bench marks at each level will be established by the GC.
 3. Exact partitions locations on floors will be established by the GC as guides to other trades.

01 50 00 TEMPORARY FACILITIES

- 015000.1 Utility Connections
1. The University will permit the contractors to connect to existing utilities when they are available and shall not charge for electricity, water, natural gas or steam used (if steam is used as a temporary utility, all condensate shall be returned to the system). When utilities are not available, the contractor responsible for the temporary utility shall arrange with the local utility company for installation of temporary utility service and shall pay all costs involved. Contractors providing heat, power, and water shall be reimbursed for the cost of fuel, power or water by the Lead Contractor via the Utilities Allowance as ordered/approved by OUA.

Unless indicated otherwise, contractors shall provide for metering the temporary and permanent utilities throughout the construction period and shall provide OUA with meter readings on a monthly basis until the project passes final occupancy inspections. Where university systems are used, meter readings will be used to provide payment from the project funds to the university utility funds. An Allowance shall be established in the Lead Contractor's contract to provide for payment of utilities as directed by OUA.

2. Connections to University utilities shall be arranged by the A/E through OUA. The A/E shall obtain drawings for existing utilities and include information concerning connections in the contract documents.
3. Utility company installations of temporary services shall be reviewed with OUA.

015000.2 Temporary utilities on typical multiple prime contract projects will be provided as follows:

1. Heat: Each Prime Contractor shall provide heating required by the work or trade as needed -until weather tight enclosure of the building. The HVAC contractor shall provide temporary heating, ventilation, and dehumidification after weather-tight enclosure of the building.
2. Temporary drainage for the building excavation including trenches, sumps, pumps, or other items as required to provide satisfactory working conditions for the execution, completion, and protection of all work shall be provided by the GC. Water shall be directed or pumped to existing sewage systems and shall not be permitted to run across the surface of the ground. Upon completion of basement slab, first level floor and foundation backfill, temporary sanitary sewer shall be provided by the plumbing contractor.
3. Temporary drainage for trenches shall be provided by the respective contractor.
4. Water service: Plumbing contract.
5. Sanitary sewer: Plumbing contract (include pumps if required).
6. Storm drainage: By contract providing permanent storm drainage.
7. Electric service: Electrical contract.
8. Internet service: Where available, the university will provide guest access to internet services via the university wireless system for contractors' use during construction. Where not available, contractors are required to provide for their own service via outside providers or by cellular/broadband services at their expense. The A/E shall coordinate availability with OUA and indicate the status in the contract documents.

015000.3 Hoisting facilities for the project shall be provided by the Contractor requiring it.

1. New elevators may not be utilized for transportation of workers and materials
2. Existing elevators may not be used for construction unless approved by OUA.

015000.4 Noise and dust control shall be provided by each Contractor causing the disturbance. Specific materials and methods shall be specified by the A/E. Other means of dust and noise control shall be required as construction operations dictate.

015000.5 Site access

1. Entrances and exits for the public must be maintained during periods of joint occupancy.
2. A secure 6-foot-high construction fence, chain link with vision slats or tarps with top and bottom rails, hinged gates and OSHA approved "No Trespassing" signs shall be erected at the perimeter of the project. The fence location shall be approved by OUA and shall be shown on the site plan. Barbed wire is prohibited. Gates shall be locked and the site secured by the Lead Contractor after working hours. Two keys will be furnished to the Office of the University Architect.
3. Keys or key cards may be provided to the Lead Contractor by OUA for renovation projects. The Lead Contractor shall be responsible for coordination of access by all trades, and shall return the keys upon completion.
4. Vehicular access to the site shall be provided and maintained by the Lead Contractor.
5. Delivery and loading areas will be limited to the building site when space permits.
6. Traffic flow shall be maintained at all times. If traffic flow must be interrupted, the contractor will notify the A/E and OUA two weeks prior to the work. The contractor will be required to post the construction area with warning signs which comply with the State Highway Signage Manual. All temporary signs shall be removed after the pavement is fully restored.
7. Street debris including mud and spillage caused by the work shall be removed immediately. Failure to clean public and University rights of way may result in the University performing the work and back charging the contractor.
8. Repair of damaged streets, roads, or other facilities shall be the responsibility of the contractor causing the damage, at no expense to the University. Work shall be performed to the satisfaction of the Director.
9. Protection of trees and existing landscaping is paramount. OUA will make arrangements for repair and remedial treatments for damage caused by the contractor, who shall bear the cost of these services.
10. Washout of concrete equipment or contamination by any construction products anywhere on University property is strictly prohibited.

015000.6 Project identification sign requirement of the General Conditions may be waived by OUA for small projects or renovations. Otherwise, the Lead Contractor will provide the sign including shop drawing submittal for approval.

1. The location of the project sign, if required, will be approved by the University and will be shown on the site plan.
2. The sign format shall be approved by OUA and provided by the Lead Contractor as illustrated on the drawings.

015000.7 Field office

1. The Lead Contractor's representative shall be present in the job office or on the building site, or otherwise readily available by phone at all times during the work.
2. The A/E shall consult with OUA to determine whether the Lead Contractor is

required to furnish a job office trailer with sufficient conference space for all prime contractors' representatives, OUA representatives and the A/E's field representative to hold project meetings.

3. The securable office trailer facilities shall include:
 - 1) Office space for the Lead Contractor's superintendent and staff,
 - 2) File storage space and layout space for use of working drawings, specifications, and shop drawings,
 - 3) Internet connections, a copy machine and fax equipment.
 - 4) A separate office space shall be provided for the A/E's field representative shall include a desk, plan rack, plan table, 5 drawer file cabinet, the space for the A/E representative shall be at least 80 SF.
 - 5) The A/E representative shall be provided with free use and access of the internet connections, copy machine and fax equipment.
 - 6) The A/E shall be entitled to use the conference space to meet with contractors and other parties to the work.
4. The Lead Contractor shall provide a private office space for each of the major prime contractors on the project, and shall be permitted to back charge the cost of the office space and utility costs pro-rated on a SF basis. Each contractor may provide its own field office trailer if site area permits.
5. Offices within the building may be established if the project size warrants, provided that this use does not adversely affect progress. OUA must approve use of the building for temporary office use by the contractors.

015000.8

Materials and equipment

1. The University will not sign for, pay for, or otherwise accept materials for the contractors. All shipments are to be addressed and delivered to the project site. Deliveries to Kent State University which arrive at the University Supply Center will be returned to the sender.
2. Transportation and handling is the responsibility of the contractors. The A/E, in concert with the Lead Contractor shall by visual observation and checking of the contractors' estimate for partial payment, control deliveries to the site to avoid congestion of storage and work areas with materials which cannot be installed in a reasonable time.
3. Storage and protection of building materials and equipment is required of each contractor and will include weather tight sheds of sufficient size to store all materials which might be damaged by the weather. All outdoor storage (when permitted by the specification) must be limited to the area within the construction fence. Small sheds shall be painted with one coat of paint (color to be selected by the OUA). Small identification signs are permitted.
4. Storage of materials within the building shall not obstruct any of the work, or entrances and exits of the building. Material storage within the building must be agreeable to all prime contractors.
5. Storage of University equipment or furnishings may be required shortly before substantial completion. The contractors shall make available large rooms at or near grade level for this use.

6. Protection of University equipment stored on site is required of all contractors, similar to the protection afforded other contractor's materials and equipment.

01 73 29 CUTTING AND PATCHING

- 017329.1 Each trade is responsible for their own cutting, patching, sealing, fire/smoke proofing and weatherproofing openings they make or existing openings they use for installation of their work. All work shall be performed by individuals trained and experienced in the work. The general trades contractor shall be responsible for structural reinforcement of all holes requiring structural framing indicated on the drawings by notes, schedules or specific structural details. Structural openings that a Contractor requests for his convenience that are not required or shown on the drawings shall be at that Contractors' cost, but performed by a qualified general trades contractor.

01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

- 017419.1 Construction Waste Management: The University seeks to maximize the diversion of construction and demolition waste away from landfills and incinerators. Where possible, waste materials are to be reused on site, salvaged, or recycled, to meet or exceed the goal of a 75% construction/demolition waste diversion rate. The University has a standard Construction Waste Management form that will be given to Contractors during the Contracting process and is required for Contractor Closeout. (Copy provided in Appendix)

01 77 00 CLOSEOUT PROCEDURES

- 017700.1 In the Multi-Prime or General Contract delivery method, Final clean-up of the project shall be assigned to the GC, unless there is no GC, in which case it shall be assigned to the Lead Contractor. In the CMR or Design Build delivery method, Final clean-up is part of their General Conditions scope. In all cases it shall include cleaning of all horizontal surfaces, windows (inside and outside), light fixtures, convactor cabinets, exposed piping and structure, equipment, HVAC grilles, and plumbing fixtures.
1. A competent janitorial subcontractor experienced in construction site cleaning shall be employed to perform final clean-up.
 2. Carpeting shall be spot cleaned and vacuum clean and hard surface floors shall be wet mopped (unless prohibited by the manufacturer).
 3. Final clean-up shall be complete, suitable for immediate occupancy by the University.
- 017700.2 Affidavits, bonds, and guarantees are required in addition to the standard forms required by the contract documents. These documents should be included in the Operating and Maintenance manuals which are to be submitted by each contractor. Include similar statements in the specifications as are listed with the following items:

1.	Affidavits and Warranties	
	Resilient flooring,	From manufacturer and installer
	Carpet	From manufacturer and installer
	Hazardous Waste Delivery	from abatement contractor
2.	Bonds	
	Roofing	20-year guarantee from manufacturer
	Roofing	2-year warranty from installer
	Steel metalwork	5-year guarantee
	Membrane waterproofing	10-year guarantee
3.	Extended Guarantees	
	Caulking and sealants	5-year guarantee
	Metal windows	2 year guarantee for windows; 5 year guarantee for weather stripping
	Wood doors	Lifetime guarantee
	Tinted and insulating glass	5-year guarantee
	Chalk and marker boards	20-year guarantee
	Water chillers	5-year guarantee
	Air cooled condensers	5-year guarantee

01 78 23 OPERATIONS AND MAINTENANCE DATA

017823.1 **Operation and maintenance (O & M) manuals** are required to be submitted by each Prime Contractor in hard paper copy in duplicate in 8 1/2" x 11" format in loose-leaf binders with label pockets on the front and the binding. Original copies of all warranties and certificates shall be included in one binder under a separate tab and index listing all documents and the details of each. O&M manual documents shall also be submitted by each prime contractor in electronic format, in duplicate, using PDF file format on CD ROMs or DVDs, and shall also be uploaded to the OAKS system under the project folder.. Each applicable section of the specification shall direct the contractors to include data in the O & M manuals.

<u>ITEM</u>	<u>DATA REQUIRED</u>
Elevators	O & M instructions and project specific wiring diagrams
Piping systems	Printed diagrams showing tagged valves
HVAC controls	Printed diagrams and operating instructions
Valves	Type-written directory of tagged valves
Communications	Point-to-point wiring diagrams and operating instructions
Motor control centers	Overload heater charts
Equipment	Operating instructions

01 78 39 PROJECT RECORD DOCUMENTS

017839.1 Project record drawings shall be provided by the A/E after final acceptance of the project.

1. Revise drawings to show as built conditions, including the revision date and the words "Record Drawings." As stipulated in the Contractor's agreement, the Contractor shall provide as-built drawings to the A/E. Deliver reproducible mylar prints reproductions to OUA with a letter certifying that "as built" conditions are shown. Provide 2 copies of electronic files of drawings in AutoCAD file format and PDF format, and electronic files of specifications in Word format and PDF format on ~~CD-ROMs or DVDs~~ thumbdrives. Upload one copy of electronic files to the OAKS system under the project folders.

01 79 00 DEMONSTRATION AND TRAINING

- 017900.1 Equipment demonstrations shall be scheduled by the respective contractors with the A/E and OUA.
1. The A/E shall attend each demonstration with the engineer responsible for the design of the system. OUA will invite interested University personnel.
 2. An explanation of mechanical, electrical, and control system operations shall be composed by the engineer in layman's terminology. Multiple copies of this explanation shall be distributed to all persons at the demonstration.

018113 SUSTAINABLE DESIGN REQUIREMENTS

- 018113.1 Sustainable Design: The University promotes energy efficient green design, construction and building operation. Where possible, design to meet or exceed the latest version of the USGBC's LEED rating system Silver level or better or as discussed with the Office of the University Architect.
- 018113.2 Provide a minimum of 10% requirement for Regional Materials as defined by the current version of USGBC's LEED rating system.
- 018113.3 Refer to Site Work General Requirements for Construction Activity Pollution Prevention recommendations.
- 018113.4 Kent State University's campuses are all tobacco-free as of July 1, 2017.

DIVISION 02 – EXISTING CONDITIONS

02000 GENERAL REQUIREMENTS

- 02000.1 During the RFQ phase, the Office of the University Architect (OUA) will identify if the design team needs to include a qualified arborist. Typically, these projects will be ones with significant site work, tree or landscape impacts, or any large project requiring exterior construction equipment. Along with the University Facilities Management (UFM) Grounds Department, the arborist will give input on recommended maintenance, protection and preservation priorities for the project area. The associate shall consult OUA and UFM Grounds during the early planning stage of the project concerning site work, excavation, grading and landscaping; removal of obstructions; alterations to existing campus drives, parking areas and walkways; removal of trees and shrubs, and access to and from the site. The associate's team (including landscape architect and arborist if required) will conduct a site walk-through with OUA and UFM Grounds to review conditions and discuss recommendations.
- 02000.2 The site survey shall include information on underground utilities and structures (if required by the contract).
- 02000.3 On projects requiring an arborist and tree inventory, the tree inventory shall include the following: species, DBH, height, distance to dripline, low or unusual branching, tree condition, suitability for preservation, maintenance recommendations and tree site number.
- 02000.4 The Associate shall be responsible for preparing a subsurface investigation report which consists of test borings, laboratory testing and engineering analysis.
- 02000.5 Existing utility locations shall be determined by the Associate in the preparation of plans for boring locations. Associate shall locate borings to avoid these utilities. Notify OUA to schedule the work. Significant amounts of underground utility information are available at OUA.
- 02000.6 Boring locations and sections showing all soil conditions shall be shown on the drawings. The specifications shall state that the information is for the contractor's use and shall hold the University harmless for the accuracy of the information.
- 02000.7 The Associate shall consult with OUA during early planning stages of projects to consider emergency vehicle access, service vehicle access, Student Disability Services vehicles, snow removal, public transportation, parking and pedestrian access, including construction staging area.
- 02000.8 The associate shall indicate on drawings that the Ohio Utilities Protection Services (OUPS) does not locate private utilities on campus nor does KSU personnel. Specifications should require contractor to hire utility location contractor services for private lines in addition to notifying OUPS.

02060 SITE DEMOLITION

- 02060.1 Remove existing foundations in open areas to a minimum depth of 5' below finish grade. If portions of the existing foundations remain, they must be shown on the "As Built" drawings.
- 02060.2 Indicate extent of demolition on drawings where new structures will replace existing.
- 02060.3 Existing slabs scheduled to remain under fill for new structures shall be broken to provide for drainage. Slabs are to be broken into pieces no larger than 50 square feet.
- 02060.4 The OUA reserves the right to remove and salvage items in areas to be demolished. The OUA may remove items with their own forces or may want the contractor to remove items and turn them over to the University. Coordinate requirements on a project-specific basis with the University project manager.
 - a. Historical items, relics and similar items including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques and other items of interest or value to the University which may be encountered during demolition remain the property of the University. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to the University.
- 02060.5 Underground utilities scheduled to be demolished shall be removed in entirety unless otherwise directed by OUA.

02200 EXCAVATING AND BACKFILLING

- 02200.1 Removal of excavated materials from the site shall be reviewed with OUA during design phase.
- 02200.2 Backfill only with acceptable materials that can be compacted, without containment, to the densities specified herein. Backfill under roads shall be per City of Kent's Construction Standards.
- 02200.3 Waste materials shall be disposed of offsite according to applicable jurisdiction.
- 02200.4 Compaction control requirements shall be specified for all fill, backfill and embankments on the site.
 - a. **COMPACTION REQUIREMENTS:** Specify that soils are to be compacted to the following minimum densities, as determined by Standard Proctor Test (ASTM D-698) within an optimum moisture content range for the soils.
 - 93% Lawn, yard, planting beds and unpaved areas: Trench and utility backfill away from paved areas.
 - 98% Zones within an area below an imaginary line drawn downward and outward at a 2 horizontal to 1 vertical slope from the outside edge of

footings of buildings, walls or edges of shoulders of paving and slabs on grade.

Backfill on inside of buildings, under slabs on grade, paving, pads, stairs and similar items.

Trench and utility backfill under paving and within 10 feet of paved areas.

Backfill around manholes, drainage structures and underground structures.

100% Top 12" of sub-grade under roadways, drives, parking areas, foundations, backfill, footings, pads, paved pedestrian walks and courts, loading docks and paving primarily for vehicle traffic.

- 02200.5 Field compaction tests and related laboratory (ASTM member) analysis shall be performed by a registered Professional Engineer specializing in soils engineering. All soil used on this project shall be analyzed and approved by this engineer for each application prior to placement. A testing laboratory representative shall "spot check" during placement and compaction operations. Tests shall be made in sufficient quantity to assure uniform compaction and density of each course of fill.
- 02200.6 Payment for reimbursable shall be assigned to the Associate. The testing laboratory will be under the direction of the Associate and will provide written reports to the Associate and the General Contractor. The Associate shall provide copies to OUA.
- 02200.7 Site utilities excavation shall be performed by each contractor including excavation, trenching and backfill associated with the respective work. All work is subject to all requirements of Division 2 of the specifications including: earthwork, excavating, backfilling, compaction, testing and payment for testing. Include references to Division 2 in all other prime contractors' specification divisions when applicable.
- 02200.8 Rough grade lawn area to a maximum of 1' vertical to 4' horizontal. Steeper grades will require ground cover planting. Provide roundings at top and bottom of banks and at breaks in grade.
- 02200.9 Scarify sub-grade to a minimum depth of 5" before placement of topsoil. Remove all waste material.
- 02200.10 Minimum depth for topsoil shall be 6" for grass and adequate depth for other planting materials.

- 02200.11 Protect new grade areas from the elements. Repair all settlement and erosion and re-establish grades to the required elevations prior to acceptance.
- 02200.12 All erosion control must comply with "Rainwater and Land Development – Ohio's Standards for Storm Water Management, Land Development and Urban Stream Protection" for all sediment control, silt fences and storm drain inlet protection.

02230 CLEARING, GRUBBING AND TOPSOIL REMOVAL

- 02230.1 Strip all objectionable growth. Remove from the site all debris resulting from the stripping operations at frequent intervals to prevent accumulation of material. On-campus disposal of material will not be permitted.
- 02230.2 Strip topsoil to its full depth from entire area to be graded. Stockpile where directed and where it will not interfere with construction activities. Topsoil to be reused shall be free from roots, brush and debris. Excess topsoil shall be deposited and/or spread on University property as directed unless otherwise approved by OUA.
- 02230.3 **Tree protection is a priority on all projects and must be included in the Construction Documents. On projects requiring an arborist and tree inventory, the certified arborist shall create a report that identifies trees with high or low value or interest; includes elevations and plan drawings of planned tree encroachments and includes which trees should be offered the most protection. A tree protection plan will be created by combining the tree inventory and the tree report to aid in identifying where limited space needs to be carefully managed to satisfy both trees and construction.** Protection of trees and shrubs scheduled to remain shall be assigned to the general contractor and shall include tops, trunks and roots. The Associate shall indicate on the drawings boxes, fences or other protection required because of proximity to the work. Do not permit heavy equipment or material stockpiles within critical root zone. Refer to appendix drawings. Any pruning required shall be with the approval and direction of OUA. The General Contractor shall be responsible for the survival of protected trees for seven years after the construction project is completed (date of substantial completion). The contractor shall be responsible for any tree that is considered to be in declining health (by a certified arborist) due to improper protection as documented during construction. An appraisal for determining a monetary opinion of the value of a tree shall be obtained by a certified arborist. Several methods for determining the value of a tree, including the Replacement method or the Trunk Formula method, shall be used.
 - a. **REPLACEMENT COST METHOD:** Applies to smaller trees with a trunk size up to 8 inches in diameter. The appraised value shall be determined by combining: price quote + transportation + planting + other costs and apply the condition and location values to the trees. The sum of these is the appraised replacement cost.
 - b. **THE TRUNK FORMULA METHOD:** Applies to trees that are too large for practical replacement and shall be appraised by determining the basic tree value by specific condition and location ratings. The appraised value shall be determined by the Ohio Chapter of the International Society of Arboriculture. All

trees with a trunk larger than 8 inches in diameter when measured at four feet above natural grade shall be calculated in this manner.

- c. If any contractor disregards the tree protections and procedure, the penalty as stated shall apply. The contractor shall be responsible for the survival of protected trees for seven (7) years after the construction project is substantially completed. The contractor shall be responsible for any tree that is considered to be in declining health (by a certified arborist) due to improper protection. The tree(s) in question shall be replaced by trees of the same species and caliper. For all trees over 3-inch caliper, the replacement shall be two 3-inch caliper trees at the location as directed by OUA. All associated costs for the removal of the declining tree(s) and any required professional assessments shall be the responsibility of the Contractor.

- 02230.4 Tree protective fencing should be 6' high, 2" mesh chain link fence with top rail and bottom tension wire and installed under the direction of OUA. Tree Protection fence locations shall be shown on all site plans. Trees to be saved shall be labeled on all site plans including, but not limited to, demolition and grading plans. Tree protection limits shall be determined and verified by project manager. At a minimum, tree protection fence shall be determined by critical root zone and 8 feet from the edge of tree canopy. No equipment or materials shall enter this area.

02350 FOUNDATIONS

- 02350.1 Types of foundations shall be determined by the Associate in consultation with his structural engineer based upon the types of soil encountered and other conditions. If pile foundations are necessary, the Associate must thoroughly examine adjacent interior features and installations. At the Associate's option, foundations may be a system of pre-cast or cast-in-place concrete piles, concrete caissons, steel piles or a combination of piles and caissons.
- 02350.2 Wood foundation systems are prohibited.
- 02350.3 Design of foundation systems shall be by an Ohio registered Professional Engineer. All structural drawings shall bear the seal and signature of this engineer.
- 02350.4 Testing of piles, continuous inspection of pile and caisson installation shall be performed by an independent laboratory in cooperation with the Associate's engineer to assure compliance with the contract documents.
- 02350.5 Payment for testing laboratory services shall be as specified by the Associate.
- 02350.6 Quantity and location of test piles will be determined by the laboratory in cooperation with the Associate's engineer. The laboratory will locate the test piles such that if the test piles meet the project requirements, they may be used in the building foundation system.

- 02350.7 Test reports for the test and permanent piles shall include all information necessary by the Associate. A copy shall be submitted to the Owner.
- 02350.8 Drilled caissons shall be continuously inspected by the testing laboratory and the Associate's engineer during excavation, casing installation and concrete placement.
- 02350.9 Data reports for caissons shall include all information as deemed necessary by the Associate. A copy shall be submitted to the Owner.
- 02350.10 Basis of payment for base bid price shall be noted in the specifications as the depths and quantities of piles and caissons shown on the working drawings and on soil boring data. The Form of Proposal shall include separate lines for the unit price of material furnished and installed length per lineal foot, to be added to or deducted from the base bid for depths differing from those indicated. State that payment will not be made for extra pilings that may be driven for the execution of his work. The Associate must certify the depths of piles or caissons upon which the contractor's price is based.

02830 FENCES

- 02830.1 Construction fence location must be approved by OUA and must be shown on the drawings.
- 02830.2 Fence shall be 6' high chain link, 2" mesh with green windscreen. The fence shall have a top pipe rail and bottom tension wire and shall be installed under the direction of the OUA.
- 02830.3 Permanent fencing may be required by the program. Specify chain link fence for perimeter protection and as guards around equipment.

DIVISION 03 – CONCRETE

03000 GENERAL REQUIREMENTS

- 03000.1 Specification format shall follow the State Architect's Handbook if design requires engineering by a structural engineer. Otherwise, a short-form specification suited to job conditions is acceptable.
- 03000.2 Short-form specifications for small projects limited to patching of, or filling holes in existing concrete, may include job mixing of Portland cement concrete. Patented cementitious patching compounds may also be included. Floor underlayment compounds will be specified in finish floor specifications sections.
- 03000.3 Coordinate specifications with the requirements of the Portland Cement Association especially concerning patching.
- 03000.4 Concrete floors shall be thermally isolated from exterior walls in compliance with current applicable building codes.
- 03000.5 Exposed concrete floors shall be specified with integral finish and hardener treatment. Separate topping is prohibited. Associate shall specify clear sealant in Division 9, Clear VOC-compliant water based sealant. Non-floating fibermesh shall be used on interior exposed concrete flooring.
- 03000.6 All concrete slabs shall be fiber reinforced at a minimum rate of 3 lbs. per cu yd with Fibermesh 650 by Propex or equal where welded wire mesh is not being used. 1 ½ lbs per cu yd of Fibermesh 300 is to be used on interior slabs where welded wire mesh is present.
- 03000.7 Strengths: Provide a minimum compressive strength of 3,000 PSI at 28 days for general use. For slabs on grade and paving, use 4,000 PSI, minimum.
- 03000.8 Concrete specified for filling excavations over footing may be 2,500 PSI, minimum.
- 03000.9 Air Entrained Concrete: An air-entraining admixture shall be used for all flatwork concrete exposed to weather (to achieve 5½% +/- 1½%).
- 03000.10 Moisture Vapor Emission Barrier: This Admixture (Barrier-1 or accepted equal) shall be added at the batch plant at a rate of 14 ounces per 100 pounds of cementitious material. This admixture is in lieu of mix water and not addition. A product representative must be present during job-site pouring for their own testing.
- 03000.11 Non-Slip Surfacing: Ramps, treads and platforms of stairs shall have a non-metallic, non-slip surface with light broom finish when not covered with finish flooring materials.

- 03000.12 Structural design of slabs should include consideration of exposed construction which can be used for finished ceilings.
- 03000.13 Tests will be performed by a testing laboratory which has been approved by the Associate. The laboratory shall perform tests for wet density, dry density and compressive strength for each specimen. Refer to Division 1, Testing Requirements, for costs of tests and contract. On projects using state funds, costs of tests must be as an allowance or reimbursable to the Associate. Contractor to notify testing agency 24 hours in advance, prior to placement.
- 03000.14 Testing Agency: Owner will engage a qualified independent testing and inspecting agency to sample materials, perform tests and submit test reports during concrete placement. Obtain one sample for each day's pour of each concrete mix exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof. A minimum of four test cylinders shall be taken during each day's pour, and written reports of tests shall be sent directly to the Associate
- 03000.15 On-Site Construction Administration: The Associate shall have a representative visit the site at appropriate intervals to observe the Work and determine if the Work is in accordance with the Contract Documents. The Associate shall keep the Owner informed and will endeavor to guard against defective work. Report any non-compliance with the specifications to the OUA.
- 03000.16 Addition of water to concrete during delivery, at project site, or during placement is prohibited, except as specified by the design mix on ticket.
- 03000.17 Placement Schedule: Contractor to submit concrete placement schedule before start of concrete placement operations. Include location of all joints, including construction joints. Provide minutes of pre-installation conference.
- 03000.18 Specify only non-staining types of curing, sealing and hardening products which are compatible with flooring materials. Take necessary precautions to prevent odor from entering adjacent occupied buildings.
- 03000.19 Sawed Joints: Cut joints into concrete when cutting action will not tear, abrade or otherwise damage surface. Joints to be sawed within 24 hours of placement of concrete. Associate to specify joint width and depth.
- 03000.20 Joint Fillers: Prepare, clean and install joint filler according to manufacturer's written instructions. Defer joint filling until concrete has aged at least six months. Do not fill joints until construction traffic has permanently ceased.
- 03000.21 Parking Garage Structures:

- a. Parking spaces in garages shall be 9'-0" wide for stalls at 90 degrees. Parking spaces designated for handicapped shall comply with ADA guidelines. Parking garages shall be designed to have a minimum of 7' 0" clear height throughout, no exceptions. Signage piping, ductwork and other objects shall not be below 7' 0" above finished floor.
- b. Review all design concepts and proposed structural systems with OUA.
- c. Structural slabs for parking garages and other concrete to be subjected to deicing salts shall include micro-silica, corrosion inhibitor and epoxy-coated reinforcing steel. Micro-silica concrete mix design shall be based on 6,000 PSI compressive strength and shall be moisture cured. Broom finish concrete in vehicular traffic areas.

03300 CAST-IN-PLACE CONCRETE

- 03300.1 Concrete Mixing: Contractor to provide batch ticket for each Ready Mixed batch discharged and used in the Work, indicating project identification name and number, date, mix type, mix time, quantity and amount of water added. Record approximate location of final deposit in structure.
- 03300.2 Vapor Retarder: Under building floor slabs, install, protect and repair vapor-retarder sheets (minimum of 6 mil, reinforced) according to manufacturer's specifications. Place sheets in position with longest dimension parallel with direction of pour. Lap joints 6 inches and seal with manufacturer's recommended tape. Cover vapor retarder with fine graded granular material, moisten and compact with mechanical equipment to elevation tolerances of plus 0 inch or minus $\frac{3}{4}$ inch.
- 03300.3 Steel Reinforcement: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing and supporting reinforcement. Repair damage and reseal vapor retarder before placing concrete.
- 03300.4 Concrete Protection and Curing: Protect and cure in compliance with ACI recommendations.
- 03300.5 Formwork: Chamfer exterior corners and edges of permanently exposed concrete.

03310 ARCHITECTURAL CAST-IN-PLACE CONCRETE

Definition: Cast-in-Place Architectural Concrete: Concrete that is exposed to view on surfaces of the completed structure or building and that requires special concrete materials, formwork, placement, or finishes to obtain specified architectural appearance.

- 03310.1 Architectural cast-in-place concrete specifications shall include a minimum of 4' x 8' sample panel to be erected at the site. The sample panel shall be protected from construction operations, but shall be exposed to the elements.
 - a. The sample panel may be incorporated into final work if approved by OUA.

- b. The sample panel shall remain on site until all architectural concrete has been approved by the OUA.
- 03310.2 Provide temporary protection for nosings on interior concrete steps. Treads of concrete steps shall be provided with non-slip surface.
- 03310.3 Reinforcement Accessories – Bar Supports: Bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Where legs of wire bar supports contact forms, use as appropriate; 1) all-plastic, 2) CRSI Class 1 plastic-protected or 3) CRSI Class 2 stainless-steel bar supports.
- 03310.4 Concrete Mixing: Refer to 03300, Cast-in-Place Concrete.
- 03310.5 Formwork: Fabricate forms for easy removal to prevent damage to concrete surfaces.
- 03310.6 Concrete Placement: Refer to 03300, Cast-in-Place Concrete.
- 03310.7 Concrete Curing: Refer to 03300, Cast-in-Place Concrete.

03410 PRE-CAST CONCRETE

- 03410.1 Pre-cast concrete design and specifications for structural concrete and concrete panels shall be based upon recommendations of the Pre-Stressed Concrete Institute. Sample Panel: Refer to 03310.1
 - a. Fabrication Qualifications: Engage a firm experienced in producing architectural pre-cast concrete units and fabricator must participate in the Pre-Cast/Pre-Stressed Concrete Institute's (PCI) Plant Certification Program and be designated a PCI certified plant for Group A1-Architectural Concrete at the time the project is bid.

03520 LIGHTWEIGHT INSULATING CONCRETE

- 03250.1 Review use with OUA.

03532 CONCRETE FLOOR TOPPING

- 03532.1 Project Conditions:
 - a. Place concrete floor topping per temperature recommended by manufacturer.
 - b. Close areas to traffic during topping application and after application.
 - c. Protect from weather until curing is complete.
- 03532.2 Preparation:
 - a. Examine substrates, with Installer present, for conditions affecting performance of concrete floor topping.

- b. Mechanically remove contaminants from existing concrete that might impair bond of floor topping.
- c. Start floor topping application in presence of manufacturer's technical representative.

03542 CEMENT-BASED UNDERLAYMENT

- 03542.1 Comply with manufacturer's recommendations and refer to project conditions and preparations in 03532 "Floor Topping."

DIVISION 04 – MASONRY

04 00 00 MASONRY GENERAL REQUIREMENTS

- 040000-1 Allowances for masonry materials to match existing are not permitted. The Associate will determine the manufacturer, texture and color of masonry units and mortar to match existing prior to bidding. Approval must be obtained from OUA. This information will be provided to the bidders in the contract documents.
- 040000-2 Where the phrase "or approved equal" or "approved substitution" occurs in the contract documents, do not assume that material, equipment or methods will be approved as equal by the Associate unless the item has been specifically approved for this work by the OUA. Color choices will be one of the determining factors for approval of masonry.
- 040000-3 Match existing coursing, bonding, color and texture of existing masonry unless otherwise approved by the OUA.
- 040000-4 Waterproofing shall be applied to all exterior materials which are not inherently water resistant. Use water resistant mortar additive in walls which will not receive applied waterproofing.
- 040000-5 Damp-proofing shall be applied to all walls below grade which are not otherwise sealed to prevent water entry.
- 040000-6 Sample Panels: Build sample panels to verify selections to demonstrate aesthetic effects. Build sample panels to approximately 48" x 60" by full thickness.
- 040000-7 Approval of sample panels is for color, texture and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship and other material and construction qualities specifically approved by Architect in writing.
- 040000-8 Protection of Masonry: During construction, cover tops of walls, projections and sills with waterproof sheeting at the end of each day's work. Cover partially completed masonry when construction is not in progress.
- 040000-9 Associate shall specify factory blending for exposed unit masonry to produce a uniform blend of colors and textures.
- 040000-10 Refer to 04 01 00 for masonry and stone restoration and cleaning.
- 040000-11 Refer to 04 01 00 for masonry and stone restoration and cleaning.

04 01 00 MAINTENANCE OF MASONRY

- 040100-1 Associate shall review all restoration and cleaning specifications with the Office of the University Architect.
- 040100-2 Associate shall schedule and coordinate testing of cleaning agents to be used prior to bidding.
- 040100-3 Associate shall specify cleaning to be performed from the bottom up.
- 040100-4 Specify pre-cleaning conference and test area.
- 040100-5 Brick and mortar selection for renovations or additions to buildings shall match the closest freshly cleaned adjacent wall unless otherwise approved by the OUA.
- 040100-6 Face brick mortar shall be tinted to match adjacent building joints in addition work, or as otherwise approved by the OUA in all other work.

04 05 00 COMMON WORK RESULTS FOR MASONRY

- 040513-1 Mortar for laying masonry may be ready-mix or job mix. Specify by types according to ASTM C270.
- 040513-2 Face brick mortar shall be tinted to match adjacent building joints in addition work, or as otherwise approved by the OUA in all other work.
- 040513-3 Tooled joints shall be standard concave joints unless otherwise required to match adjacent existing joints.
- 040513-4 Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.
- 040513-5 Cold-Weather Admixture: Non-chloride, non-corrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
- 040513-6 Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather condition, to ensure that mortar color is consistent.
- 040513-7 Protect Stone and cast stone from masonry cleaners. Masonry cleaning to be scheduled to be performed immediately following grout set.
- 040513-8 Source Quality Control: Associate shall specify requirements for masonry mortar testing. Refer to Division 1 for testing.

04 05 19 MASONRY ANCHORAGE AND REINFORCING

- 040519-1 Masonry Joint Reinforcement, General: ASTM A 951.
- 040519-2 Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods per structural engineer's recommendation.
- 040519-3 Masonry Joint Reinforcement for Multi-Wythe Masonry:
- Ladder type with 1 side rod at each face shell of hollow masonry units more than 4 inches (100 mm) in width, plus 1 side rod at each wythe of masonry 4 inches (100 mm) or less in width.
- Tab type, either ladder or truss design, with 1 side rod at each face shell of backing wythe and with rectangular tabs sized to extend at least halfway through facing wythe but with at least 5/8 inch (16mm) cover on outside face.
- 040519-4 Hot-dip galvanized, carbon-steel wire or steel sheet.
- 040519-5 Wire, steel sheets, steel plates, shapes and bars.
- 040519-6 Stainless steel bars for stone trim or pre-cast concrete trim.
- 040519-7 Corrugated metal ties are prohibited.
- 040519-8 Reinforcing Bar Positioners: Galvanized wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells.

04 05 23 MASONRY ACCESSORIES

- 040523-1 Associate to indicate all control and expansion joints on exterior elevation. Control joints shall be designed at one side of every opening and sill and at a maximum 20' horizontal spacing. Expansion joints shall be as designed by the Associate Architect/Engineer.
- 040523-2 Weep Hole Wicking Material: Absorbent rope made from cotton 1/4" – 3/8" in diameter.
- 040523-3 Cellular Plastic Vent: One piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8" (3 mm) less than depth of outer wythe, in color selected from manufacturer's standard. Install at heads and sills of all openings and top and bottom of wall.
- 040523-4 Cavity Draining Material (Mortar Net): Free-draining mesh, made from polymer stands that will not degrade within the wall cavity.

- 040523-5 Stainless steel preferred. Review all other types with the OUA. Isolate flashings to prevent galvanic action.
- 040523-6 Loose-Granular Fill insulation: Perlite complying with ASTM C 549, Type II (surface treated for water repellency and limited moisture absorption) or Type IV (surface treated for water repellency and to limit dust generation).
- 040523-7 Extruded-polystyrene board insulation, ASTM C 578. Minimum R value to comply with current Ohio Energy Code.

04 20 00 UNIT MASONRY ASSEMBLIES

- 042000-1 Associate shall determine unit compressive strength and weight classification of CMU.
- 042000-2 Exposed exterior CMU assemblies shall only use Grade A washed, crushed limestone aggregate and washed limestone sand. Units shall have integral water repellent.
- 042000-3 All exposed CMU outside corner assemblies (including at doors, windows and wall offsets) shall be constructed with bull-nosed units.

04 21 00 CLAY UNIT MASONRY

- 042100-1 Modular brick coursing, three courses to 8 inches, is required unless existing conditions are different or as approved by the OUA.
- 042100-2 Stack bond is prohibited unless approved by the OUA for limited architectural effect.
- 042100-3 Split coursing is prohibited at the head of any opening.
- 042100-4 Efflorescence test certificate must be submitted to the OUA prior to approval of selection indicating no efflorescence when tested in accordance with ASTM C67.
- 042100-5 Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- 042100-6 Brick Surface Coating: Brick with colors or textures produced by application of coatings are prohibited.

04 21 23 STRUCTURAL CLAY TILE MASONRY

- 042123-1 Structural clay facing tile shall be select quality, ceramic glaze, 8" x 16" face. Reinforcing clay facing tile assemblies in alternating courses with approved truss-type reinforcing.
- 042123-2 Provide special shapes where required for corners, jambs, coved bases, sills and other special conditions indicated, including applications that cannot be produced by sawing standard units.

- 042123-3 Provide bull-nose units for outside corners, unless otherwise indicated, and coved internal corners. Provide recessed, coved base units.

04 43 00 STONE MASONRY

- 044300-1 Limestone shall be Buff Indiana Limestone except where other types may be required to match existing surfaces. Backs and bonding faces shall be damp-proofed with a water barrier as approved by the Indiana Limestone Institute of America, Inc. Limestone shall not be installed lower than 4" above grade when adjacent to lawns or planted areas.
- 044300-2 Non-staining sealant or acrylic-based compounds shall be used for sealing stonework. Silicon-based compounds are prohibited for limestone.
- 044300-3 Handling, protection and installation shall comply with the recommendations of the Indiana Limestone Institute of America, Inc.
- 044300-4 Limestone, ASTM C568 classification 2 Medium density minimum. Comply with recommendations in ILI's handbook.

04 72 00 CAST STONE MASONRY

- 047200-1 All cast stone shall be minimum 6,500 psi concrete. All exposed corners shall be eased.
- 047200-2 Embedded anchors and other inserts shall be fabricated from stainless steel.
- 047200-3 Associate shall specify cleaner that is compatible with cast stone.

DIVISION 05 – METALS

- 050000.1 **Refer to Front End Documents for Domestic Steel requirements.**
- 050000.2 Sustainable Design & LEED Projects: The University promotes energy efficient green design, construction and building operation. Where possible, materials are to be specified to meet or exceed the latest version of the USGBC's LEED rating system or as discussed with the Office of the University Architect.

051200 STRUCTURAL METAL FRAMING

- 051200.1 Specifications shall be complete for this part of the work in addition to the Structural Engineer's notes on the drawings. The Associate is responsible for complete coordination of statements in the specifications with notes on the drawings.
- 051200.2 Comply with American Institute of Steel Construction (AISC) for all structural steel.
- 051200.3 Erect structural steel within the tolerances stipulated in the AISC code of standard practice for buildings designed with future vertical expansion provisions.
- 051200.4 Specifications will require the erection subcontractor to provide an affidavit at the completion of the job which states that the structural steel frame is plumb and level within normal tolerances specified in the AISC code.
- 051200.5 Submit shop drawings in accordance with all applicable provisions of these specifications. Associate to review shop drawings for conformance with overall design intent.
- 051200.6 Shop prime all interior structural steel with oxide-rich primer.
- 051200.7 Hot dip galvanize all exterior or wet location steel. Repair all damage to galvanized coatings.
- 051200.8 An independent testing agency shall verify and report the strengths of all high strength, bolted connections and welded connections. Associate to verify with OUA testing agency payment procedure.

052100 STEEL JOISTS

- 052100.1 Manufacturer's Certificate of Compliance with Steel Joist Institute Specifications is required.
- 052100.2 Shop prime coat and field touch-up painting are adequate for joists except where subject to moisture or exposed to view.
- 052100.3 Clean all joist members prior to acceptance by Owner. Verify that proper finishes have been applied to all faces of joist members.

053000 METAL DECKING

- 053000.1 Manufacturer's Certificate of Compliance with Steel Deck Institute Specifications is required.
- 053000.2 Galvanized decking shall be installed for all roof decks and all other moisture-prone floor slabs such as mechanical rooms, kitchens and bathrooms. Coordinate with OUA.

054000 COLD-FORMED METAL FRAMING

This section pertains to load-bearing assemblies. Refer to Division 9 – Finishes for non-load bearing metal stud assemblies.

- 054000.1 C-Shape Studs: Provide and install manufacturer's standard load-bearing metal studs of size, shape and gauge indicated or as determined by design requirements with 1.625" minimum flange and flange return lip.
- 054000.2 Patented metal framing systems which are required for the support of plaster or gypsum board ceilings should be specified in this section and approved by OUA.

055000 METAL FABRICATIONS

- 055000.1 Design shall be complete for all required metal fabrications. Contractor designed metal fabrications are prohibited (this includes stairs, ladders and railings).
- 055000.2 Specify that the general contractor will provide and install lintels for all openings through walls shown on drawings for all other prime trades.
- 055000.3 All exterior lintels, exterior gratings and interior wet location ferrous metals shall be hot-dip galvanized after fabrication. Repair all damage to galvanized coatings. Fasteners shall be galvanized. Welded connections shall be re-galvanized to prevent rust.
- 055000.4 All exterior handrails and guardrails on concrete stairs or walks shall be galvanized steel with black powder coat finish over oxide primer. Railings are to be set in concrete base outside of stair cheek wall. Refer to standard detail.
- 055000.5 For all exterior steel use of powder-coated metals is preferred. Verify with OUA before specifying.
- 055000.6 Interior metal stairs for public access shall not be exposed concrete. At a minimum, cover all concrete tread risers with rubber stair tread materials.
- 055000.7 Exterior metal stairs are discouraged; when necessary, they shall be constructed of hot-dipped galvanized members. Fully weld all rails, handrails, attachments and supports and repair welds with galvanizing repair paint. Stair treads and landings shall be perforated or grating type material to allow drainage. Associate to verify ADA compliance.

- 055000.8 Bilco "Ladder Up" or approved equivalent safety device is required at all roof ladders through the roof hatches. Associate to locate roof ladders in custodial closets or mechanical rooms.
- 055000.9 Metal expansion joint covers shall be aluminum and are required at all joints in traffic planes.
- 055000.10 Gratings shall be standard sized, galvanized and painted after fabrication. Provide galvanized hardware under all areaway gratings.
- 055000.11 All Exterior Gratings exposed to public pedestrian traffic shall be ADA compliant and safe for walking with shoes with narrow heels (1/4" maximum gap). Grating shall also be structurally rated for vehicular traffic.

DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES

06 00 00 GENERAL PROVISIONS

- 06100.1 Sustainable Design & LEED Projects: The University promotes energy efficient green design, construction and building operation. Where possible, materials are to be specified to meet or exceed the latest version of the USGBC's LEED rating system or as discussed with the Office of the University Architect.

06 10 00 ROUGH FRAMING (Interior and Exterior)

- 06100.2 Always provide and install fire-treated lumber unless otherwise directed by OUA. Back up all wall and ceiling-mounted accessories with wood blocking (especially wall-mounted door stops, grab bars, shelving standards, window treatment hardware, and Kitchen & Bathroom wall cabinetry). Install only true, straight pieces.
- 06100.3 All lumber in contact with masonry, concrete or roof termination details shall be 'ground contact' preservative treated to meet AWPA standards. All fasteners, anchors, plates and hardware shall be hot dipped galvanized or stainless steel to withstand the corrosiveness of preservative treatments.
- 06100.4 Truss shop drawings shall include a complete design analysis of structural components. On all roof projects, design Fall Protection anchor points. Data shall bear the seal and signature of an Ohio-registered professional architect or engineer certifying that the design of the trusses complies with the requirements of the building code. Associate shall review shop drawings to verify conformance with design intent.
- 06100.5 Associate shall verify grade stamps of all lumber installed.
- 06100.6 Associate shall verify & specify code-required wood fastening requirements.

06 20 00 FINISH CARPENTRY

- 06200.1 Conform to Architectural Woodwork Institute Specifications (AWI) for custom quality work.
- 06200.2 Back prime all exterior trim prior to installation. Spot prime ends.
- 06200.3 Shelving shall be $\frac{3}{4}$ " 5-ply plywood - no particleboard. Hardwood plywood shelves with hardwood edge may be stained, or shelves may be completely covered (all six faces) with plastic laminate. Melamine surfaces and "T" edge molding is approved for spans 4' and under. Support shelves on heavy-duty adjustable steel standards and brackets unless otherwise indicated; KnappeVogt or equal.
- 06200.4 Provide fire treated plywood telephone and electrical/data backboards where specified; paint gray. Verify size of plywood backboard with OUA.

- 06200.5 Associate shall specify “tamperproof” or “vandal resistant” fasteners in areas that are subject to vandalism by the general public. These fasteners shall have a ‘Snake Eyes’ head.

06 40 00 INTERIOR ARCHITECTURAL CABINET WORK

Refer to Division 12 for Laboratory Casework.

- 06400.1 Flush door and drawer design preferred on custom casework. Pre-manufactured cabinets are acceptable if construction will withstand use. Refer to Division 12.
- 06400.2 Custom laminate casework to incorporate high pressure laminate (HPL) and PVC edge banding at horizontal countertop edge and surrounding cabinet door edges and all other vertical surfaces. Preferred edge banding thickness: 3mm at vertical surfaces, 1-2mm at horizontal surfaces. No plastic laminate self-edges to be specified.
- 06400.3 In wet areas (restrooms, kitchens, window sills, and similar locations), solid surface counter material is preferred if the budget allows.
- a. Provide auxiliary support under counters to withstand sitting loads.
 - b. If plastic laminate countertops must be installed at sink/wet areas, core material to be marine grade or exterior grade plywood.
- 06400.4 Counter tops may be fabricated off site, but back and end splashes should be shipped loose for field installation. All countertop laminates to have a backer sheet. Carbonite countertops preferred for all laboratories. Specify scratch and abrasion resistant colors, textures, and finishes for abusive installations, such as Geology rock labs, areas with fossil work, etc.
- 06400.5 ADA Compatible cabinet hardware (drawer and door pulls) specifications should be included in this section for installation by the manufacturer/installer.
- 06400.6 All casework and countertop particleboard shall be LEED certified or equivalent formaldehyde free sheet material such as “Wheatboard”.

06 64 00 GLASS FIBER-REINFORCED PLASTIC

- 06600.1 Associate to review all products with OUA.

DIVISION 07 – THERMAL MOISTURE PROTECTION

07110 WATER RESISTANCE AND DAMPPROOFING

- 07110.1 Membrane water resistance shall be a heavy duty permanent water-resistant type capable of adjusting to building movements without breaking the membrane seal.
- 07110.2 Preferred system is tar or asphalt impregnated fiberglass fabric. Associate to recommend preferred system. A ten-year experience clause is required in the specification.
- 07110.3 Fully detail all conditions on the drawings to prevent seepage from exterior sources. Concrete foundation walls around elevator pits and basements, from grade to footings, shall be treated with membrane water resistance.
- 07110.4 Compatibility with water stop materials as may be required at joints shall be determined by the Associate.

07160 DAMPPROOFING

- 07160.1 Bituminous dampproofing shall be installed on all walls where interior surfaces are scheduled to receive applied finishes.
- 07160.2 Install dampproofing prior to installation of interior finishes.

07190 WATER REPELLENTS

- 07190.1 Exposed surfaces of exterior brick, concrete block, cut stone and pre-cast concrete shall be coated with a penetrating, colorless, non-staining, mildew resistant water repellent.
- 07190.2 Water repellent coatings should be specified for all new and restored brick, concrete masonry and architectural pre-cast concrete. Products specified should be breathable silanes or siloxanes as appropriate for the surface to be coated. Film forming surface coatings such as silicones, acrylics, mineral gum resins and blends should not be used. Products specified should be those which have an estimated life expectancy of 10 to 15 years.
- 07190.3 Specify that adjacent and nearby surfaces be protected from spillage or overspray from repellents. Require that live plants, grass, windows and other areas be covered.
- 07190.4 Coordinate water repellents with graffiti-resistant coatings to ensure compatibility and warranty requirements. Ideally these products should be from the same manufacturer.

07200 ROOF INSULATION

- 07200.1 Roof deck insulation including cant strips and tapered edge strips shall be non-hygroscopic. Hygroscopic materials are prohibited in any part of the roof system.

- 07200.2 Minimum gap between roof insulation boards shall be the minimum as required by the manufacturer. This requirement is especially important around roof penetrations and projections.
- 07200.3 Daily installation of roof insulation materials shall be limited to that amount which can be covered with the roofing membrane prior to the end of the day or prior to the onset of inclement weather.
- 07200.4 Anchor roof insulation in accordance with manufacturer's recommendations for fastener type, size, placement and density. Installation shall comply with Factory Mutual 1-90 rating against uplift.

07210 BUILDING INSULATION

- 07210.1 On vertical surfaces, set units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.
 - a. If not indicated, extend insulation to footer depth.
- 07210.2 Protect below-grade insulation on vertical surfaces from damage during backfilling and site work by applying protection board.

07240 EXTERIOR INSULATION AND FINISH SYSTEMS

- 07240.1 Use of Exterior Insulation and Finish Systems (EIFS) shall be limited and only as approved by OUA.

07260 VAPOR BARRIERS

- 07260.1 Under floors use minimum 6 mil polyethylene sheet. If a crawl space occurs, protect the vapor barrier with a 3" (min.) concrete slab; where utilities occur, utilize a 2000 psi strength concrete.
- 07260.2 In exterior walls and ceilings under roofs which are scheduled to be finished gypsum board, use 6 mil fiber-reinforced polyethylene sheet.

07272 AIR INFILTRATION

- 07272.1 Provide building air infiltration barrier (building wrap) where appropriate; Tyvek or equal.

07300 GENERAL REQUIREMENTS

- 07300.1 General Requirements:
 - a. For new roofs: flat roofs shall be designed to provide a minimum ¼" per foot slope as required by Code. Increased slope up to ½" per foot is preferred to prevent standing water on roofs. Dead level roofs are prohibited. Slope shall be accomplished by sloped structural members whenever possible or tapered

insulation if necessary (except for coal tar). Additional tapered insulation should be used at strategic locations to create saddles, crickets and additional taper around equipment, perimeter areas, curbs valleys and other potential problem areas. Scupper openings and overflow roof drains shall be discussed with OUA.

- b. Provide roofing membrane manufacturer approved walkway pads around all rooftop equipment and in areas subject to traffic.
- c. On re-roofing projects, drainage should be assessed and, if necessary, provisions should be added to improve drainage. Provide tapered insulation systems as required to increase existing slopes to ¼" per foot minimum. Consult with UFM for maintenance issues. Insulation should be increased to meet code minimum R-value. This will often necessitate increasing fascia heights.
- d. Rooftop piping, conduits and equipment shall be mounted on supports specifically manufactured for roofing. Wood blocking is not an acceptable means of support.
- e. Review existing parapet heights and fall protection systems. Projects should include fall protection systems.
- f. Lightning Protection systems: new roofs should achieve a UL Master Label lightning protection system. Re-roofing projects with an existing system will typically replace all rooftop conductors and horizontal cabling.

07300.2 Roof System Selection:

- a. The roof system selected shall be determined on a project-by-project basis. Although there is no single roof system requirement, the University requires that the following criteria be considered in selecting a roof system. Re-roofing projects shall include tear-off of old roofing systems to original substrates.
 - 1. The roof system shall pursue a 30-year warranty.
 - 2. Traffic should be considered in product selection.
 - 3. Dark roofs are more appropriate for energy considerations.

07300.3 Project Management and Coordination: Review methods and procedures related to roofing system including, but not limited to, the following:

- a. Review temporary protection requirements for existing roofing systems that is to remain, during and after installation.
- b. Review roof drainage during each stage of re-roofing and review roof drain plugging and plug removal procedures.
- c. Review structural loading limitations of deck during re-roofing.

- 07300.4 Pre-Installation Conference: Before starting roofing installation, associate shall conduct a meeting with the roofer and job superintendent, roofing material manufacturer's representative and Owner's Representative to review roofing materials and procedures. Record discussions and furnish copy of meeting notes to each participant.
- 07300.5 Maintain roof drains in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof drains and conductors. Use roof drain plugs specifically designed for this purpose. Remove roof drain plugs at end of each work day, when no work is taking place or when rain is forecast.
- a. If roof drains will be temporarily blocked or unserviceable due to roofing systems removal or partial installation of new membrane roofing system, provide alternative drainage method to remove water and eliminate ponding. Do not permit water to enter into or under existing membrane roofing system components that are to remain.
- 07300.6 Built-Up Coal Tar Roofing: Store liquid materials in their original containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
- a. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
 - b. Provide tie-offs at end of each day's work to cover exposed roofing membrane sheets and insulation with a course of coated felt with joints and edges sealed.
 - c. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.

07310 SHINGLES AND ROOFING TILES

- 07310.1 Overlapping unit roof systems (shingles and tiles) shall not be used unless roof slope exceeds 3½ units of rise to 12 units of run.
- 07310.2 Asphalt or fiberglass shingles shall be minimum fire resistive UL Class C, wind resistive type, 30 year guaranteed.
- 07310.3 Associate shall verify all fasteners are compatible with substrates and accessories and have adequate protrusions below sheathing. No staples shall be used.
- 07310.4 Water-resistant membrane shall be detailed in at valleys, roof edges and other areas where ice build-up may cause water to enter the roof system.

07411 METAL ROOF PANELS

- 07411.1 Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal roof panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

- 07411.2 Finish Warranty Period: This warranty is project specific per product specified (how many years from date of contract completion).
- 07411.3 Review metal fastening systems with OUA.

07500 MEMBRANE ROOFING

- 07500.1 Factory Mutual (FM): Materials and workmanship shall conform to 1-90 wind uplift resistance.
- 07500.2 Manufacturer's Warranty: After final inspection and approval by roofing manufacturer's representative, provide written warranty signed by manufacturer of primary roofing materials and his authorized Installer, agreeing to replace/repair defective materials and workmanship as required to maintain roofing system in water-tight condition.
- 07500.3 Minimum term for warranty shall be 30 years with no dollar limit, unless standard manufacturer's warranty exceeds this term. The GC, roofing sub-contractor and the manufacturer, shall furnish the written guarantee bearing their three signatures for the complete roof installation (including installation of items supplied by other contractors).
1. The manufacturer's guarantee for sheet membrane material shall be executed and submitted with the GC's guarantee.
 2. The GC will submit the guarantee(s) in triplicate to the Associate and the term shall begin with the Contract completion.
 3. The primary responsibility for executing guarantee work shall lie with the GC.
 4. The guarantee shall include, at no cost to the University, all labor and materials required to repair or replace the entire roof system including insulation, membrane, flashing, sheet metal, coping and roofing accessories as may be caused by faulty workmanship or materials.
 5. Contractor's Warranty: Submit two executed copies of the Contractor's Roofing Warranty, signed by the Installer (Roofer), agreeing to warrant the roof system.
 1. Warranty period is 2 years from date of Contract Completion.
 6. The warranty shall include all flashing, fascia, and other sheet metal.
- 07500.4 Single-ply sheet roofing membrane layout shall be reviewed with OUA.
- 07500.5 Flashing shall meet the manufacturer's details to provide a 30-year warranty. Flashing materials shall be furnished by the manufacturer of the sheet roofing membrane.
1. Pipe seals shall be pre-manufactured boots.

2. All flashings and counter-flashings, including pipe seals, shall be installed by the roofing contractor to assure a complete water-resistant installation

07500.6 Wood members used in conjunction with roof system shall be pressure treated with water-borne preservatives for above ground use in compliance with AWPB LP-2.

07600 FLASHING, SHEET METAL AND TRIM

- 07600.1 All flashing and sheet metal work shall be as recommended by the sheet roofing membrane manufacturer and shall be included in the roof guarantee.
- 07600.2 All edge metal work shall meet ANSI/SPRI ES-1 criteria.
- 07600.3 All metal shall be compatible with surrounding systems.
- 07600.4 Gutters and downspouts shall be copper, stainless steel or factory finished, color coated metal.
- 07600.5 Fascias and gravel stops shall be extruded aluminum, copper, stainless steel or color coated metal.
- 07600.6 The top of flashing (bottom of counter-flashing) shall be a minimum of 8" above the plane of the roof.
- 07600.7 The use of pitch pans is strongly discouraged. Items penetrating roof should be flashed with pre-formed accessories, secured to the roof and penetrating items.
- 07600.8 Relief vents shall not be installed unless roof no longer is under warranty and vents are recommended by the manufacturer of the sheet roofing membrane. For roofs being constructed or under warranty, all wet insulation shall be replaced.
- 07600.9 Walkways shall be provided to all major pieces of mechanical equipment and around all equipment that requires servicing. Provide elastomeric roof treads as recommended by the manufacturer of the sheet roofing membrane.
- 07600.10 Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.

07720 ROOF ACCESSORIES

- 07720.1 Fasteners: Same metal as metals being fastened or non-magnetic stainless steel or other non-corrosive metal as recommended by the manufacturer. Match finish of exposed fasteners with finish of material being fastened.

- 07720.2 Provide fall protection system if parapet height is insufficient: XPS Genesis system. Review layout with OUA.

07811 FIREPROOFING

- 07811.1 Sprayed-on fireproofing shall be 100 percent asbestos free. Sprayed-on fireproofing shall be a cementitious type. Specify higher density products if needed based on project requirements. Sprayed fiber type products are prohibited.
- 07811.2 Specify field quality control testing of sprayed-on fireproofing by an independent testing agency to verify that installed fireproofing complies with specified thickness, density and bond strength prior to ductwork installation.
- 07811.3 Specify that installed fireproofing which is damaged during construction shall be repaired to original condition. On multiple prime projects, require that the contractor that disturbs the fireproofing be responsible for having it corrected.
- 07811.4 Coordinate the extent of fireproofing between structural and architectural documents. Specify that structural steel to receive fireproofing shall not be prime painted. Such steel shall be properly stored and protected to prevent surface rust. Require that applicators prepare steel in accordance with fireproofing manufacturer's recommendations to ensure proper bond.

07920 JOINT SEALANTS

- 07920.1 Drawings shall use the terms "sealant" or "joint sealant." The term "caulk" or "caulking" may be used in the documents to indicate interior joint sealants only. The drawings, however, shall not indicate the specific type of sealant. Specifications shall define the types of sealants to be used for each specific condition and adjacent materials. The sealant specifications shall include all accessories such as seals, water stops, backer rod, bond break tape and primer.
- 07920.2 Sealants shall be specified for all exterior applications and those interior applications where caulking compounds are not suitable.
- 07920.3 For horizontal construction joints in concrete pavements or walks, use pourable urethane base sealant.
- 07920.4 Five years experience of applicator shall be certified to the Associate prior to the installation of any sealants.
- 07920.5 Acceptance of conditions for application of sealant materials shall be solely the responsibility of the sealant sub-contractor.
- a. If substrata are not ready or cannot be made ready for application of these materials, the sub-contractor shall notify the GC and Associate.

- b. After sealant materials are installed, this sub-contractor assumes all responsibility for the satisfactory installation of sealants.
- 07920.6 Installation of sealant materials shall be as late in the project as possible, but between cleaning operations and paint application. Do not install sealants when the temperature is below 40 degrees F. unless approved by the manufacturer and the Associate.
- 07920.7 A written guarantee for all joint sealants shall be provided by the GC and the sealant sub-contractor agreeing to replace all materials which fail within 5 years after acceptance. Replacement shall be at no cost to the University. Guarantee shall be submitted to the Associate in triplicate and shall be signed by the GC and the sealant sub-contractor.

**DIVISION 08 – OPENINGS –GENERAL AND EDUCATIONAL BUILDINGS
(RESIDENCE SERVICES CONTROLLED)**

08 00 00 GENERAL PROVISIONS

- 08000.1 UFM and Residence Services Lockshops differ between Hardware and Door Access Control Standards.
- 08000.2 Sustainable Design & LEED Projects: The University promotes energy efficient green design, construction and building operation. Where possible, materials are to be specified to meet or exceed the latest version of the USGBC's LEED rating system or as discussed with the Office of the University Architect.
- 08000.3 The minimum size for all doors shall be 3'-0" x 7'-0" x 1¾", except for chase access and other special doors. Mechanical Room doors must be 42" wide single leaf or 60" pair.
- 08000.4 Labeled construction shall be specified where required by code.
- 08000.5 ADA compliant access is required through the entire building except WHERE SPECIFIED BY CODE.
- 08000.6 The University exceeds the minimum required accessibility measures. Each building shall have a primary entrance equipped with a door operator and door access control system that utilizes both a proximity reader and push-button actuators. At least one set of restrooms shall have door operators with proximity readers. Refer to door access appendix.
- 08000.7 In store-front situations, the design shall accommodate door operators. Review options with OUA. These include providing a 5" minimum high head frame for door operators and adequate ceiling height. Run power through frame head to operator. Coordinate conduit and wiring pathways for operators, electric strikes and access systems. Surface conduit shall be avoided where possible.
- 08000.8 Multiple exterior doors shall be organized in pairs (latch to latch) and shall have fixed jamb separations between leafs except that at least one pair of doors shall have a keyed, removable mullion for large equipment access.
- 08000.9 Typical Residence Hall design provides for an unsecured exterior set of doors and security access within the vestibule to provide weather cover.
- 08000.10 Exit Doors: Coordinate conduit for operators, power, access systems and stand alone or on-line security.
- 08000.11 Residence Services shall have a key override at all exterior openings.

08 11 13 HOLLOW METAL DOORS AND FRAMES

- 08110.1 All exterior doors, including exterior mechanical room doors, shall not be less than 16 gauge galvanized steel insulated doors with the top channel turned 'web up' to eliminate dirt pockets.
- 08110.2 Interior doors and mechanical room doors shall not be less than 18-gauge metal. Solid grout head and jambs in high traffic or abuse locations.
- 08110.3 Door frames shall be one piece welded assemblies of not less than 16-gauge metal. Frames in interior walls of up to 8" thickness shall be full thickness of wall where wall finish protection is needed. Coordinate with OUA. Knock down frames may not be used unless otherwise approved by OUA.
- 08110.4 Frames in exterior walls and interior masonry shall be back primed with 'Rhino Coat', recessed to inside face of wall and grouted solid.

08 12 00 ALUMINUM DOORS AND FRAMES

- 08410.1 Aluminum doors shall be wide stile, thermal break construction with 10" bottom rail to accommodate wheelchairs.
- 08410.2 Heads of door frames shall be coordinated for door operator installations.
- 08410.3 KSU standard finishes are clear anodized or dark bronze anodized aluminum. Any other manufacturer colors or custom colors shall not be specified unless approved by OUA.
- 08410.4 If custom colors are approved and specified, attic stock for doors or windows stops, etc. shall be required in quantities of 200 feet per building.

08 14 00 WOOD DOORS

- 08210.1 Wood doors shall be solid core (particle board core preferred) with plastic laminate veneer; door shall be reinforced for all hardware including closers; prime or seal all hardware cut outs and top and bottom of door. All doors shall be pre-finished unless otherwise approved by OUA. The typical plastic laminate finish is: Wilsonart CastleOak 7928-38 fine velvet texture.
- 08210.2 Bi-fold or bi-passing doors are prohibited.
- 08210.3 Exterior wood doors are prohibited unless specifically approved by OUA.
- 08210.4 Guarantee shall be a lifetime guarantee.

08 33 00 UPWARD ACTING SECTIONAL COILING DOORS

- 08360.1 Upward acting doors shall be insulated metal or fiberglass with heavy-duty track, electric operator and weather-stripping. Verify spring duty cycle requirements for each

installation. Motors shall be mounted to structure. (Clips in guides shall be cast metal, not stamped metal.)

08360.2 Multiple control locations may be required for operators. Include wall penetrations, pathways, stubs, pavement penetrations and exterior conduit for exterior controls. With 'foreseeable' future exterior controls, provide pathways including pavement knockout panels.

08360.3 Outside key switch or card swipe shall be coordinated with security requirements.

08360.4 Controls shall be up/down/stop.

08 51 00 ALUMINUM WINDOW: refer to Division 08 UFM

08 52 00 WOOD WINDOWS: refer to Division 08 UFM

08 51 00 UNIT SKYLIGHTS: refer to Division 08 UFM

08710 HARDWARE

08710.1 The Associate shall specify all required hardware for each opening. There will be no deviations from approved Residence Services Hardware.

08710.2 Door Access Control: refer to Door Access Control appendix for specific scoping and design requirements.

08710.3 Hardware finish is to be BHMA 626 (US26D) Satin Chromium Plated unless otherwise required to match existing hardware.

08710.4 Residence Services is ~~in the process of converting their door access control system from Lenel and BEST Basis G off line to a~~ utilizes a Wifi system and on-line system controlled by CBORD.

1. Residence Hall buildings shall typically use the Assa Abloy Sargent Passport P-2 Wifi lockset at all interior doors.
2. Review with OUA and Residence Services any interior location that will not use a WiFi lockset.
3. All exterior door access is provided through on-line card readers. New installations utilize Von Duprin QEL XP exit devices. Existing openings/hardware may utilize other methods depending on the situation; coordinate with Residence Services lockshop.

08710.5 Any metal key required by Residence Services uses a patented Medeco keyway. Cylinders should be an SFIC format. The accepted vendor for supplying Medeco products and keys is Midwest Security.

08710.6 Butt hinges for all doors shall be full mortise 4½" **heavy duty** ball bearing with non-removable pins – no pivots or cam action hinges allowed. Refer to General Provisions

8000.1 for paired mechanical room doors, provide surface mounted slide bolts top and bottom on fixed leaf with astragals.

- 08710.7 Door stops shall be wall mounted with concealed wood blocking. Use floor mounted stops where wall mount will not protect door and wall. Use door checks on exterior doors subject to wind loads.
- 08710.8 Closers shall be LCN 4000 series for exterior doors and heavy traffic doors and LCN1400 series for interior doors, sized for application. Floor recessed or concealed in head closers are prohibited. Through bolting attachment of closers (i.e. sex bolts) is required at all doors.
- 08710.9 Exit devices shall be Von Duprin 98 series. Where used with door access control, the exit device shall also be XP, QEL (quiet electric latch) and have an internal REX (request to exit.)
- 08710.10 Refer to door access control appendix for operators and controls.
- 08710.11 Kick plates shall be 16 gauge, 10"h. x 2" less than door width.
- 08710.12 Push/pull sets shall be 4" x 16" plates with appropriate pull. Verify pull style with OUA. Exterior doors will typically utilize a recessed cup pull: Hager _____.
- 08710.13 Exterior doors shall be equipped complete with weather strip, threshold and door sweep with rubber molding on inside.

08800 GLAZING: refer to Division 08 UFM

DIVISION 08 – OPENINGS –GENERAL AND EDUCATIONAL BUILDINGS (UFM CONTROLLED)

08 00 00 GENERAL PROVISIONS

- 08000.1 UFM and Residence Services Lockshops differ between Hardware and Door Access Control Standards.
- 08000.2 Sustainable Design & LEED Projects: The University promotes energy efficient green design, construction and building operation. Where possible, materials are to be specified to meet or exceed the latest version of the USGBC's LEED rating system or as discussed with the Office of the University Architect.
- 08000.3 The minimum size for all doors shall be 3'-0" x 7'-0" x 1¾", except for chase access and other special doors. Mechanical Room doors must be 42" wide single leaf or 60" pair.
- 08000.4 Labeled construction shall be specified where required by code.
- 08000.5 ADA compliant access is required through the entire building except WHERE SPECIFIED BY CODE.
- 08000.6 The University exceeds the minimum required accessibility measures. Each building shall have a primary entrance equipped with a door operator and door access control system that utilizes both a proximity reader and push-button actuators. At least one set of restrooms shall have door operators with proximity readers. Refer to door access appendix.
- 08000.7 In store-front situations, the design shall accommodate door operators. Review options with OUA. These include providing a 5" minimum high head frame for door operators and adequate ceiling height. Run power through frame head to operator. Coordinate conduit and wiring pathways for operators, electric strikes and access systems. Surface conduit shall be avoided where possible.
- 08000.8 Multiple exterior doors shall be organized in pairs (latch to latch) and shall have fixed jamb separations between leafs except that at least one pair of doors shall have a keyed, removable mullion for large equipment access.
- 08000.9 When possible, design a porch or overhang to protect exterior doors, cardswipe readers & pedestrians from snow and rain.
- 08000.10 Exit Doors: Coordinate conduit for operators, power, access systems and stand alone or on-line security.
- 08000.11 There should be only one keyed exterior door per building. Coordinate with OUA and UFM.

08 11 13 HOLLOW METAL DOORS AND FRAMES

- 08110.1 All exterior doors, including exterior mechanical room doors, shall not be less than 16 gauge galvanized steel insulated doors with the top channel turned 'web up' to eliminate dirt pockets.
- 08110.2 Interior doors and mechanical room doors shall not be less than 18-gauge metal. Solid grout head and jambs in high traffic or abuse locations.
- 08110.3 Door frames shall be one piece welded assemblies of not less than 16-gauge metal. Frames in interior walls of up to 8" thickness shall be full thickness of wall where wall finish protection is needed. Coordinate with OUA. Knock down frames may not be used unless otherwise approved by OUA.
- 08110.4 Frames in exterior walls and interior masonry shall be back primed with 'Rhino Coat', recessed to inside face of wall and grouted solid.

08 12 00 ALUMINUM DOORS AND FRAMES

- 08410.1 Aluminum doors shall be wide stile, thermal break construction with 10" bottom rail to accommodate wheelchairs.
- 08410.2 Heads of door frames shall be coordinated for door operator installations.
- 08410.3 KSU standard finishes are clear anodized or dark bronze anodized aluminum. Any other manufacturer colors or custom colors shall not be specified unless approved by OUA.
- 08410.4 If custom colors are approved and specified, attic stock for doors or windows stops, etc. shall be required in quantities of 200 feet per building.

08 14 00 WOOD DOORS

- 08210.1 Wood doors shall be solid core (particle board core preferred) with hardwood veneer; door shall be reinforced for all hardware including closers; prime or seal all hardware cut outs and top and bottom of door. Laminate clad doors may be preferred in some locations. All doors shall be pre-finished unless otherwise approved by OUA.
- 08210.2 Bi-fold or bi-passing doors are prohibited.
- 08210.3 Exterior wood doors are prohibited unless specifically approved by OUA.
- 08210.4 Guarantee shall be a lifetime guarantee.
- 08210.5 Face veneers shall be book-matched. Rotary cut is prohibited. Coordinate door veneers with adjacent existing doors, if any. Verify door veneer selection with OUA.

08 33 00 UPWARD ACTING SECTIONAL COILING DOORS

- 08360.1 Upward acting doors shall be insulated metal or fiberglass with heavy-duty track, electric operator and weather-stripping. Verify spring duty cycle requirements for each installation. Motors shall be mounted to structure. (Clips in guides shall be cast metal, not stamped metal.)
- 08360.2 Multiple control locations may be required for operators. Include wall penetrations, pathways, stubs, pavement penetrations and exterior conduit for exterior controls. With 'foreseeable' future exterior controls, provide pathways including pavement knockout panels.
- 08360.3 Outside key switch or card swipe shall be coordinated with security requirements.
- 08360.4 Controls shall be up/down/stop.

08 51 00 ALUMINUM WINDOWS

- 08520.1 All habitable rooms shall have at least one operable window, or section of window (awning type preferred) unless otherwise approved by OUA. Verify screening requirements with OUA.
- 08520.2 In general window frames shall be thermally broken 2" x 4-1/2" heavy commercial aluminum windows, flush dry glazed from the interior. Dark Bronze anodized finish.
- 08520.3 The use of spandrel panels is discouraged. If utilized they shall be insulated units.
- 08520.4 Prior to acceptance by the University, proposed manufacturers must provide to the Associate copies of test reports by an independent laboratory which certify that the proposed window units meet or exceed current performance standards. Verify current standards with OUA. The following standards were current when this Guideline was issued:
 - a. Air infiltration of an assembled sash and frame shall not exceed 0.70 cubic feet of air/minute/foot (ASTM E783-93) of sash perimeter when subject to the static air pressure developed from a wind velocity of 50 miles per hour.
 - b. No water leakage to the interior side of the window shall be present when tested according to the Metal Curtain Wall Manual Test C1.
 - c. Approved manufacturers: Oldcastle, Kawneer-Traco and Wausau. All others must be reviewed with OUA and UFM glassshop.
- 08520.3 Written guarantee shall state that all components will meet specified performance requirements for a period of 2 years following acceptance.
 - a. Weatherstripping shall be shall be guaranteed for a period of 5 years.
 - b. Guarantee shall certify that all work is in accordance with the specifications and that defects will be repaired during the term of the guarantee at no cost to the University.

- 08520.4 Install windows in wall to positively drain to the exterior. Insure proper head flashing details.
- 08520.5 If custom colors are specified, attic stock stops for doors or windows shall be required in quantities of 200 feet per building.
- 08520.6 Standard finish colors are clear or bronze anodized, or other color as approved by OUA.

08 52 00 WOOD WINDOWS: Wood windows are generally prohibited. Review with OUA.

08 51 00 UNIT SKYLIGHTS: Unit Skylights are generally prohibited because of fall protection issues. Consider clerestory windows instead of skylights. **If skylights are included, OSHA fall protection must be met either through fall restraint anchor points or documentation that the structural design of the skylight meets OSHA requirements and a minimum 400lb load.**

08710 HARDWARE

- 08710.1 The Associate shall specify all required hardware for each opening. One manufacturer shall be scheduled with two other acceptable manufacturers listed (unless excluded by the University). All hardware shall be approved by OUA.
- 08710.2 Door Access Control: refer to Door Access Control appendix for specific scoping and design requirements.
- 08710.3 Hardware finish is to be BHMA 626 (US26D) Satin Chromium Plated unless otherwise required to match existing hardware.
- 08710.4 On the Kent Campus, all new locksets shall be part of a Card Access System in lieu of mechanical keys unless designated otherwise by the OUA. Kent Campus has started to implement Wi-Fi locks instead of offline locks for interior door access locations. All new buildings, additions or major renovations shall implement the Wi-Fi system. Coordinate all other projects with OUA for a determination of lock system.
 - 1. All on-line doors all part of the Lenel Access Control System.
 - 2. All Wi-Fi locks shall utilize the Assa Abloy Sargent Passport 1000 P2 series and the Lenel Access Control system. These locks must be furnished and installed by an authorized Lenel dealer to ensure proper licensing and integration. This will be a separate vendor than the typical supplier of door/frames/hardware.
 - 3. ~~For offline locks, locksets shall be the BEST Basis G system.~~
 - (a) ~~BEST Basis G: All doors shall use the mortise lock prep with no deadbolt, model NV.~~ **Renovation projects that do not utilize new Wi-fi locks must be discussed with OUA and the UFM lockshop on a project by project basis to determine the appropriate lockset selection.**
 - 4. Associate shall specify the supplier to provide a minimum of 10 temporary operator cards for use by the contractors and the owner during construction. Cards to be delivered to OUA for distribution. Verify quantity required with OUA.
 - 5. In general, all hardware including door access control items will be purchased by the

Contractor.

- 08710.5 On the Kent Campus when metal keyed locks are to be used, specify Corbin Russwin locks and locksets to be provided by a factory-direct supplier **only**. Cylinders shall be Corbin Russwin 6-pin master ring cylinder for all doors except those requiring rim type cylinders (for rim type, use Corbin Russwin standard 6-pin cylinder).
- i. Keying shall be done at the factory. Key all cylinders to a building master and to the existing KSU Great Grand Master. Review with UFM as required.
 - ii. Keying shall be determined by OUA.
- a. The Distributor is: Midland Hardware Co., Cleveland, Ohio
- 08710.6 The Kent State University Regional campuses have various metal key systems. To utilize existing systems, the Associate shall coordinate hardware specifications and keying with the Project Manager from OUA.
- 08710.7 Butt hinges for all doors shall be full mortise 4½" **heavy duty** ball bearing with non-removable pins – no pivots or cam action hinges allowed. Refer to General Provisions 8000.1 for paired mechanical room doors, provide surface mounted slide bolts top and bottom on fixed leaf with astragals.
- 08710.8 Door stops shall be wall mounted with concealed wood blocking. Use floor mounted stops where wall mount will not protect door and wall. Use door checks on exterior doors subject to wind loads.
- 08710.9 Closers shall be LCN 4000 series for exterior doors and heavy traffic doors and LCN1400 series for interior doors, sized for application. Floor recessed or concealed in head closers are prohibited. Through bolting attachment of closers required at wood and hollow metal doors.
- 08710.10 Exit devices shall be Von Duprin 98 series. Single point latching is required. Exposed or concealed vertical rods are prohibited. When utilized with door access control, the exit device shall be a QEL (quiet electric latch) with an internal REX (request to exit.)
- 08710.11 Refer to door access control appendix for door operators and controls.
- 08710.12 Kick plates shall be 16 gauge, 10"h. x 2" less than door width.
- 08710.13 Push/pull sets shall be 4" x 16" plates with appropriate pull. Verify pull style with OUA.
- 08710.14 Exterior doors shall be equipped complete with weather strip, threshold and door sweep with rubber molding on inside.

- 08710.15 A coat hook shall be installed on the wall behind each office or laboratory door. Coat hooks are desired in many classroom or lab situations, Associate shall coordinate quantity and location with OUA.
- 08710.16 Battery operated exit alarms shall be manufactured by DETEX with Corbin Russwin keys per guidelines above.

08800 GLAZING

- 08800.1 Exterior glazing shall be designed for energy conservation. In general, utilize solar cool gray glass in 1" insulated units.
- 08800.2 ALL glazing, including exterior windows, shall be tempered. If budget may restrict this item, bid this feature as an alternate.
- 08800.3 Where not required to be fire rated, interior borrowed lights shall be polished tempered or laminated glass.
- 08800.4 Glaze all windows and borrowed lights from 'inside', which will permit replacement without the use of multi-story scaffolding.
- 08800.5 The use of spandrel panels is discouraged. If utilized they shall be insulated units.

DIVISION 09 – FINISHES

090000 GENERAL PROVISIONS

- 090000.1 Provide minimum flame spread ratings for interior finish materials as required.
- 090000.2 All finish materials must be set up on a color board with samples and must be approved by the Office of the University Architect prior to release to the contractor.
- 090000.3 Associate shall submit technical data for finish certification to the building department for final plan approval.
- 090000.4 Associate shall provide a record of all finish materials and colors with Record Drawings.
- 090000.5 Sustainable Design: The University promotes energy efficient green design, construction and building operation. Where possible, materials are to be specified to meet or exceed the latest version of the USGBC's LEED rating system or as discussed with the Office of the University Architect.

092216 METAL FRAMING SYSTEMS

- 092216.1 Patented ceiling systems which are required for the support of plaster or gypsum board ceilings should be specified in separate sections and noted on details.
- 092216.2 All framing shall be at a maximum of 16" o.c. minimum 22 gauge metal studs.
- 092216.3 All door and window jambs shall show a minimum 18 gauge stud full height from floor to structural deck or top of wall, jack studs and head framing. Associate shall indicate stud gauges in details on door/window details.
- 092216.4 Ceiling suspension attachment to structure above shall be designed and specified by the Associate.

092400 LATH AND PLASTER

- 092400.1 Plaster is permitted for ceilings and patch of existing plaster. Coordinate application with the Office of the University Architect.
- 092400.2 Stucco is prohibited.

092900 GYPSUM BOARD

- 092900.1 All material to be minimum 5/8" fire resistance rated gypsum board unless otherwise required for special applications. Abuse resistant gypsum board is recommended for high traffic public areas.
- 092900.2 Gypsum sheathing is required behind acrylic or fiberglass reinforced panels finish systems when installed over metal framing systems.

- 092900.3 All corner bead to be metal unless identified for specific details.
- 092900.4 Associate shall review the level of gypsum board finish as appropriate for specific locations with the Office of the University Architect relative to recommended Levels of Gypsum Board Finish GA-214-M-97. Associate shall review lighting conditions (wall wash type fixtures, paint gloss, etc.) to determine finish level required as well.
- 092900.5 MOISTURE RESISTANT GYPSUM BOARD GUIDELINES FOR SPECS/DRAWING NOTES:
- a. All moisture resistant gypsum board or shaftwall shall be fire rated.
 - b. Moisture Resistant/ Fire Rated gypsum board shall be specified for the following areas (in addition to standard practice for rest rooms & other wet areas)
 - i. All partitions and furred walls at stories below or partially below grade.
 - ii. All vertical and horizontal pipe chases, soffits, and all inaccessible areas including plumbing and heating/cooling HVAC piping.
 - c. Moisture Resistant/ Fire Rated gypsum board shall be required by coordinated Drawing Notes, General Notes, Special or Supplemental Conditions and other directions to the Lead contractor and/or General Trades Contractors in reference to:
 - i. Scheduling work and the project's CPM construction schedule, delays due to weather, etc.
 - ii. Phasing, sequencing, and coordination of other prime contractors' work, delays due to others, etc.
 - iii. Building enclosures, temporary heat and dehumidification, etc. So that all gypsum board installed on the project, that may be exposed to moisture due to any of the above, shall be installed as Moisture Resistant/ Fire Rated board, whether specifically indicated on the drawings, or not.
- 092900.6 Associates shall provide for unit pricing (per sq. ft.) for the differential cost of Moisture Resistant/ Fire Rated type gypsum board over standard Fire Rated gypsum board.
- 092900.7 Increased costs for Moisture Resistant/ Fire Rated board, or replacement of previously installed gypsum board to Moisture Resistant gypsum board, due to delay or impediments caused by other contractors shall be back-charged to the parties causing the delay and exposure.
- 092900.8 Installation of all materials shall be as recommended by the Gypsum Association Handbook.
- 092900.9 Associate shall determine if more extensive measures (such as exterior gypsum board) are required due to project conditions or scheduling.

093000 CERAMIC AND QUARRY TILE

- 093000.1 Ceramic floor and wall tile is required for all restrooms, shower rooms. Tile is preferred in areas of food preparation, food serving and other common areas of similar use as confirmed with the Office of the University Architect. Other suitable solid surface materials are acceptable as approved by the Office of the University Architect.
- 093000.2 Install floor tile flush with adjacent materials without the use of reducer strips.
- 093000.3 Where tile is mounted on walls above counters, tile backsplash and end splash works well. Bullnose all exposed edges.
- 093000.4 Grout shall be that of a darker color and shall be confirmed with the Office of the University Architect. All floor tile grout shall be a sealed epoxy grout and wall grout in high traffic wet areas shall also be sealed.

095123 ACOUSTIC CEILINGS

- 095123.1 Auxiliary support systems for acoustic ceilings should be specified within the section for acoustic ceilings. Ceiling systems shall be supported from structure or suspension system attached to structure with toggle bolts, self drilling anchors or other approved system. Ceilings shall not be supported from ductwork, conduit, HVAC lines or associated supports.
- 095123.2 Mineral fiber lay-in panels shall be 2' x 2' or 2' x 4'; confirm with Office of the University Architect project manager. Non-standard sizes are prohibited, unless approved by OUA. **Basis of design product: Armstrong 2x2 Dune.**
- 095123.3 All ceiling systems should be readily accessible. Metal ceiling systems (i.e. paraline) and specialty systems concealed should be limited to areas which will require minimal access and approved by Office of the University Architect. Spline systems are prohibited.
- 095123.4 Suspension systems shall be supported directly from the building structural system and shall be supported at four corners of each lay-in fluorescent light fixtures.
 - a. Lay-in fluorescent light fixtures are to be supported directly to the structural system (independent of the ceiling grid) with a minimum of two auxiliary hangers at opposite corners of each fixture. Ceiling installer provides and installs auxiliary hangers to deck. Electric contractor attaches hangers to fixtures.
 - b. Associate shall identify this separation of work in both the ceiling section and the electrical section of the specifications.
- 095123.5 Fire rated ceiling finish materials should be gypsum board or lay in ceiling systems which do not require clips to achieve fire ratings.

- 095123.6 In renovation situations, Associate shall specify removed ceiling tiles shall be recycled in a program by or similar to Armstrong (www.armstrong.com/environmental).

096500 RESILIENT FLOORING

- 096500.1 The Associate specify standard testing methods for determination of Relative Humidity in concrete flooring, Moisture Vapor Emission Rate of concrete subfloor and outline Contractor responsibility for conducting tests prior to installation of materials.
- 096500.2 Cleaning and waxing of all resilient flooring materials (per manufacturer's recommendations) is required by General Contractor prior to acceptance.
- 096500.3 1/8" thick resilient base shall be 4" minimum height rubber with cove for all installations. Pre-molded corners are required. Internal and external corners shall be field formed with joints 18" minimum from the corners. Ends shall be beveled and rounded. Resilient base color shall be integral throughout.
- 096500.4 Associate shall specify transition strips between varying floor materials which shall meet all ADA requirements noted in ADAAG.
- 096500.5 Provide 1/8" Rubber Flooring (treads, risers and field tile) in all stairwells and stair landings. Associate shall specify on finish schedule that landings are to be tiles with field tile as well as preformed treads on the treads. Metal stringers shall be painted.
- 096500.6 Rubber flooring material preferred design is a "hammered" speckled finish in lieu of a solid, raised disc or square pattern.
- 096500.7 Associate shall coordinate any areas with special flooring requirements (such as food service areas) with the Office of the University Architect.
- 096500.8 Luxury Vinyl Tile (LVT) shall be discussed with Office of the University Architect during design phase to determine whether it is an appropriate flooring material for location and use.
- a. Tile Standard: Commercial Grade, ASTM F1700 "Standard Specifications for Solid Vinyl tile," Class III, Type B
- b. Wear Layer Thickness: Per Project Requirements. Minimum 20 mil wear layer may be acceptable for light traffic areas. Minimum 30 mil wear layer is preferred for high use corridors, classrooms, etc.
- 096500.9 Homogenous linoleum sheet flooring or homogenous linoleum tile made of natural materials is acceptable when rated for extra heavy commercial traffic. A minimum of 45% post industrial recycled content is recommended.
- 096500.10 Vinyl Composition Tile shall have a minimum post consumer and post-industrial waste recycled content of 10%. The Associate may propose resilient materials other than VCT

that are advantageous to the project with consent from the Office of the University Architect.

096600 TERRAZZO

- 096600.1 In building renovations, effort shall be made to preserve and restore existing terrazzo whenever possible.

096810 CARPET

- 096810.1 Carpet will be specified as part of the General Contract unless otherwise determined otherwise by the Office of the University Architect.
- 096810.2 Carpet should be modular carpet tiles unless otherwise specified by the Office of the University Architect.
- 096810.3 4" high rubber or vinyl cove base shall be installed. Continuous coils in manufacturer's longest standard length. Internal and external corners shall be field formed with joints 18" minimum from the corners. Ends shall be beveled and rounded. Resilient base color shall be integral throughout.
- 096810.4 Manufacturer's with approved products: Bentley Mills, Interface, Mannington, Milliken, Tandus. Other manufacturers should be reviewed with the Office of the University Architect.
- 096810.5 Product: Carpet shall meet the minimum specified requirements.
- a. Tufted carpet, level or multi-level loop pile
 - b. Fiber Content: 100% Nylon, Type 6,6
 - c. Fiber Type: Antron is preferred
 - d. Dye Method: 100% solution dyed nylon
 - e. Electrostatic Propensity: By permanent means and without chemical treatment, static generation must be below 3.5 kilovolts per AATCC TM 134.
 - f. Density: Minimum of 5,500 for heavy traffic
 - g. Tufted Face Weight: Not less than 16oz/ sq yd
 - h. Texture Appearance Retention Rating (TARR):

Severe for high traffic corridors, public spaces, classrooms, dining areas and any areas with heavy foot traffic

Heavy for Conference Rooms, Open Office and general office space

- i. Primary backing: Woven or non-woven synthetic
- j. Secondary backing: High performance modular backing system. Manufacturer to provide detailed information on options and performance properties
- k. Recycling: prefer carpet contains recycled content, is recyclable and meets LEED standards, where applicable.
- l. Carpeting shall have a stain resistance and soil resistance.
- m. Coloration/Patterning: It is recommended that hue values to be in medium to medium-dark range with random or complex patterning for optimum soil hiding capability.
- n. Warranty: Must meet or exceed a 10 year warranty from date of substantial completion.

096810.6 Carpet shall meet or exceed the following performance characteristics:

- a. Resistance to Delamination: ASTM D 3936 test method: not less than 3.5 lbf/in
- b. Tuft Bind: Not less than 3 lbf according to ASTM D1335
- c. Critical Radiant Flux Classification: Class 1, Not less than 0.45 W/sq.cm according to NFPA 253.
- d. Flammability: Class 1 Radiant Panel Test per ASTM E-648
- e. Smoke Density: ASTM E-622 test method, rating to be less than 450 Dm in flaming mode (or to state code)
- f. Dry Breaking Strength: Not less than 100 lbf according to ASTM D 2646
- g. Colorfastness to Crocking: AATCC TM 165, minimum rating of 4 using the AATCC Chromatic Transference Scale
- h. Colorfastness to Light: Not less than 4 after 40 AFU (AATCC fading units) according to AATCC 16, option E.

096810.7 Installation: Comply with CRI's "CRI Carpet Installation Standard" and carpet manufacturer's written installation instructions

096810.8 Submittals required for approval by the Office of the University Architect shall include the following.

- a. Product Data: Include manufacture data on physical characteristics, durability, installation recommendations per substrate and manufacturer certification that product is appropriate for intended use
- b. Shop Drawings to include: Carpet type, color, installation method, starting point and direction.

- c. Types, colors and locations of edge transition and other accessory strips
- d. Full size sample of each carpet product, in specified color and tile size
- e. Samples of each transition, in specified color and style/model
- f. Warranty: Manufacturer's standard form in which, for a period of 10 years from substantial completion, the manufacturer agrees to repair or replace components of carpet installation that fail in materials or workmanship, including but not limited to the following:
 - 1. More than 10 percent edge raveling, snags and runs
 - 2. Dimensional Instability
 - 3. Loss of face fiber
 - 4. Loss of tuft bind strength
 - 5. Delamination

096810.9 Adhesive materials, accessories and application equipment shall comply with flammability requirement for installed carpet and be recommended or provided by carpet manufacturer

096810.10 Secondary entry areas and possibly vestibule areas shall have modular, walk-off carpet tile. Coordinate with the Office of the University Architect.

096810.11 Used Carpet: Remove carpet and recycle regardless of manufacturer, fiber type or construction.

096810.12 Refer to Division 12 for Walk-Off entry mats.

09 72 00 WALLCOVERINGS

097200.1 **Wallcovering:** use shall be limited and only where directed by the Office of the University Architect. If approved wallcovering shall only be used in public areas and upper echelon offices as budget allows.

097200.2 **All markings** on substrate from ink pens, markers, etc. shall be removed prior to finish.

097200.3 **All substrates** shall be primed, sealed and prepared for wallcovering removal with a mildew resistant primer.

098433 SOUND ATTENUATION

- 098433.2 The Associate shall specify wall and ceiling systems to insure acoustical privacy as follows:
- c. Executive Offices – STC 52 minimum
 - d. Offices, conference rooms, counseling rooms, meeting rooms, janitor closets and electrical closets containing transformers – STC 45 minimum.
 - e. Classrooms – STC 42-47 minimum.
 - f. Toilet Rooms – STC 47 minimum.
 - g. Sleeping Rooms – STC 52-58 minimum; Exterior walls as dictated by code or meet nationally recognized sound isolation criteria.
 - h. Floors – IIC 55 minimum.
 - i. Any other areas requiring confidentiality shall meet nationally recognized sound isolation criteria.
 - j. Sound isolation shall be specified and detailed as continuous sealant wherever possible.
- 098433.3 Ceilings do not require additional sound attenuation if insulated walls are continuous to the roof deck. If walls are not continuous to roof deck, install a 4' wide sound attenuation batt over top of insulated walls to form a continuous sound barrier.
- 098433.4 Project requirements may dictate having an acoustic consultant on the Associate's design team. Review acoustic issues with the Office of the University Architect.

09 91 00 PAINT

- 099100.1 In lieu of attic stock of paint and sealant materials, the Contractor is required to provide a detailed finish schedule denoting manufacturer, type, color and any other pertinent information required to match the product in future maintenance or repairs. The schedule is to be provided at project closeout for posting in mechanical room at the Office of the University Architect's discretion.
- 099100.2 Contractor shall remove remaining paint and coatings from the job site and properly dispose of after final punch list is completed at their own cost.
- 099100.3 The Associate shall prepare a schedule for all surfaces to be painted and the number of coats with dry film thickness for each. Type and number of coats is variable, but the following systems are recommended.
- 099100.4 **Stained interior woodwork:** 1 coat filler (for open grained wood); 1 coat stain; 2 coats satin clear finish (2.0 mil thickness minimum). Back prime all trim and fill nail holes and gaps at joints.

- 099100.5 **Painted interior woodwork:** 1 coat alkyd primer; 2 coats alkyd finish (semi-gloss). Back prime all trim and fill nail holes, caulk gaps at joints.
- 099100.6 **Wood doors:** For new construction, Associate shall specify factory prefinished doors only. For renovation work that requires matching existing wood doors, use 1 coat stain and 2 coats satin clear finish (2.0 mil thickness minimum).
- 099100.7 **Metal doors and frames:** 1 coat factory shop primer; 2 coats semi-gloss alkyd enamel. Paint tops and bottoms of doors.
- 099100.8 **Gypsum Board:** 1 coat primer/sealer; 2 coats eggshell latex enamel.
- 099100.9 **Interior concrete block:** 2 coats latex block filler; 2 coats semi-gloss latex enamel.
- 099100.10 **Interior concrete floors:** 2 coats water based epoxy for moderate exposure, clear w/ gloss finish. Prepare floor per manufacturer's recommendations.
- 099100.11 **Interior ferrous metal:** 1 coat shop primer; 2 coats semi-gloss alkyd enamel
- 099100.12 **Exterior ferrous metal:** 1 coat shop primer; 2 coats gloss alkyd enamel. If possible, powder coat exterior ferrous metal, refer to 05500 for requirements.
- 099100.13 **Accent colors:** if anticipated to exceed 5% of the project, the Associate shall note accent color locations and extents to aid the bidders. Include a statement that information given in no way restricts the Associate in the selection of paint colors.
- 099100.14 **Multicolored interior coatings:** are preferred in lieu of wallcoverings. Review requirements and recommendations with the Office of the University Architect.
- 099100.15 **Exposed piping** to be painted shall be clearly identified by the Associate on the drawings and specifications. Associate shall also identify proper preparation technique for the pipe to receive paint.
- 099100.16 **Hollow metal frames** shall be caulked where they meet adjacent surfaces. The Associate shall specify this work to be performed by the painting contractor.
- 099100.17 **Acceptable paint manufacturers:** Benjamin Moore, ICI, Pittsburgh Paints, Pratt & Lambert and Sherwin Williams.
- 099100.18 **All markings** on substrate from ink pens, markers, etc. shall be removed prior to finish.
- 099100.19 **Multicolored interior coating** paint systems such as Zolatone, Polymix or Scuffmaster are encouraged in high profile, high traffic areas in lieu of wallcoverings. Consult with the Office of the University Architect. Associate shall specify patch kits for the owner.

09 96 00 SPECIAL COATINGS

Special Coatings: use shall be limited and only where directed by the Office of the University Architect. Mechanical Room and other Service Room floors in all buildings

shall be completely sealed from water and moisture penetration to the floors below. Coating shall meet current VOC requirements set by the EPA for special coatings.

DIVISION 10 - SPECIALTIES

10100 CHALKBOARDS, TACKBOARDS, AND MARKER BOARDS

- 10100.1 Marker boards are preferred in general classroom areas. Chalkboards are prohibited in dust critical areas such as computer labs.
- 10100.2 **Chalkboards and markerboards** shall be porcelain enameled steel as follows: 2 coats of porcelain enamel; 28 gauge enameling steel; 1/2" industrial fiberboard core; 0.005" thick aluminum backing sheet.
- 10100.3 Chalkboards and marker boards shall be specified with 2" minimum map rail with cork tack strip.
- 10100.4 **Tackboards** shall be 1/4" thick cork over 1/4" hardboard backing or fabric laminated over 1/2" fiberboard (such as Homasote). Associate shall coordinate locations for Tackboards in public areas with OUA.
- 10100.5 **Frames and trays** shall be aluminum with concealed fastening devices. Mount boards to wall with necessary blocking in stud cavity.
- 10100.6 **Guarantee** shall be submitted to the University, signed by an officer of the manufacturer, stating that all chalkboards and marker boards which do not retain the original writing quality, erasing quality, and visual acuity for 20 years after acceptance, shall be replaced including installation, at no cost to the University.
- 10100.7 Boards shall be installed to walls with clips rather than mastic.
- 10100.7 Projection screen specification (size, proportions, motorized, finish, mounting, enclosure, etc.) shall be coordinated with KSU OUA and Audio Visual Services.

10160 TOILET PARTITIONS

- 10160.1 **Finish** shall be baked enameled steel, phenolic core or solid HDPE plastic. Coordinate finish selections per location with OUA.
- 10160.2 **Toilet compartments** shall be floor supported, overhead braced with stainless steel shoes. Overhead bracing or brackets shall be aluminum or stainless steel.
- 10160.3 **Urinal screens** (when required) shall be stainless steel with secure mounting to withstand lateral and vertical loads.
- 10160.4 All **Anchors**, fasteners, fittings and required hardware (hinges, latches, etc.) shall be stainless-steel, vandal-proof type.

10160.5 Spring loaded, hold open hinges are preferred.

10160.6 Associate shall indicate on drawings and specifications that toilet stalls shall comply with current ADAAG.

10160.7 At a minimum, design shall include an alternate for compartments with reduced sight lines.

10200 LOUVERS AND VENTS

10200.1 Architectural and Mechanical louvers and vents shall be clearly identified on Mechanical and Architectural drawings regarding prime contractor responsibilities for providing and installation.

10200.2 Louver finish shall be powder coated. Review final color selections with OUA.

10200.3 All exterior louvers shall be specified to include ½" x ½" bird screen on the interior face.

10200.4 Associate shall verify elevator shaft ventilation requirements and specify those provisions accordingly.

10260 WALL AND CORNER GUARDS

10260.1 Wall and corner guard required locations and material selection shall be coordinated with OUA.

10260.2 Typically, corner guards will only be required in public corridors and high abuse service areas.

10270 ACCESS FLOORING

10270.1 **Accessible flooring** systems shall be specified as appropriate to project specific requirements. Coordinate with OUA.

10270.2 **Install** system per manufacturer's recommendations including auxiliary structural support and accessories.

10270.3 **Coordinate** heights of all mechanical and electrical fixtures with floor.

10270.4 **Provide ramp** or other transition for disabled access (and handrails) if access floor cannot be recessed to match adjacent finish floor elevations.

10440 SIGNAGE

10440.1 **All signage** shall comply with the KSU Wayfinding Standards. Contact OUA for Interior and Exterior Standards.

10440.2 **Unless otherwise directed**, the project shall include: exterior building sign; building directory; floor directories; directional; signs; emergency refuge areas; code required signage (such as occupant load) and room identification signs/numbers. All signage must conform with ADA requirements (see Appendix B).

10440.3 Room numbering shall be provided to Associate by KSU OUA planner.

10440.4 Associate shall specify sign contractor to provide a full sign schedule for review during shop drawings phase of project. Associate shall review sign schedule with OUA prior to issuance for fabrication.

10500 LOCKERS

10500.1 **Material** shall be enameled steel unless project requirements dictate otherwise.

10500.2 **Size and quantity** will be shown on the drawings and determined by the user program.

10500.3 **Install** lockers fully recessed into wall or with sloped top. 10500.4 Doors shall be vented with silencers, latch, and integral recessed hasp.

10500.5 Base shall be solid base with toe space and sanitary cove.

10500.6 Accessories shall include shelves, robe hooks and/or rods as defined by user.

10522 FIRE PROTECTION ACCESSORIES

10522.1 Associate shall specify and indicate on drawings number, type, location and size of extinguishers and cabinets per NFPA. Associate shall specify that GC shall provide all extinguishers as well as cabinets.

10522.2 Typically, extinguishers shall be multi-purpose (ABC) dry chemical type, minimum capacity 10#. Coordinate unique location requirements with OUA and KSU Fire Prevention Officer. "Amerex" Brand fire extinguishers are not acceptable. These extinguishers carry a D.O.T. stamp and cannot be recharged by KSU personnel.

10522.3 Fire extinguisher cabinets shall be semi-recessed type with clear, flat panel vision. No protruding "bubbles" allowed. "Break glass to enter" type cabinets are prohibited. All cabinets shall be keyed with break away or bendable latch.

10522.4 Fire extinguisher cabinets shall be supplied with labels on both sides indicating "Fire

Extinguisher” per NFPA. Wall mounted signs are prohibited.

10522.5 All buildings shall include at least one “Knox Box” Rapid Entry System key holder – Part #3270 – Hinged door, recessed mount. Associate shall indicate that the Knox Company requires authorization from KSU Fire Prevention Officer for order and that the box shall be keyed identically to other KSU Knox Boxes.

10522.6 In some instances a Knox Locking Storz Cap will be required, part #3080, keyed identically to all other KSU Knox Boxes. Coordinate this requirement with KSU OUA.

10550 POSTAL SPECIALTIES

10550.1 In general, only Residence Halls require USPS approved mailboxes. The mailboxes for student residents shall be heavy duty, key-operated boxes. Minimum size box shall be 3-1/2” x 12” with viewer window and engraved number on each door. Boxes shall be rear loading type, mounted no lower than 18” a.f.f..

10605 DEMOUNTABLE PARTITIONS

Do not specify demountable wall systems.

10650 OPERABLE PARTITIONS

10650.1 Support shall be overhead with no bottom track.

10650.2 Typically, operation shall not be motorized except for special installations.

10650.3 Sound rating shall be a minimum S.T.C. value of 45, sound rating of 50-55 is preferred if budget allows.

10650.4 Accessories shall include automatic bottom seal and jamb seals and doors on storage pockets.

10650.5 Passage doors, if requested by users, through operable partitions are not recommended for primary circulation. Design spaces so required exits do not occur through operable partitions.

10650.6 Preferred finish is fabric. Coordinate with OUA.

10650.7 Coordinate tack surface or marker board requirements (if any) with OUA.

10800 TOILET ACCESSORIES

10800.1 New/Renovations/Additions: The OUA is responsible for coordinating the toilet room accessories below as needed.

10800.2 Feminine hygiene disposal, soap dispensers, hand sanitizer dispensers, toilet tissue dispensers, and paper towel dispensers model numbers are included in the appendix for the A/E to lay out and insure adequate space and blocking for installation.

10800.3 Solid wood blocking shall be specified behind all items. Mount with concealed fasteners wherever possible. Tamper proof fasteners shall be used at all other locations.

10800.4 Associate shall indicate on the drawings mounting heights and dimensioned plan locations for all equipment to comply with latest edition of ADAAG.

10800.5 Built in combination waste/ paper towel dispenser units are prohibited. Free standing waste receptacles shall be provided by owner. Design sufficient floor space in toilet room for freestanding unit (12"D x 24"W).

10800.6 Toilet Accessories

- .1 Hand Soap Dispenser: see appendix
- .2 Hand Sanitizer Dispenser: see appendix
- .3 Toilet Paper Dispenser: see appendix
- .4 Feminine Hygiene Disposal: see appendix.
- .5 Excel Hand Dryer, Xlerator, XL-SI-1.1N (KSU Logo with green message) preferred method of hand drying where applicable. Verify substitutions and paper dispensers with OUA Project Manager.
- .6 Paper Towel Dispenser: see appendix
- .7 Changing Table: stainless steel-clad recess mounted horizontal baby changing station. Acceptable models: Bobrick KB100-SSRE or Bradley 962
- .8 Folding Seat: for use in Universal Restrooms. Provide minimum 25 inch wide x 14 1/2 inch deep seat capable of supporting 500 pounds. Stainless steel frame and mounting brackets with minimum 5/16 inch thick solid phenolic seat. Basis of Design: Bobrick B-5193.

- 10800.7 Locker room or Residence Hall shower soap dispensers shall be verified with OUA.
- 10800.8 Feminine Hygiene Disposal units shall be located one per toilet compartment in Women's Restrooms and per each Universal Restroom.
- 10800.9 Garment hooks shall be compartment manufacturer's standard. Mount one (1) per stall door with integral door bumper.
- 10800.10 Grab bars shall be 1 1/4" outside diameter with texture surface.
- 10800.11 Mirrors shall be 1/4" float/plate glass with wrap-around stainless steel frame and steel back plate. Provide mirrors above lavatories and one (1) wall mounted full-length mirror for disabled per restroom outside of stalls.
- 10800.12 Parcel shelves shall be built into the walls or an accessory, minimum depth to be 8". Provide one (1) per toilet room.
- 10800.13 Broom/mop holders shall be installed over the mop basin in every custodial space. Provide waterproof wall finish (i.e. stainless steel or FRP) to underside of mop holder at these locations
- 10800.14 Vending machines for sanitary napkins and condoms are not required.
- 10800.15 All types, locations and quantities of the accessories should be defined on the contract drawings. UFM will not be responsible for any ordering, handling, installation etc. of the devices on a new project.
- 10800.16 UFM will be responsible for the full maintenance of all the toilet room accessories once they are installed. With the exception of contractor installation defects, there will be no maintenance responsibilities of the contractor or OUA after proper installation.

DIVISION 11 – EQUIPMENT

110000 EQUIPMENT (GENERAL)

- 110000.1 **The user program** will identify which equipment is to be specified and which equipment is to be provided by the University. Specify all electrical and mechanical connections for University provided equipment.
- 110000.2 **Specify** all fixed equipment as required to respond to the program. Where applicable, O.U.A. will advise the Associate of experience with specific types and manufacturers.
- 110000.3 **Moveable equipment** will be specified by O.U.A. unless specifically included in the Associate's scope of work. Associate to coordinate all necessary components for the movable equipment to make functional upon occupancy.
- 110000.4 **Submittal** by Associate specified equipment suppliers shall include rough-in drawings for the other prime contractors.
- 110000.5 **The Associate** shall coordinate all aspects of equipment installation including receiving, unloading, distribution, and trade jurisdictions.
- 110000.6 Sustainable Design & LEED Projects: The University promotes energy efficient green design, construction and building operation. Where possible, materials are to be specified to meet or exceed the latest version of the USGBC's LEED rating system or as discussed with the Office of the University Architect.

111200 LOADING DOCK EQUIPMENT

112600 UNIT KITCHENS

- 112600.1 **Unit kitchens are prohibited.** When serving kitchens are required, use base cabinets with drop-in appliances or with recesses for owner supplied appliances. KSU Project Manager will coordinate with University Culinary Services for all kitchen equipment and requirements for service.

113100 RESIDENTIAL APPLIANCES

114000 FOODSERVICE EQUIPMENT

- 114000.1 **Foodservice equipment**, if required, will be specified by the Associate as a separate prime contractor. Verify with the Project Manager.

115123 LIBRARY STACK SYSTEMS

115123.1 **Library equipment**, if required, will be specified by the Associate as a separate prime contractor. Verify with the Project Manager.

115213 PROJECTION SCREENS

115213.1 **Manually operated** ceiling or wall mounted screens are normally provided by the University. Concealed blocking or reinforcing for mounting must be specified.

115213.2 **Electrically operated** screens for large lecture halls, auditoriums, etc. are to be specified with fully automatic operation. Two control stations (front and rear of room) are required.

115313 LABORATORY FUME HOODS

115313.1 Work tops within fume hoods shall be solid epoxy or stainless steel. Sinks shall be integral with work top. Alarms required for airflow and sash position.

116123 FOLDING PORTABLE STAGES

116143 STAGE CURTAINS

116123.1 If any of these items are required for the project, on-campus consultants to advise the Associate.

116623 GYMNASIUM EQUIPMENT

116800 PLAYFIELD EQUIPMENT AND STRUCTURES

DIVISION 12 – EXTERIOR SITE FURNISHINGS

120000 GENERAL REQUIREMENTS

- 120000.1 The associate shall consult the Office of the University Architect (OUA) during the early planning stage of the project concerning site furnishings.

129300 SITE AND STREET FURNISHINGS

- 129300.1 **FURNITURE STANDARDS:** The following are standard site and street furnishings for use in campus open spaces **or equivalent** as approved by OUA. All site furnishings to be **black powder coated**. Furnishings shall be bolted or securely anchored. Associate to verify with OUA what street furnishings shall be included in construction documents.

129300.2 FURNISHINGS

A. BENCHES:

1. Victor Stanley, Inc.
 - i. Steelsites RB-28, Color: Black, Length: 6'
 - ii. Backless Bench: Steelsites R-12, Color: Black, Length: 6'
2. Landscape Forms (Risman Plaza & University Green)
 - i. Plainwell Bench, 72", Color: Black

B. PICNIC TABLES

1. Victor Stanley, Inc.
 - i. Square Table: Steelsites IPR-36 Special, Surface Mount, Color: Black
 - ii. Round Table: Steelsites RND-363, Surface Mount
 - iii. Rectangular Table: FRST-6 with optional ADA compliant legs, Surface Mount, Color: Black
2. Landscape Forms (Risman Plaza)
 - i. Round Tables: Carousel Table, Backless perf., Steelhead perf., 5 seat, 42" diameter, Color: Black
 - ii. Metal Umbrella: Solstice Umbrella, Style: Cygnus, Color: Black

C. TRASH RECEPTACLE:

1. Victor Stanley, Inc.
 - i. Ironsites Series model #S-42: VS Black plastic liner with standard tapered spun steel lid (250# each), Color: Black
2. Landscape Forms (Risman Plaza & University Green)
 - i. Chase Park, Side Opening, 36 Gallon, Color: Black

D. RECYCLING RECEPTACLE:

1. Victor Stanley, Inc.
 - i.
2. Landscape Forms (Risman Plaza & University Green):
 - i. Chase Park, Side Opening, Color: Silver, Custom Filler Plate

E. DUAL FLOW RECEPTACLE:

1. Victor Stanley, Inc.
 - i. Steelsites Series model #RSDC-36: VS Black plastic liners, Color: Black

~~F. CIGARETTE URNS:~~

- ~~1. Rubbermaid:~~
 - ~~i. Infinity Ultra High Capacity Smoking Receptacle, Color: Black~~

G. BICYCLE RACKS

1. Cora Bike Rack: (Preferred) Model Expo series, Color: Black
2. Dero: Hoop Rack HD, Color: Black
3. Bike Track, model: Mini-mum (interior applications)

H. ANTI-SKATE BOARD DEVICES

1. Retaining walls and seat walls: manufacturer: Grind to a Halt, model "Grinderminder" install at 36" o.c.

I. PARKING METERS:

1. Duncan Industries, model Duncan Eagle.

J. BOLLARDS:

1. All steel poles shall be powder coated.
2. Safety bollards for protection of buildings and equipment; 6" concrete filled steel pipe, painted yellow.
3. Decorative traffic control bollards: Reliance Foundry Co. Ltd. (www.reliance-foundry.com) model: R-7589 (35") available for permanent installations; similar model number for removable installations

K. SITE LIGHT AND POLES:

1. Site light bollards are not acceptable. Refer to Division 16 for standard poles and fixtures.

L. BUILDING ILLUMINATION SYSTEMS:

1. System shall be provided for building faces on Hilltop Drive or other locations as approved by OUA.

M. SIGNS:

1. Traffic Signage: Associate shall determine street and parking signage as in Division 10 of the specifications.
2. Building Identification Signs: Refer to KSU standard details.
3. Construction Signs: For DAS project construction sign, verify with State Architect for Capital-funded projects.

129300.3

WARRANTIES:

1. Contractor shall provide the University with the warranty from the manufacturer.
2. The Contractor shall warranty installation of site furnishings for one year from the date of the Certification of Contract Completion.

DIVISION 12 – FURNISHINGS

12 00 00 FURNISHINGS

12000.1 **Furniture** will be specified by O.U.A. unless specifically included in the Associate's scope of work.

12345 LABORATORY CASEWORK AND FIXTURES

12345.1 **Laboratory equipment**, if required, will be specified by the Associate as a separate prime contractor.

12345.2 **Utility fixtures** and fittings shall be at least of the quality specified for the plumbing, mechanical, and electrical prime contracts. Associate shall verify corrosive resistant materials are required.

12345.3 **Water faucets** with hose connections shall be specified with vacuum breakers.

12345.4 **Ducts** for fume hoods shall be specified with non-corrosive lining.

12345.5 **Laboratory casework and countertop** material selection shall coordinated with the OUA.

12500 WINDOW TREATMENT

12500.1 The Associate will specify window treatments to be included in base bid work unless otherwise directed by the OUA. Coordinate all window treatment specification with the OUA.

12500.2 The preferred product for interior sun control is manually operated shading fabric such as Draper, Inc. Manual Flexshade. Coordinate shading density with OUA.

12500.3 Alternate selection will be horizontal aluminum 1” slat blinds with jamb channels.

12500.4 Vertical blinds are prohibited.

12500.5 Use "blackout" treatment in audio visual areas when required. Coordinate motorized blinds requirements with OUA. Specify electrical connections and controls to be in electrical contract.

12500.6 Specify all concealed blocking or reinforcing as required for secure installation of the window treatment.

12690 ENTRANCE MATS

12690.1 **Surface mats** are usually provided by the University for problem "wet areas."

12690.2 **Recessed mats**, if specified, will be readily removable for cleaning.

12690.3 **Deep recesses** for mats supported on aluminum extrusions are acceptable.
Floor drains below the mats are prohibited.

12710 AUDITORIUM AND THEATER SEATING

12710.1 Specify that all seats are to have articulating tablet arms.

12710.2 Ten to twelve percent of the seats should have left hand tablet arms.

12710.3 Minimum size of tablet arm shall be sufficient to completely support a laptop computer.

12710.4 Provide multiple locations and writing surfaces for wheelchairs within the fixed seating area.

12710.5 Pre-approval of fixed seating by O.U.A. is absolutely required. A full size sample showing all features, materials, and finishes shall be delivered to the Director's office.

DIVISION 13 - SPECIAL CONSTRUCTION

13000 GENERAL

13000.1 **Each item** of this division of work will require specific approvals from O.U.A.

13000.2 **Items** to be approved include: air supported structures, cable and fabric structures, sound rooms, cold rooms, clean rooms, integrated ceilings, stand alone shelters, saunas, steam baths, radiation protection, pre-engineered building systems, swimming pools, and other similar items.

13090 RADIATION PROTECTION

13090.1 **Materials and equipment** shall conform to the recommendations of the National Council on Radiation Protection and Measurements.

13090.2 **Materials and equipment** shall be furnished and installed in strict conformity with the Code of Federal Regulations, Title 21, Department of Health, Education, and Welfare, FDA Division and the manufacturer.

13120 PRE-ENGINEERED STRUCTURES

13120.1 **Specify** that analysis of framing and structural components be submitted to the Associate for approval.

13120.2 **The signature and seal** of an Ohio registered professional architect or structural engineer shall be on the analysis, certifying that the structure meets the requirements of the specifications and the Ohio Basic Building Code.

13120.3 **Copies** of this data shall be submitted to O.U.A.

13123 GLAZED STRUCTURES

13123.1 **Comply** with all glazing sections above.

13123.2 **Integral drainage system** shall be specified to positively drain the glazing system.

13123.3 **Access** shall be designed around the structure to permit maintenance for the structure as well as for adjacent equipment.

13123.4 **Design** structure to support mechanical and electrical items which may be suspended

from the structure, as well as loading which may occur during repair/maintenance of structure.

DIVISION 14 - CONVEYING SYSTEMS

14200 ELEVATORS

14200.1 Approved manufacturers: Canton Elevator Company, ThyssenKrupp Elevator, Schindler Elevator Corporation, Otis Elevator Company and US Elevator.

14200.2 **A planning conference** shall be scheduled by the Associate with O.U.A. to determine elevator requirements. For “service” or “freight” type elevators, the Associate shall verify type of freight and method of moving (i.e. pallet jack) to determine state elevator code requirements and floor load design criteria. If the elevator shall be dual use (passenger and freight) a variance may be required and the Associate shall apply for the variance at the time of plan approval. Extent of upgrades to existing elevators shall be discussed at same meeting. Associate is encouraged to bring elevator into current compliance if possible.

14200.3 **Elevator Cab size** shall be sized as needed to fit City of Kent’s stretcher with attached oxygen bottle. -86 inches long. See appendix.

14200.4 **Entrances** shall be fully automatic except for "freight only" elevators. Avoid the use of double sided entrances whenever possible.

14200.5 **Full accessibility** is required for the disabled including features for the hearing and vision impaired, per A.D.A. requirements.

14200.6 **Elevator Cab** shall be assigned a room number on the first floor plan. Coordinate number with OUA planner during design development.

14200.7 **Cab finishes** shall be specified on the room finish schedule. Floor finish shall be resilient or ceramic, porcelain or quarry tile; carpet is discouraged. Doors and jambs shall be brushed finish stainless steel; painted finishes are prohibited. Wall panels shall be plastic laminate with stainless steel rails on three walls. The ceiling system and lighting shall be vandal resistant with no exposed lamps within reach inside the cab. An inspection certificate frame shall be mounted in the cab with tamper resistant screws.

14200.8 Coordinate **numbering designations** of floor levels at cab buttons and door locations with KSU OUA.

14200.9 The Associate shall specify protective **moving blankets** and associated hooks as part of the base bid.

14200.10 If building generator is not required/provided, the elevator machine shall include **battery back-up lowering device**.

14200.11 Associate shall verify code requirements for **Fireman’s Emergency return**

system, shunt trip devices at elevator pit and machine room.

14200.12 Associate shall specify ~~that the fireman's service key shall be keyed alike to Kent State University standard, barrel type key, number EX515 (blanks made by Gem).~~

The following elevator keys:

Fire Service Cabinet FEO-K1

Fire Service Key Switch FEO-K1

Emergency Stop EX512

Two Speed Fan Switch EX513

Independent Service Switch EX514

Light Key Switch EX513

Voice Tone EX514

14200.13 **Processors or other equipment** which can only be serviced by the manufacturer are prohibited. All equipment is to be non-proprietary and non-restrictive. The following paragraph must be included in the specification VERBATIM!

Components of the Microprocessor Logic Control shall be serviceable by the Owner's selected elevator maintenance contractor. The Owner's maintenance contractor shall be able to access on board diagnostics and be able to interpret all fault codes and make routine programming adjustments without specialized equipment (diagnostic tool, hand held programmer, etc.). The Elevator contractor shall provide all software, access codes and/or keys to allow the maintenance as indicated above. The Elevator contractor shall provide all wiring diagrams, technical manuals and diagnostic tools as part of the O&M manual. These items will not be subject to any manufacturer's restriction.

Belt replacement shall be based upon the wear and thickness of belts. Provide monitoring system to identify actual belt wear and when replacement is actually required.

14200.14 **Elevator pit** shall be complete with ladder, light, sump, sump cover; sump pump; oil interceptor (for hydraulic elevators); and all electrical and drainage connections. Associate shall insure lighting levels in the pit comply with the elevator code requirements. Consider providing additional fixture(s) in the pit.

14200.15 Provide quantity of light fixtures in the elevator pit and machine room necessary to insure code required lighting levels are met in **all areas** (corners) of the room.

14200.16 **Any and all bracing and connections** required by the elevator contractor shall be provided by the General Contractor under the miscellaneous metals portion of the contract.

14200.17 **Elevator shaft requirements-** Associate shall verify code requirements for pressure relief vents and smoke dampers and clearly specify which contract is to provide and/or install louvers and/or vents.

14200.18 Associate shall indicate tolerances for shaft plumb and maximum size of “ledges” and protrusions allowed by code.

14200.19 **Telephone** shall be **Ceeco, model SSP-571-D-ADA-SS furnished by Kent State University Telecommunications Department to be installed by the elevator manufacturer** for each elevator with complete cabling back to the controller for connection by data cabling contractor, KSU telephone services and the telephone utility. Device shall be programmable auto dial with automatic reset time.

14200.20 **The Telephone Service** shall **not** be continuously hardwired into the elevator machine. A two outlet faceplate shall be installed on a wall of the elevator machine room. One outlet shall be connected to the elevator machine and the second outlet shall be connected to the telecomm closet. A patch cord will be installed between the two ports to complete the circuit. Refer to the detail in the appendix.

14200.21 **On the Kent Campus**, all auto dialers shall dial Kent State University Building Automation and Control Center at 22307 (5-digit KSU internal number).

14200.22 Elevator location identifier recording shall follow this format: "ELEVATOR LOCATION, KENT STATE UNIVERSITY, KENT OHIO (INSERT BUILDING NAME AND ELEVATOR NUMBER IF APPLICABLE STARTING FROM LEFT TO RIGHT FACING THE ELEVATORS FROM THE OUTSIDE 1 THRU REQ'D), ADDRESS (NUMBER AND STREET NAME, IF NO NUMBER AVAILABLE INDICATE STREET NAME ONLY)."

14200.23 The elevator contractor shall perform and confirm all programming is correct with KSU BACC upon completion.

14200.24 **On all regional campuses**, the elevator contractor shall coordinate dialing and identification requirements with the KSU OUA project manager.

14200.25 **Mechanical Level Security requirements:** If an elevator cab has a stop that enters only into a mechanical space, security measures are required. The elevator shall require a key or electronic card swipe access to allow access to that level. The key shall match KSU Mechanical Room master key with Corbin Russwin Master ring cylinder.

14200.26 **Miscellaneous Security requirements** may be required by program. Coordinate with OUA Project Manager.

14200.27 **Residence Hall Security Measures:** In some instances, an elevator in a Residence Hall will require a BEST Access Systems magnetic card swipe to allow entrance to resident only floors. The necessary “traveler” cable shall be provided and installed by the elevator contractor. Coordinate final details with KSU OUA and Residence Services.

14200.28 **A pre-installation conference** shall be scheduled with the GC, elevator subcontractor, Fire Protection contractor, HVAC contractor and Electrical contractor (and Fire Alarm subcontractor) to coordinate layout and requirements of all related systems. The State requirements checklist shall be verified and signed off at this meeting.

14200.29 **All permit fees** including inspection and first operation permit are to be included in the elevator specification/subcontract. Subsequent re-inspection fees shall be paid by the General Contractor; a deduct change order will be issued to the parties responsible for initial failed inspection.

14200.30 The Associate shall specify that the Elevator contractor is to include an **additional site visit** in his base bid for the State Elevator re-inspection. This presumes that the elevator will not pass the inspection on the first visit.

14200.31 The Associate and elevator contractor shall notify the University of the date and time of the elevator inspections so that a KSU representative from Campus Environment and Operations may participate in the inspection.

14200.32 The Associate shall specify that the General Contractor and the Elevator Contractor must turn over the elevator for use by the Owner immediately following successful inspection and prior to final payment.

14200.33 The Elevator will not be used during construction for transport of material or workman unless approved by the OUA and only if adequate protective measures are taken.

14200.34 **Final payment for the elevator will not be made** until maintenance and instruction manuals are submitted and approved by the Associate. Specifically note that "project specific" wiring diagrams are required before release of final payment will be approved. Generic wiring diagrams are unacceptable.

14200.35 The Associate shall specify a mandatory preventive maintenance contract as well as a callback service agreement to be **included in the base bid**. The service agreement shall be for 1 year from the date of acceptance of the elevator to include the following: regular monthly examinations and inspection; repair or replacement of worn or defective components; lubrication, cleaning, adjusting, supplies and parts for proper operation at rated speed and capacity. The Associate shall also clarify that this service agreement is considered to be above and beyond the standard 1 year building warranty. Include 24 hour-per-day, 7 day-per-week emergency call back service response time within 2 hours or less.

1. **Competent and trained** employees of the manufacturer will perform all maintenance.
2. **Manufacturer must certify** that a service office is located within 100 miles of the University, and that a parts warehouse is located within 150 miles of the University.
3. **Elevator manufacturer** shall provide repair parts catalogs, instruction manuals, and written directions as part of the final O&M submittal to KSU OUA.
4. **Notify the University** in advance of inspection or maintenance trips so employees of

the University may be present.

14200.36 **Escalators** are prohibited.

14420 WHEELCHAIR LIFTS

14420.1 **Wheelchair Lift** use is discouraged. A mid-level or bi-level elevator is preferred.

14420.2 If the program necessitates a wheelchair lift, the Associate shall specify a phone jack on the wheelchair lift.

MECHANICAL GUIDE

BASIC REQUIREMENTS for DIVISIONS 11, 21, 22, 23 AND REFERENCE TO 25.

1. **Format:** The standard CSI specification format is used for the generation of the standard specifications. Divisions 21 through 23 are general mechanical items and apply to plumbing, fire protection, heating ventilating, and air conditioning (HVAC). Division 21 applies to Fire Protection Systems; Division 22 applies to Plumbing Systems; Division 23 applies to HVAC; Division 25 applies to Integrated Automation (Temperature Controls). The Ohio Revised Code requires that separate drawings and specifications be prepared for all Fire Protection, Plumbing and HVAC work.
2. All record drawings, shop drawings or data sheets shall be furnished to the Office of the University Architect (OUA) in an electronic PDF format. Drawings shall be converted into AutoCAD version 2007 format and all layers shall be bound to a single drawing. No external x-refs will be allowed for final record documents.
3. **Minimum Requirements:** This section does not cover all phases of mechanical work but only those areas where special attention is needed. Compliance with all State, Federal and local (Health Department approvals and site utilities connecting to the local utilities) and OSHA standards shall be minimum requirements. All associates shall include in their mechanical designs flow diagrams for all steam, chilled water and heating water systems. Flow diagrams shall include all of the necessary details to represent the overall system and control points for the BAS being designed. All flow diagrams shall be reviewed with the OUA prior final construction documents are prepared and released for bidding.
4. **Safety Requirements:**
 - 4.1. **General:** The contractor shall be required to comply with OSHA requirement for physical hazards, safety equipment, fire fighting equipment and protective equipment.
 - 4.2. Belt guards, coupling guards, rails, roof fall protection, etc. shall be provided to meet OSHA requirements. Vent shafts and vertical openings shall be enclosed and comply with all OSHA requirements.
5. **Insurance Requirements:** All systems and equipment must be of a quality acceptable to the University's insurance representatives. The Associate will be required to submit two copies of the design documents to the representative for review and comment prior to distribution.
6. **Utility Connections:** Connections to the existing utilities must be prearranged for a time suitable to the University. The Associate shall contact the Director, Office of the University Architect (OUA) or his designate to schedule a planning meeting for this purpose.

7. Submittals:

- 7.1. The Associate shall submit two hard copies or an electronic PDF (coordinate with OUA) of the approved submittal information to the University. Each submittal shall be forwarded to the University at the time of approval and not held until the end of the project.
- 7.2. Equipment shop drawings shall include nameplate data, model number and efficiency rating along with full load amps for all electrical motors.
- 7.3. Unless approved otherwise, all piping and ductwork shall be kept a minimum of 7' – 0" above the floor in access-ways and around equipment. The plans shall clearly indicate potential restrictions and detail the areas appropriately.
- 7.4. Coordination drawings should be required at 1/4"=1'-0" or larger. All systems shall be required. Lead Contractor shall prepare based on extent of work involved. All plans shall indicate potential restrictions. Use of graphics packages for coordination drawings shall be coordinated with the OUA.

8. As-Built Documents (Outside Utilities):

- 8.1. The University shall be provided with as-built drawings on all outside utilities. Notes for these drawings shall be made in the field by the Associate's construction manager during installation and verified by Associate.

9. As-Built Documents (General):

- 9.1. The University shall be provided with as-built documents as prepared by the Contractor and verified by the Associate. The Associate shall prepare the Record Documents based on information provided by the contractor. One set of prints shall be submitted to the Owner's designate for review prior to submission of final reproducible, one (1) copy of PDF to retain all plotting line weights and One (1) copy of AutoCAD VER TBD with all layers bound on CD. Electronic Files shall be named for ease of recognition – not simply by job number or sheet number.

10. Maintenance Manuals:

- 10.1. One (1) preliminary review manual shall be submitted to OUA for review after the Associate has reviewed and approved and this shall be submitted prior to equipment start-up and function testing under the commissioning of the mechanical, electrical, plumbing or fire protection systems. Upon approval by the University and at the completion of the commissioning one (1) final hard copy and one (1) electronic copy on DVD or flash drive in "PDF" (searchable PDF format is required for all possible content or at minimum section dividers of content) format shall be provided at time of signing your contract completion certificates and shall be uploaded into the OAKSCI at that time and the electronic copy is to be provided to OUA prior to release of project retainage.

- 10.2. The Maintenance manual to be bound in a hard cover, high quality, three-ring binder. The binder shall include a transparent vinyl sleeve on the front and the binder edge to protect labeling. The manual shall be labeled on the front as well as the binder with the project name, project number and the trade covered (i.e. "PLUMBING", "HVAC", etc.). See appendix.
- 10.3. Maintenance manuals shall include at a minimum the following:
- 10.3.1. Cover sheet with project name, number and contractor.
 - 10.3.2. Table of Contents
 - 10.3.3. Contractor and sub-contractor contact and phone list.
 - 10.3.4. Contractor warranty, indicating date of final acceptance.
 - 10.3.5. Total air and water balance (TAB) report.
 - 10.3.6. Equipment and material warranties and guarantees.
 - 10.3.7. Tabbed sections for each topic included in the manual.
 - 10.3.8. Complete equipment list with model numbers and serial numbers. Final Operating parameters (CFM, pressures, GPM etc.) (Must match TAB and Commissioning reports).
 - 10.3.9. Manuals shall indicate all local suppliers and contact information for supplied equipment and components.
 - 10.3.10. All final submittals shall indicate actual device provided not general product information. All included options shall be clearly indicated.

11. Prohibited Construction:

- 11.1. All plumbing and mechanical equipment, especially piping, shall be at least three feet away horizontally from any electrical switchgear or transformers. No hydronic lines or steam lines shall pass through telephone, transformer, switchgear rooms or elevator equipment rooms.
- 11.2. Draining or Chemical Cleaning of any Closed Loop Chilled Water, Steam and Steam Condensate Systems, Glycol Systems, Closed Loop Heating Water, and Cooling Tower Water Systems to the City of Kent's sanitary system is prohibited, without filling for a discharge drainage permit. Mandatory two week Notice to dump will be required with an approved signed document from the City of Kent. (KSU will not sign for this service) KSU would prefer that the designing engineers require reclaim methods be implemented vs dumping unless no other options are possible. Compliance with these requirements will be required in your base of design for any project on the Kent Campus.

12. Design for Energy Conservation:

- 12.1. The University is committed to the principle of conserving natural resources and requires detailed examination of proposed construction for means of reducing initial costs, long-range operating costs and energy consumption. Designs shall comply with The Ohio Basic Building Code Energy Program; Local Authorities having jurisdiction, ASHRAE - 2007 90.1 and 62 guidelines shall be used. HB251 requires the HVAC design to be 20% better than ASHRAE 90.1 and all designs shall meet at a minimum to LEED Silver certification. Associate shall submit LEED accreditation documentation to University up to the Silver level through the design process and shall submit to the USGBC when directed by the University (project-by-project basis). Associate shall review all LEED concepts prior to implementation into the final contract documents with University. Outcome of the LEED process shall be submitted as a separate report at the conclusion of this project.
- 12.2. Incorporate the following minimum requirements into the University's Design and Construction Standards for HB-251 and HB-7 compliance:
 - 12.2.1. For capital improvement projects with construction costs > \$100 K, and where programming/design work will commence after July 1, 2008, exceed ASHRAE 90.1.2007 by 10% for new construction projects and 7.5% for renovation/other projects.
 - 12.2.2. For capital improvement projects with construction costs > \$100K, and where programming/design work will commence after July 1, 2017, exceed ASHRAE 90.1.2007 by 20% for new construction projects and 15% for renovation/other projects.
 - 12.2.3. For new construction or major modernization projects, meet the following targets for energy consumption:(needs to be updated on annual basis)
 - 12.2.3.1. E&G Buildings: 55,000 btu/gsf/year maximum
 - 12.2.3.2. Auxiliary Buildings: 80,000 btu/gsf/yr maximum
 - 12.2.3.3. Residence Halls with air conditioning: 125,000 btu/gsf/yr maximum
 - 12.2.3.4. Science Laboratory Buildings: 80,000 btu/gsf/yr maximum
 - 12.2.4. The current 6-year Capital Plan (2016-2020) identifies approximately 525, 000 (need to verify) gsf of existing space to be renovated.

13. Design for Future Repair and Replacement:

- 13.1. The Associate shall lay out equipment and mechanical rooms in such a way to facilitate the long-term maintenance of the equipment. Coil pull clearances shall be shown on the drawings. Access to mechanical rooms shall be analyzed for future replacement of large equipment.

- 13.2. Unless approved otherwise, all piping ductwork shall be kept to a minimum of 7'-0" above the floor in access-ways and around equipment. The plans shall clearly indicate potential restrictions and detail the areas appropriately.

13.3. Associates shall limit the use of proprietary controls in equipment without the approval of the OUA. Original software and associated computers, cables shall be furnished with equipment for startup and training of software and use of said equipment shall be incorporated into the design documents and specification. No annual software agreements will be acceptable and manufacturers which require such requirements shall be removed as an acceptable manufacturer's supplier for KSU.

01 89 00 SITE CONSTRUCTION PERFORMANCE REQUIREMENTS

02 40 00 DEMOLITION AND STRUCTURE MOVING

DIVISION 11 – FUME HOOD AND SAFETY EQUIPMENT

1. The design of fume hoods shall be based on end use of science being performed with OUA. Fume hood design shall include the following options and specifications:
 - a. Standard Fume base of design shall be provided with a hood face velocity of 100 fpm in occupied room condition and minimum of 65 fpm in an unoccupied room condition. Velocities above 100 fpm shall be reviewed with the OUA. Only radioisotope and perchloric fume hoods can be designed with higher velocity rates (not greater than 125 fpm). Perchloric hoods shall be avoided at KSU.
 - b. Low flow hoods based on 85 to 65 fpm shall be reviewed with the OUA and Lab Safety Personnel. Use of low flow hoods should **not** be considered for any research or high toxic or heavy concentration of chemical use. Low flow hood applications have to be approved by OUA, lab safety personnel and end users. Written sign off shall be required.
 - c. Fume hood designs should be based for VAV applications unless designed for single exhaust fan application in which case fume hood could be constant volume. Engineer shall incorporate energy reduction measures whenever possible and all control sequence of operations shall be coordinated with OUA and end user.
 - d. Fume hood lab controls and room pressurization shall always be reviewed with OUA prior to selection of fume hood design. Room or hood occupancy sensors shall be used for control of fume hoods for both an occupied and unoccupied control strategy. Fume hoods shall maintain constant 100 fpm across the sash opening during occupied and 65 fpm in unoccupied room condition.
 - e. Fume hoods base of design will incorporate latching hood sash positioners for horizontal sash set at 6", 18", 24" and full open positions above hood working surface. Fume Hoods having a sash above 18" shall be coordinated with OUA. Vertical sash side by side hood design shall also be coordinated by shall include 100 fpm throughout the hoods whole open face area.

- f. Walk in fume hoods shall be reviewed with OUA prior to consideration or selection.
- g. Dual sash or bi directional fume hoods shall also be coordinated with OUA.
- h. Fume hoods shall be furnished with baffle plates, audible and visual alarms devices complete with mute. Hoods shall indicate normal operation of face velocity. Face velocity readings are preferred. Indicator lights red, yellow and green shall be optional.
- i. Fume hoods shall be of a by-pass design and shall include proximity sensors if part of a central fume hood system. If single hood with single fan hood fan switch shall be furnished.
- j. Fume hoods shall be designed with interior lighting package and factory wired switch mounted on the outside of the hood.
- k. Fume hoods shall also be reviewed for associated lab gases and all fume hoods piping shall be coordinated and extended to the edge of the fume hood assemble. Pipe orientation shall be coordinated by installing contractor based on position to building services. Power wiring for fume hoods shall also be of single point of connection having a j-box for final terminations. All wiring within the fume hood shall be factory installed, tested and meets NEC, and UL classifications along with AHJ for state and local codes.
- l. Fume hood working surface shall be made of acid resistant material. All hood components associated with the hood shall be epoxy resin or stainless steel which is designed for the chemical in which the fume hood will be exposed. Fume Hood material selection shall be coordinated with OUA. Chemical concentration level shall be required from end user along with lab operations and safety protocols to design professional. Bottom sash by-pass shall be made of stainless steel for impact and added chemical resistant. Review location and construction with OUA.
- m. Lab Controls shall utilize Phoenix or Tritech pressurized lab design systems with integration into the Johnson Controls Metasys systems using Bacnet IP were available. Review network requirements with OUA. Systems shall be read write capable. Full graphics package will be required with all lab systems thru JCI

2. LAB SAFETY EQUIPMENT

- a. Each research or general laboratory shall be furnished with an emergency eyewash station, combination eyewash/shower and shower. These fixtures shall meet OSHA and ANSI Z358.1, and installed to ASPE, OSHA, ASSE, and LABS21 guidelines and manufacturers recommendations for both use and installation.
- b. Sanitary drainage system shall be coordinated with science and use of chemical resistant type of system shall be reviewed with OUA.
- c. Tepid domestic water system shall be utilized for any safety equipment. The review of temperature setting shall be reviewed with KSU safety personnel and end user of the laboratory. Written operating, testing and maintenance program of emergency lab safety

devices of system shall be required to be submitted on any system being installed. Training on proper use shall also be incorporated into the design for lab spaces. All tepid water system shall use master mixing valve designed for use in this type of application “Lawler” is the preferred manufacturer for mixing valve.

- d. Emergency shutoff valves for lab gases (Flammable) shall be installed for all classrooms and research laboratory facilities. The shutoff valves are to be recessed provided with panic button and keyed for manual override to close gas process. The isolation valves shall be UL rated for the gas type and pressure rated to meet ASTM and ANSI standards.
- e. Laboratory process gas material, cylinder system, central plants and manifolds shall be reviewed with the OUA. All piping and fitting for lab equipment shall be designed to meet ASTM and ANSI standards for all lab equipment, materials and pressure ratings associated with the process requirements of the process gas being furnished. Quantities and storage requirements shall comply with NFPA. Design of piping materials and joints and fitting shall also be considered for high pressure applications. Soldered joints are not acceptable.

3. LAB CHEMICAL STORAGE AND FLAMIBLE STORAGE CABINETS AND ROOMS

- a. Chemical storage cabinets shall be constructed and ventilated per manufacturers recommendations. The exhaust from chemical storage shall be connected to the building chemical and fume hood exhaust systems. The duct connection and cabinet shall be made of such materials which can handle the chemical resistance of the materials being stored. The exact CFM quantity shall be reviewed with OUA and Lab safety personnel. Engineer shall provide in the design a means of balancing the ventilation air from the storage device or casework. Slide gates or exhaust valves shall be considered.
- b. Flammable storage cabinets shall be ventilated per NFPA and manufacturers recommendations. Flammable storage cabinet shall be UL approved for storage cabinet classification of quantities allowed to be stored according to the Building Classification and quantities allowed by code, AHJ and KSU. Flammable storage cabinets shall only be exhausted into an approved exhaust system designed for flammable vapors. Explosion proof ventilation system shall be used at all times. The connection, locations, size, ventilation needs of such cabinets shall be reviewed with OUA, KSU Life Safety and Lab Safety personnel prior to design and installation.
- c. Storage rooms for chemical or flammable liquids within University complexes shall be reviewed with OUA, KSU Life Safety and Lab Safety personnel.

DIVISION 31 – EARTHWORK

Associates shall provide full NPDES permit for Kent, Stark and Tuscarawas campuses, the contractor shall submit for NOI and NOT with the Ohio EPA and shall coordinate with local authorities having jurisdiction. Kent projects shall coordinate with City of Kent’s and Portage County storm water requirements. Stark campus shall conform to Stark Soil and Water and Tusc. Campus is to conform to Ohio EPA and the Muskingum water shed district.

DIVISION 32 – EXTERIOR IMPROVEMENTS

DIVISION 33 – UTILITIES

All utilities shall be reviewed with OUA. Ohio Utilities Protection Services “Oups” is not used on the Kent Campus, location of utilities has to be reviewed with OUA. Regional campuses may use OUPS but not always supported by all utilities. Each project will need to be reviewed with OUA on available public utility services.

DIVISION 34 - TRANSPORTATION

1. The site storm, potable water, natural gas, electric and sewer service piping from 5’ outside the building to utility connections shall be installed by Site Contractor or Contractors of that discipline.
2. The buildings storm and sanitary sewer systems shall be installed by the Plumbing Contractors from 5’-0” outside of the building. Site/Civil Contractors extend to public utilities. Only Fire Protection Contractor should be considered for both building and site installation of fire line services. Associates shall review the design method with OUA prior to making design assumptions.
3. General Installation Requirements
 - 3.1. Wherever possible, the storm or sanitary service connection shall be made to the Kent State University storm and sanitary sewer systems. If connections to the City of Kent’s services close coordination and use of the City of Kent’s design standards shall be Utilized and coordinated with OUA. When not possible or if project is located at a Regional campus, the Associate shall comply with the local codes and requirements. Storm systems shall use EPA – NPDES (National Pollution Discharge Elimination System) Best Management Practice where possible. Review with OUA for additional requirements.
 - 3.2. Plans shall include a grade profile of the storm, potable water and sanitary line to insure adequate coverage and sloping for air and water drainage. (Minimum 3'-0" cover required unless otherwise approved by OUA) for sanitary and storm and Minimum of 5’-0” for potable water.
 - 3.3. City of Kent or local authority’s standard requirements shall be followed whenever possible. A meeting shall be arranged by the Associate between the City of Kent or local authority Building Department and OUA as soon as the preliminary plans are complete. The purpose of the meeting will be to familiarize the Associate with the requirements as well as informing them of the project scope.
4. Plans and specifications shall be submitted to the City of Kent Building Department or local authorities for review only when connection is to a county or city main. Submit reference set to the City if connecting to KSU Distribution System. The submission to the City or county shall occur

at the same time as final approvals are submitted to the State of Ohio, Industrial Compliance Division. All correspondence shall be reviewed with KSU prior to submission.

5. The contractor shall pay for all tap-in fees and contact the City or county for inspections of the storm or sanitary service line.
6. Utilization fees, excavation permits, etc., associated with the storm and sanitary piping shall be paid for within the project budget.

SITE WATER SERVICE PIPING

1. Water service piping from 5' outside the building to utility connection shall be installed by Site Contractor and coordinated with all Prime Contractors.
2. The building water service piping starting at 5' outside the building shall be installed by the Plumbing Contractor or Fire Protection contractor if service is for a combination service. Civil Contractor can perform work but shall hire fire protection contractor to install fire or combination domestic/fire water service. If civil contractor is also a licensed fire suppression installer they will be allowed to perform this type of work. Associates will need to vet out contractor prior to allowing them to perform installation.
3. When combination water/fire services are installed the fire protection contractor shall install from water purveyor to inside of the building to subdivision between fire and potable water system. Use of Post indicator valves shall be reviewed with OUA and local fire department having jurisdiction. Plumbing contractor shall connect at subdivision within the building complex. All deviations from this shall be coordinated with the OUA.
4. Fire lines are to be provided with post indicator valve and tamper switch, thrush restrains, backflow and shall be reviewed with OUA and AHJ. Fire department connections shall have Stortz connection with Knox Box. Review Knox Box requirements with OUA.
5. General Installation Requirements:
 - 5.1. Wherever possible, the water service connection shall be made to KSU master meter system. When not possible or if project is located at one of the regional campuses, the Associate shall comply with the local codes and requirements. Installation depth of water mains shall be 5'-0" below finished grade unless special written approval is given by OUA.
 - 5.2. Water meters with BAS communication are required on all systems to allow water conservation efforts. Sub-meter all cooling tower make-up or outdoor water features to allow sewer rate deduct billing. Coordinate meter types and options required for communication with the Johnson Controls Metasys Automation System. Typically, Neptune turbine temperature compensated to read in cubic feet with TRI-CON E3 Reader is to be furnished on the Kent Campus. Meter types at all regionals shall be coordinated with local water purveyor and OUA.

- 5.3. A standard clockwise-to-close curb stop shall be provided at the connection to the street main.
- 5.4. Plans shall include a grade profile of the water line to insure adequate coverage (5'-0" minimum). Design shall consider sloping for air and water drainage - coordinate with City of Kent or local authority.
- 5.5. City of Kent or other local authority's standard requirements shall be followed whenever possible. A meeting shall be arranged by the Associate between the City of Kent and local authorities.
6. Plans and specifications shall be submitted to the City of Kent Building Department or local authority for review when system is connected to local authorities Utilities (Domestic Water, Storm, and Sanitary). Provide reference set of drawings if connected to the KSU main distribution system. Reference set shall be sent to the local authority or City of Kent at the same time as final approvals are submitted to the State of Ohio, Industrial Compliance Division.
7. The respective contractor shall pay for all tap-in fees and contact the local authorities or city for inspections of the water service line.
8. Utilization fees, excavation permits, etc., associated with the water service piping shall be paid for within the project budget.
9. Chlorination of domestic water mains at the Kent campus is by the City of Kent Water Department. Coordination and cleaning shall meet City of Kent's or other local authority's requirements. Chlorination taps are provided by the City of Kent with a minimum 2-week time duration. Water taps at regional campuses shall be coordinated with local water purveyor.

21 05 13, 22 05 13, 23 05 13 COMMON MOTOR REQUIREMENTS FOR FIRE SUPPRESSION, PLUMBING AND HVAC EQUIPMENT

1. All electrical components shall be UL labeled.
2. All electrical installations shall comply with the Division 26 specifications and with the National Electric Code.
3. Motors:
 - 3.1. One (1) HP and below 120V/1 Phase/60Hz. (Unless reviewed with KSU/OUA)
 - 3.2. Above 1 HP, 208, 230 or 460V/3 Phase/60HZ. (Unless reviewed with KSU/OUA)
 - 3.3. VFD motors shall be inverter duty, premium efficiency, designed to operate efficiently with VFD requirements.

- 3.4. Noise Rating: Motors shall be of "premium" efficiency and shall exceed mandated government efficiencies. All motors shall employ bearings for a "quiet" noise rating.
- 3.5. Efficiency: "Energy Efficient" motors shall be of premium efficiency as scheduled in accordance with IEEE Standard 112, test method "B". Associate to provide info on efficiency and motor types, nameplate data to OUA for review.
- 3.6. Harmonics and lubrication shall be addressed. Motor brake HP, RLA, LRA shall be indicated on the drawing schedules.
- 3.7. All motors shall have a minimum service factor of 1.15 and be designed for non-overloading use.
- 3.8. Motors exposed to wet locations shall be TEFC or meet NEC requirements, whichever is more stringent.
- 3.9. **"AEGIS" Type Shaft grounding technology** shall be applied to all motors. This applies to all pumps, fans, and on all VFD type of systems. Review other system if base of design is not around AEGIS.

4. Variable Speed Drive (VSD) or Variable Frequency Drive (VFD)

- 4.1. All drives shall be provided with manual by-pass features, BACnet IP, MS/TP, N2 Communications for integration with Johnson Controls Metasys Building Automation System.
- 4.2. All drives are to be provided with Front Panel Displays (HMI) including password protection feature which need to be reviewed with OUA.
- 4.3. All Drives are to be housed in the proper NEMA enclosure for the environment in which the unit is to be placed. High ambient temperature relating to mechanical or equipment rooms shall be reviewed with OUA and project architect.
- 4.4. All drives are to be reviewed with OUA for type of Human Machine Interface (HMI) display, terminal block options, and communications packages and drive **protection** features. All of these key items can be project specific and have to be review with both OUA electrical and mechanical engineers.
 - 4.4.1. Displays must have the following:
 - 4.4.1.1. Output Frequency (HZ)
 - 4.4.1.2. Speed (RPM)
 - 4.4.1.3. Motor Current
 - 4.4.1.4. Calculated Motor Torque (%)
 - 4.4.1.5. Calculated Motor Power (kw)

4.4.1.6. DC Bus voltage, Output voltage

4.4.1.7. Resettable time meter

4.4.1.8. KWH meter (resettable)

4.4.1.9. Error and Fault text notification

4.4.1.10. PID actual value (feedback) and error messaging

4.4.1.11. Auto restart (reset) selectable and adjustable by KSU

4.4.1.12. Programmable analog, digital inputs and outputs (number to be reviewed with OUA)

4.4.1.13. Input Speed Signals 4-20 ma or 0 to 10 v complete with increase/decrease reference contacts, serial communications

4.4.1.14. Start/ Stop functions review contact number and reference signal communication features with OUA engineers.

4.4.1.15. Fire alarm control input features shall also be coordinated with OUA engineers and fire alarm contractor prior to ordering final unit for KSU projects.

4.4.1.16. Start Function on Ramping, auto torque etc. shall be reviewed with OUA electrical and mechanical engineers based on system applications.

4.5. All drive applications Sequence of Operations for chillers, air handling units, cooling tower pump control, domestic water booster pump control, hydronic pump control and all type of fans or fan wall systems.

4.6. All Drives are to be manufactured by the following companies:

4.6.1. SQ. D, ABB, Danfoss or Allen Bradley. Exception to these manufacturers have to be reviewed with OUA and only if part of an OEM packaged system not offering one of KSU preferred vendors.

4.7. All Drives PID Controls, Motor control features, Preprogrammed Protection circuits, programmable fault functions and protection options shall be reviewed with OUA engineers.

4.8. Final review of manufacturer options which are not part of the required information provided above shall be reviewed with both OUA mechanical and electrical engineers.

21 05 00, 22 05 00, 23 05 00, 25 05 00 COMMON WORK RESULTS FOR FIRE SUPPRESSION, PLUMBING, HVAC, INTEGRATED AUTOMATION

1. Abandoned Building Systems: Wherever possible, abandoned piping and ductwork shall be removed back to the main and capped; includes associated hangers, supports, miscellaneous steel, disturbed remaining insulation and vapor barriers shall be repaired.
 - 1.1. All exposed piping shall be removed back to the active line and capped. No dead legs longer than 5' will be permitted on active lines. No dead legs which can trap condensate shall be permitted on steam lines.
2. Backfill and Fill Material: Backfill requirements at road and parking lot crossings shall meet the City of Kent's standards for backfilling. City of Kent's approval is not required unless City owned. Review with OUA if any questions.
3. Joint Sealers:
 - 3.1. Elastomeric Joint Sealers shall be one part, mildew resistant, silicone sealant complying with ASTM C 920, Type S, Grade NS, and Class 25 for all non-traffic areas.
 - 3.2. Standard manufacturer colors shall be submitted to the Associate for selection, and to KSU OUA for approval.
4. Fire and Smoke Sealers:
 - 4.1. The contractor shall provide submittal data on each installation type for approval by the Associate.
 - 4.2. Fire and smoke sealing systems shall be tested in accordance with the appropriate current NFPA ASTM E 814 and by Underwriters Laboratories requirements.
 - 4.3. All materials shall be non-asbestos containing.
 - 4.4. All firestop material shall be painted to match adjacent wall surfaces in visible public spaces.
5. Miscellaneous Metals: All outdoor miscellaneous metal equipment supports shall be galvanized steel. Spray-on galvanizing shall be applied to all disturbed areas. All indoor miscellaneous metal equipment supports shall be black iron, primed and painted or galvanized.
6. Miscellaneous Mechanical Room Replacements: Access to mechanical rooms shall be analyzed for future replacement of large equipment. Manual valves above 7'-0" to have chain wheel operators. The plans shall clearly indicate potential restrictions/service areas and detail the areas appropriately. Coordinate all systems to provide maximum head room with no items below 7'-0" A.F.F.
7. All Hydronic and fire systems shall include in design initial fill and flushing taps. For quick fill and flushing of system. Review flush and fill tap locations with OUA engineers.

8. All **hydronic** heating water or chilled water **Minimum** piping distribution size shall be **$\frac{3}{4}$ " nominal pipe diameter**. Any smaller line size shall be reviewed on a case by case basis and have written authorization to reduce pipe size below $\frac{3}{4}$ ".
9. The use of gate valves within any hydronic, plumbing system shall be reviewed with OUA prior to including in specifications. If gate valves are used for steam applications, they shall be specified to have rising stem. Avoid Non-rising stem valves and only allowed with written approval by OUA mechanical engineers.
10. Chain wheel operators are required on any valve 2" diameter and above with chain wheel operators if installed above 7'-0" AFF in mechanical equipment type spaces.

21 05 19, 22 05 19, 23 05 19 METERS AND GAGES FOR FIRE SUPPRESSION SYSTEMS, PLUMBING PIPING, HVAC

1. Thermometers:

- 1.1. Thermometers shall be 9" long with glass front, spring secured with 180° adjustments in the vertical plane and 360° adjustments in the horizontal. Adjustment shall have locking device. Thermometers shall be well type whenever physically possible. Mercury type is not permitted.
- 1.2. Dial thermometers minimum 4½" diameter will be acceptable in certain fluid applications. Consult with OUA.
- 1.3. Thermometers shall be located in the following locations (minimum):
 - 1.3.1. Supply and return of heating hot water boilers.
 - 1.3.2. Discharge from domestic water heaters and downstream of master mixing valve supply to building.
 - 1.3.3. Supply and Return to hydronic heating boilers.
 - 1.3.4. Supply and return to chillers and cooling towers (condensers).
 - 1.3.5. Supply and return to heat exchangers, both domestic and hydronic.
 - 1.3.6. Discharge off sterilizer drains.
 - 1.3.7. Supply and return chilled/heating water serving air handling unit cooling/heating/preheat coil sections.
 - 1.3.8. Discharge line of chilled/heating water pumps.
 - 1.3.9. Thermometer manufacturer requirements equivalent to Trerice Company.

1.3.10. Dial thermometers shall be used in air ductwork, bi-metal vari-angle, Weiss or approved equal.

2. Pressure Gauges: All gauges to be rated for fluid applications with expected operating pressure to fall in the middle of the pressure range, min. 4½" dia. – **liquid** filled on all vibrating equipment shall be included in all base of design specifications. Weiss or approved equal.

2.1. Gauges shall include isolation ball or gate valve (steam), schedule 80 nipples, fittings and pipe. Provide tee fitting between isolation valve and gauge.

2.2. Gauges on steam systems shall include protective siphon.

2.3. Pressure gauges shall be located at the following locations (minimum):

2.3.1. Suction and discharge of pumps.

2.3.2. Discharge of steam condensate pumps.

2.3.3. Fire protection systems including limited area systems connected to potable water.

2.3.4. At pressure reducing fill valves both upstream and downstream.

2.3.5. All PRV (pressure regulating valve) stations both upstream and downstream of station.

2.3.6. All expansion tanks.

2.3.7. All inlet and discharge of Air and Dirt Separators

2.3.8. Central station AHU coil supply and return piping.

2.3.9. Upstream and downstream of main building backflow devices, i.e. fire system double check and domestic water RPBP (RPZ).

21 05 29, 22 05 29, 23 05 29 HANGERS AND SUPPORTS FOR FIRE SUPPRESSION, PLUMBING, HVAC PIPING AND EQUIPMENT

1. Support length and location shall be as specified in the State Architect's "Handbook of Instruction" and Ohio Basic Building Code.
2. Hangers for copper pipe shall be copper or nylon. Plated copper not acceptable. On domestic water or Hydronic copper pipe systems shall use Hydra-Zorb (-65 to 275 deg F) on any Unistrut type support structures.
3. Hangers for refrigerant piping shall be isolated from the pipe by a non-metallic material around the piping in such a manner to protect the piping from damage due to vibration and to minimize sound transmission in the building.

4. Dual temperature service heating and cooling piping 2½" and larger shall be mounted on roller hangers. The piping shall be supported on saddles of length and size as recommended by the manufacturer and verified by Associate for proper installation.
5. Chilled water piping shall utilize specialized blocking and shield to allow proper insulation and vapor barrier to eliminate condensation (service and flow direction shall be labeled).

21 05 53, 22 05 53, 23 05 53, 25 05 53 IDENTIFICATION FOR FIRE SUPPRESSION, PLUMBING, HVAC, INTEGRATED AUTOMATION

1. All piping shall be labeled at change of direction ±50 feet minimum intervals, and at both sides of wall or floor penetrations.
2. All site utility piping shall be labeled with underground detectable type plastic line markers. The tape shall be multi-ply tape consisting of solid aluminum foil core between two layers of plastic tape. Line markers shall be located 6" - 8" below finished grade and indicate pipe service.
3. Identification shall comply with ANSI A13.1 for lettering size, length of color field, colors and viewing angles of identification.
4. Label location:
 - 4.1. Equipment labels shall be located where easily seen from the front of the equipment. When the equipment itself is not able to accept the label (i.e. pressure sensitive tape does not stick to the surface) the tag shall be mounted in an appropriate location on the wall. Equipment tags shall include such information as capacity, voltage, static pressure ratings, CFM, GPM, TDH, HP and pressure settings based on actual system setup at time of commissioning.
 - 4.2. Equipment, main isolation valves and air terminal devices located concealed above ceilings or access doors shall be labeled utilizing an engraved tag or printed label (Brother P-Touch or similar), black 18-point size letters, on white background, mounted on the ceiling grid or on the access door. Color and system coordinated with OUA and A/E team.
5. Piping shall be labeled utilizing one of the following:
 - 5.1. Standard pre-printed, permanent adhesive, color coded, pressure sensitive vinyl pipe markers, complying with ANSI A13.1. Do not use plastic bands to hold on pipe markers. All labels to be taped around pipe on both ends.
 - 5.2. Snap-on application of pre-tensioned semi-rigid plastic pipe marker.
6. Arrows and Color Banding: Print each pipe marker with arrows indicating direction of flow, either integrally with piping system service lettering (to accommodate both directions), or as separate unit of plastic. Piping shall also be marked with color band codes; color codes shall be as developed and specified by OUA. Flow arrows shall be reviewed by Associate prior to installation to verify proper direction and application.

7. Valves shall be tagged utilizing one of the following:
 - 7.1. Brass Tags: 1½" diameter, 19-gage polished brass valve tags with stamp-engraved piping system abbreviation in ¼" high letters and sequenced valve numbers ½" high and with 5/32" hole for fastener. The tag engraving shall be filled with black enamel.
 - 7.2. Plastic Tags: 3/32" thick engraved plastic laminate valve tags with piping system abbreviation in ¼" high letters and sequenced valve numbers ½" high and with 5/32" hole for fastener.
8. Valve tags shall include an abbreviation for the type of service. The abbreviations shall be as follows or as directed by OUA.
 - 8.1. Plumbing Systems: DCW=potable cold water; DHW=potable hot water; DRHW=re-circulated hot water; GAS=natural gas.
 - 8.2. Fire Protection Systems: LSP=Limited sprinkler, Fire Line, Dry pipe Sprinkler, Wet pipe Sprinkler, .
 - 8.3. HVAC Systems: CW=chilled water; HW=hot water heating; ST=steam (LPS =<15 psig, MPS=>15 psig or < 65 psig; HPS >65 psig. SC=steam condensate. Add S or R to letter for supply or return when needed) (LPSC, MPSC, HPSC pressure still apply).
 - 8.4. Mechanical equipment shall also be tagged with make, model, performance data and BAS tag number. Extent of performance data shall be reviewed with OUA.
 - 8.5. TW=condenser water (add S or R to letter for supply or return when needed).
9. Valve tags shall be attached to the valve bonnet with brass or stainless steel chain.
10. Valve Chart: A typewritten directory of all valves shall be framed under glass and wall mounted. Coordinate location with KSU OUA. The valve list shall include the valve number, type of service, size, approximate location, and equipment or area isolated. A copy of the valve chart shall be included in the O&M manual.
11. Install labels on ceiling grid at VAV terminal unit locations, duct smoke detectors, differential pressure sensors, static pressure sensors and piping system isolation valves. Ceiling tag shall indicate VAV terminal designation along with thermostat BAS tag. All expansion tanks, relief valves and pressure reducing valves shall have system set pressure attached to device once final set point is complete.
12. Apply printed labels on thermostats, humidistat's, CO2 sensors and other wall mounted control devices to identify the type of controller or sensor, equipment controlled and Air Handling Unit system association. Engineer shall call out in contract document for contractor label and tag all system components to match the current or new BAS naming convention so we have continuity within the building complex.

21 07 00, 22 07 00, 23 07 00, 25 07 00 FIRE SUPPRESSION SYSTEMS, PLUMBING, HVAC, INTEGRATED AUTOMATION, INSULATION

1. The following plumbing piping systems shall be insulated (minimum thickness shall be reviewed with OUA engineers based on application and design needs):
 - 1.1. Potable hot, cold and re-circulated water. Maintain vapor barrier on all cold water lines.
 - 1.2. Horizontal storm piping inside building until first vertical drop. Vapor barrier is to be maintained.
 - 1.3. Roof drains sumps inside the buildings shall be insulated tight to deck.
 - 1.4. Other piping systems prone to condensation, hot systems for personal protection as directed by OUA. Domestic water service main, backflow preventer, meters, and valving associated with service entrance line up shall be insulated. Removable insulation covers will be acceptable.
 - 1.5. Ice machines or kitchen equipment drainage.
2. The following mechanical piping systems shall be insulated (minimum thickness shall be reviewed with OUA engineers based on application and design needs.):
 - 2.1. Chilled water piping including all valves, sensing lines and tubing, shall be insulated to eliminate condensation.
 - 2.2. A/C condensate lines if install in unconditioned location
 - 2.3. Heating water piping.
 - 2.4. Dual temperature heating and cooling piping.
 - 2.5. Steam piping.
 - 2.6. Steam condensate piping.
 - 2.7. Refrigerant piping (hot gas, suction and liquid). Refrigerant lines outside of building shall be designed with UV protection. (PVC jacket, mastic coating with white finish including a protective all weather jacket.)
 - 2.8. System make-up water piping, backflow, and meters shall be insulated in such a manner as to provide access to test ports and readers.
 - 2.9. Air conditioning condensate drain piping located in interior or penthouse areas where surfaces could be subject to condensing.
 - 2.10. Other piping systems and equipment as directed by OUA.
 - 2.11. Expansion Joints: Removable jackets.

- 2.12. Steam Control Valves: Pressure reducing valves, humidifier canisters and steam traps – removable jackets.
- 2.13. Steam Traps 50 psi or greater – removable jackets.
- 2.14. Steam shut-off valves – insulate flanges and body with standard insulation similar to piping – allow for operation or actuator.
- 2.15. Equipment and expansion tanks, chilled water pumps, air separators, heat exchangers, condensate pump tanks, pressure powered pumps, standard commercial domestic water heaters and storage tanks shall also be provided with insulation.
- 2.16. Pipe insulation subject to water damage shall be covered with PVC or aluminum jacketing so insulation that may be subject to discharge from strainers, relief valves, automatic air vents or other drain taps is protected with the correct type of jacketing material based on type of discharge exposure.
- 3. The following duct systems shall be insulated:
 - 3.1. Outside air intake ductwork and plenums, utilize rigid board insulation with weld on pins.
 - 3.2. Supply air ductwork.
 - 3.3. Return air ductwork when located in unconditioned areas.
 - 3.4. Relief air ductwork within 5'-0" of relieve louver.
 - 3.5. Boiler breaching and thimbles as required by NFPA and state codes, and shall be reviewed by OUA. All breeching shall be designed for condensate removal and treatment were required.
 - 3.6. Steam vents, or any safety relief vents shall be designed for thermal expansion thru roof structures and shall be designed for ventilation at building/roof penetrations. Penetration and curb details shall be required in all designs and shall be reviewed with OUA for final approval.
 - 3.7. Other duct systems as directed by OUA.
 - 3.8. Internal duct liners shall not be used except in rare cases and approved by OUA. When used they should be fiber lock or closed cell elastomeric type with antimicrobial coating and all end seams shall be sealed. NO exposed insulation will be accepted. Use of double wall duct design may be used and all insulated ductwork designs shall be reviewed with OUA.
 - 3.9. Review duct system sound attenuation and special provisions with the OUA. Provide details on any roof mounted equipment so all sound transmission and vibration isolation is accounted for. Roof curbs shall be designed with sound acoustic designs at all locations. NC curves shall be specified. Review all curbs details for sound transmissions with OUA.
- 4. Removable jackets shall be wired into place. All materials shall be rated for application.

5. Insulation Smoke & Flame Spread

- 5.1. Mechanical insulation (insulation, jackets, coverings, sealers, mastics and adhesives) shall have a flame-spread index of 25 or less, and smoke-developed index of 50 or less, as tested by ASTM E 84 (NFPA 255) method. Low VOC to meet LEED requirements shall be required in all installations.

6. Fiberglass Pipe Insulation

- 6.1. Fiberglass Piping Insulation: ASTM C547, Class 1 unless otherwise indicated.
- 6.2. Jackets for Piping Insulation: ASTM C 921, Type I for piping with temperatures below ambient, Type II for piping with temperatures above ambient.
- 6.3. Encase pipe fittings insulation with one-piece, pre-molded PVC fitting covers.
- 6.4. Encase exterior fiberglass piping insulation with aluminum jacket or PVC wrap with weatherproof construction. Insulation and jacketing systems specifically designed for outdoor or otherwise hazardous locations may be considered. Review with OUA.
- 6.5. Pipe insulation exposed within reach of the public or in food service areas shall be covered with 0.5mm thick PVC covers. Johns Manville Zeston, Ceel-Co or equivalent.
- 6.6. Pipe insulation exposed to blow down, strainer discharge or rain via tunnel entrance shall be covered with PVC jacket or aluminum jacket to a weather proof condition.

7. Flexible Unicellular Pipe Insulation (ARMACELL, AEROFLEX, K-FLEX, AEROCCELL)

- 7.1. Flexible unicellular insulation may be used on refrigerant piping. Other piping systems may utilize flexible unicellular insulation if approved by OUA.
- 7.2. Insulation exposed to the outdoors or UV radiation shall be protected with PVC jacket.
- 7.3. Insulation shall have good permeable feature, handle extreme heat and cold and shall be closed cell properties.

8. Cellular Glass or mineral wool Pipe Insulation (Preferred)

- 8.1. Cellular glass or mineral wool pipe insulation shall be used to insulate steam and steam condensate piping in areas subject to moisture or water damage such as pits and vaults.
- 8.2. Cellular glass or mineral piping insulation may be used for direct buried steam piping provided the proper wrap is used to protect the piping and insulation, such as “Gilsulate” or other pre-approved piping system.

9. Calcium Silicate Pipe Insulation: Consult with OUA for special requirements.

10. Vermiculite or Gilsulate Buried Pipe Insulation: Consult with OUA for special requirements and detailing.
11. Fiberglass Duct Insulation
 - 11.1. Rigid Fiberglass Ductwork Insulation: ASTM C 612, Class 1.
 - 11.2. Flexible Fiberglass Ductwork Insulation: ASTM C 553, Type I, Class B-4.
 - 11.3. Jackets for Ductwork Insulation: ASTM C 921, Type I for ductwork with temperatures below ambient; Type II for ductwork with temperatures above ambient.
 - 11.4. Rigid insulation shall be used in all exposed locations unless otherwise approved by OUA.
 - 11.5. Duct insulation thickness shall be increased in areas of above normal ambient temperature such as attics or near major steam pressure reducing stations to reduce heat gain.
12. All insulation categories above: any location exposed to weather, fluids (blow-downs), maintenance abuse (standing) shall be protected by a suitable jacket system.
13. All insulation thicknesses and densities shall be selected to meet or exceed the energy reductions of current House Bill 251 and ASHRAE 90.1 and utilize ecologically friendly technology when possible. Review with the OUA.
14. Ductwork located outside exposed to weather shall be designed for wind loading, snow and ice loading, and shall be 100% water proof and shall be designed to shed rain water off any horizontal ductwork being installed. Ductwork passing through roof or exterior walls shall have design details and coordinated with project architect. All HVAC designs shall be incorporated with architectural flashing details when applicable.

21 08 00, 22 08 00, 23 08 00, AND 25 08 00 COMMISSIONING OF FIRE PROTECTION, PLUMBING, HVAC AND INTEGRATED AUTOMATION

1. This service shall be reviewed with OUA. The minimum scope and standards will be as outlined in the current Building Commissioning Association Guidelines and as reviewed with KSU OUA. Partial commissioning of buildings or MEP systems shall be avoided unless approved by OUA. The commissioning process shall also cover both seasonal changes for up to one year as a minimum service.

22 05 23, 23 05 23 GENERAL DUTY VALVES FOR PLUMBING, HVAC PLUMBING

1. Submittal Data: Information on each valve, including parts list and supplier contact name and phone number, shall be submitted to the A/E for review. This information shall be included in the operational maintenance manuals.

2. Valves shall be by one manufacturer whenever possible.
3. Valves (General):
 - 3.1. Hydronic systems shall utilize full port quarter-turn ball valves for isolation up to and including 2-1/2". Utilize butterfly valves for 3" and above. Trim, seat and valve material shall be as appropriate for application.
 - 3.2. Valve bonnet must be repairable flanged or union style. Steam, condensate and high temperature hot water (210°F. and higher), shall utilize rising stem.
 - 3.3. Drain valves and manual air vents shall be comprised of a full port ball valve with a capped hose end connection. The cap shall be attached to the valve with a chain.
 - 3.4. Auto air vents (only in unfinished or mechanical spaces) shall be Hoffman 79 or approved equivalent. All shall be piped to nearest floor drain where possible. All air vents above finished spaces shall be a 3/4" ball drain valve with hose thread connection, cap and chain.
 - 3.5. Potable water ball valves shall be quarter-turn, full port, and of bronze construction. All plumbing fixture stop valves shall be 1/4 turn ball type. (Chicago Faucet, McGuire (commercial division), T&S and Watts) Other manufacturers shall be pre-approved by OUA.
 - 3.6. Steam control valves shall be installed with actuator/shaft one bolt pattern off top dead center to minimize controller heat damage. Steam control valves are to be selected for proper steam pressure and seat material type shall be coordinated and approved by OUA. All steam control valve installation will be provided with manual (automatic optional with OUA Approval) isolation valve upstream of any installation regardless of steam pressure or application.
 - 3.7. Install steam system strainers with strainer leg in the horizontal plane.
 - 3.8. All manual isolation Valves located in mechanical rooms above 7'-0" shall be equipped with chain wheels. Chain wheels' installation shall be coordinated and approved for use by OUA.
 - 3.9. Three-way valves when used shall not be designed with a reduced port when used in a by-pass mode of operation. All control valves CV values shall be reviewed with OUA engineers.
4. Valve End Connections:
 - 4.1. Potable water systems (2 1/2" and smaller): Valves shall have soldered connections where used for zone isolation or have threaded connections when used in conjunction with a union for equipment isolation. Valves 3" and larger with hand wheel above 7'-6" A.F.F. shall have chain wheel actuator, with chain down to 7'-0" A.F.F. if located in mechanical rooms.
 - 4.2. Potable water systems (3" and larger): All valves shall have flanged connections.
 - 4.3. Hydronic heating and cooling systems (2" and smaller): Valves can have soldered, grooved, (Pro-Press style where approved) or flanged connections where used for zone isolation or have threaded connections when used in conjunction with a union for equipment isolation. Multi-

purpose valves are acceptable. Suction diffusers are acceptable; blow down valve shall be piped to nearest floor drain. Suction diffusers shall be insulated with removable covers to allow removal of basket.

- 4.4. Hydronic heating and cooling system (2½" and larger): Valves shall have flanged connections.
- 4.5. Steam and steam condensate (1" and smaller): Valves shall have threaded connections.
- 4.6. Steam and steam condensate (2" and larger): Valves shall have flanged connections.
- 4.7. Mechanical and pressure joint systems are acceptable on applicable piping services except for steam and condensate.
- 4.8. All buried potable water isolation valves shall be furnished with valve stem key, curb box assembly and lid shall call out water, painted blue and tagged on underside of lid per OUA requirements.

VALVE PRESSURE/TEMPERATURE CLASSIFICATION SCHEDULES

1. Valves 2-inches and smaller:

<u>SERVICE</u>	<u>GLOBE</u>	<u>BALL</u>	<u>CHECK</u>	<u>GATE</u>
Heating Water	150	150	150	
Chilled Water	150	150	150	

2. Valves 2½ and larger:

<u>SERVICE</u>	<u>GLOBE</u>	<u>BALL</u>	<u>CHECK</u>
<u>GATE</u>			
Domestic Hot & Cold Water	125	150	125
Heating Water	125	200	125
Chilled Water	125	150	125

3. Steam (15 psig or less) (low pressure) (150 class) 16 psig to 65 psig 150 class, Engineers please specify rising stem gate valves when utilized.
4. Steam Condensate (gravity, low pressure) (15 psig or less) (150 class) Please use rising stem valves when specified.
5. Steam Condensate (gravity, high pressure) (300 class) Rising stem on gate valves.

6. Steam (15 to 125 psig) ½" to 2½" dia. 300 class; 3" to 18", 150 class, 300 class at power plant or connected to plant's main header. Rising stem on gate valves.
7. Steam Condensate (pumped) (150 class)
8. Feed Water (Class 300)
9. Natural Gas valves shall be classified to meet Utility Service being provided. Coordination and verification of all natural gas valves shall be done with Utility Service Provider and OUA. Gas Valves shall be UL, CSA and FM listed for pressure and classification being used. All valving shall meet ANSI Z21.21, AGA 3-88 and ANSI/ASME B16.33 for Min. rating of 150 PSIG on low pressure systems. If used on fire protection systems FM approval is required. Natural gas valves used for emergency shut off for lab rooms, engineers need to verify if lab is open to public and non-secured or secured. If rooms are non-secured in addition to the emergency shut-off valve located by exit a second isolation valves with a keyed interlock is to be provided under the design for any un-secured location.

VALVE SCHEDULE

1. Ball Valves – 1" and Smaller

1.1. Accepted Manufacturers:

- 1.1.1. Conbraco (Apollo)
- 1.1.2. Crane
- 1.1.3. Grinnell
- 1.1.4. Jenkins
- 1.1.5. Nibco (not on potable water systems)
- 1.1.6. Stockham
- 1.1.7. Watts
- 1.1.8. Milwaukee
- 1.1.9. Milwaukee Butterball
- 1.1.10. Hammond

2. Ball Valves – 1¼" to 2"

2.1. Accepted Manufacturers:

- 2.1.1. Conbraco (Apollo)
- 2.1.2. Grinnell
- 2.1.3. Nibco
- 2.1.4. Stockham
- 2.1.5. Watts
- 2.1.6. Milwaukee
- 2.1.7. Milwaukee Butterball

3. Gate Valves - 2" and Smaller (Class 125) all valves located in mechanical spaces above 7'0" finished floors are to be provided with chain wheel actuators.

3.1. Accepted Manufacturers:

- 3.1.1. Crane
- 3.1.2. Grinnell
- 3.1.3. Hammond
- 3.1.4. Jenkins
- 3.1.5. Lunkenheimer
- 3.1.6. Milwaukee
- 3.1.7. Nibco
- 3.1.8. Powell
- 3.1.9. Stockham

4. Gate Valves – 2½" and Larger (Class 125)

4.1. Accepted Manufacturers:

- 4.1.1. Crane
- 4.1.2. Grinnell
- 4.1.3. Hammond

- 4.1.4. Jenkins
- 4.1.5. Lunkheimer
- 4.1.6. Milwaukee
- 4.1.7. Nibco
- 4.1.8. Powell
- 4.1.9. Stockham

5. Globe Valves - 2" and Smaller

5.1. Accepted Manufacturers:

- 5.1.1. Crane
- 5.1.2. Grinnell
- 5.1.3. Hammond
- 5.1.4. Jenkins
- 5.1.5. Nibco
- 5.1.6. Stockham

6. Swing Check Valves - 2" and Smaller

6.1. Accepted Manufacturers:

- 6.1.1. Crane
- 6.1.2. Grinnell
- 6.1.3. Hammond
- 6.1.4. Jenkins
- 6.1.5. Nibco
- 6.1.6. Stockham

- 7. All high performance butterfly (triple or quad duty offset with "0" bubble leakage) or gate valves shall be reviewed with OUA prior to accepted manufacturers. (Centerline, Zwick preferred, Vanessa, Quadax and Flowseal) These valves shall have all stainless steel seals, shafts, low torque gear driven operators, hand wheels, flanged connections. Minimum 1-year warranty from time of installation.

8. Installation of multipurpose valves shall also be supplied with manual isolation valves so check valve in multipurpose valve can be worked on and maintained without draining system.
9. All drain valves shall be ball valves with ¾" hose adaptor connection. Valve shall be provided with chain on end with solid gasketed end cap

INSTALLATION OF VALVES

1. Valves shall be provided in suitable locations at each item of equipment, branch circuit, riser or section of piping as indicated or required for proper and safe operation of the system and to facilitate maintenance and/or removal of all equipment and apparatus. On horizontal pipe runs, install all valve stems vertically up where possible and in no case shall the stems be turned more than 90 degrees from the vertically up position. Design shall also incorporate interstitial isolation valves for partial system isolation. Number of isolation valves shall be reviewed with OUA engineers.
2. Install valves in compliance with manufacturer's installation instructions.
3. Potable water and/or hydronic systems (2" and smaller) shall utilize valves as indicated with soldered connections where used for zone isolation, or threaded connections when used in conjunction with a union for equipment isolation.
4. Potable water and/or hydronic systems (2-1/2" and larger) shall utilize valves with flanged connections.
5. Steam and steam condensate systems (2" and smaller) shall utilize valves with threaded connections.
6. Steam and steam condensate systems (2-1/2" and larger) shall utilize valves with flanged connections.

EXPANSION COMPENSATION

1. Expansion loops are preferred, when possible, to eliminate maintenance requirements. All designs shall include full dimensional detailing, placement of slides and anchor points. All associates shall submit expansion loop calculation for OUA records.
2. Discuss preferred options with OUA.
3. Expansion devices, when required, shall be reviewed with OUA. Consultant and manufacturer shall include as part of design all expansion calculations. Flanged packed expansion joint is preferred; the less costly externally pressurized joint design should be reviewed with OUA prior to approval.

4. All expansion devices shall be provided with design installation diagrams/details with performance information in addition to being scheduled and specified. Designs shall locate all anchors, guides and mounting devices.
5. Preferred manufacturers are: Metroflex, Hyspan, Keflex, (Victaulic is not acceptable and will not be specified for this use)

DIVISION 21 FIRE SUPPRESSION

1. General Requirements: The Associate shall comply with all necessary building codes pertaining to the fire protection requirements. Associate will also obtain flow test information from the local authority. Submit all testing data to the OUA. Design drawings are to indicate fire and smoke rated walls and shall indicated wall ratings on all design documents, fire stopping requirements and details shall be reviewed with OUA.,
2. UL and FM Compliance: Fire protection system materials and components shall be Underwriter's Laboratories listed and labeled, and Factory Mutual approved for the application anticipated. Associate shall verify Factory Mutual requirements since their requirements may be stricter than the Ohio Basic Building Code and NFPA.
3. Fire main entrance details and distribution main lines shall be indicated on the contract drawings. Sprinkler head installation details (center of tile preferred), isolation and test drain design (discharge all testing outlets to the outdoors on concrete splash blocks) All of these locations shall be shown. Not intended to be hydraulic installation drawings- but for overall building design coordination.
4. Systems:
 - 4.1. Fire suppression for kitchen hoods shall be a wet chemical system. Dry chemical systems will not be allowed.
 - 4.2. Halon systems will not be permitted.
 - 4.3. Carbon dioxide systems shall be avoided. Special permission must be granted to the Associate by OUA and KSU Fire Marshal.
 - 4.4. Use of glycol systems shall be reviewed with OUA.
 - 4.5. Clean agent fire system shall be DuPont FM-200 or Ansul-Inergen (data closets, data centers, high asset value areas). Review with OUA.
5. Extra Materials
 - 5.1. Valve Wrenches: Furnish valve wrenches for each type of sprinkler head installed. Store in suitable cabinet.

- 5.2. Sprinkler Heads and Cabinets: Furnish extra sprinkler heads per NFPA 13 requirements with cabinet of each style included in the project. Cabinet(s) shall be mounted as directed by the OUA. Include associated escutcheons and protect all in sealed plastic bags.
6. Piping: Fire protection piping shall be of one of the following:
- 6.1. Copper Tubing – Drawn Temper: ASTM B 88, Type L.
 - 6.2. Steel Pipe: ASTM A 120, Schedule 40, seamless, black steel pipe, plain ends 3” and smaller.
 - 6.3. Steel Pipe: ASTM A 120, Schedule 10, seamless, black steel pipe, plain ends 4” and larger.
 - 6.4. Other piping types or material (Blazemaster or similar) as approved in writing by OUA.
7. Fittings shall match the piping material and meet NFPA requirements.
- 7.1. Quick adjust, single strap tap-in fittings shall not be permitted. All fittings shall be approved by OUA.
 - 7.2. Flexible sprinkler head connectors are acceptable. If UL and FM approved.
 - 7.3. Mechanical Tees’s fittings with Gasket having a single u-bolt mounting configuration are not permitted for use under any condition.
 - 7.4. Adjustable stem fitting shall also be prohibited.
8. Sprinkler Heads
- 8.1. Sprinkler Heads in Occupied Areas: Concealed style head with white escutcheons and white heads are preferred in high end occupied areas; recessed in most occupied areas where approved by OUA. White escutcheons and heads preferred. If optional colors are required- must be approved by OUA and Sprinkler Head manufacturer to maintain ratings.
 - 8.2. Sprinkler heads in mechanical, electrical, data closet and elevator equipment rooms shall be standard brass pendant or upright style with protective wire basket and 212 deg. rating. Review with OUA.
9. Valves and Fire Alarm Devices for Fire Protection Systems: Consult with OUA for specific requirements. Backflow based on system pressure needs.
10. Miscellaneous Equipment and Specialties: Backflow protection shall be provided with an approved double-check valve. Review manufacturers with OUA; Watts, Ames and Conbraco preferred.
11. Review system flushing design with OUA to meet NFPA 25 flushing requirements. Flushing and pressure testing is required for all design installations. Consultants to comply with all NFPA and AHJ.

12. Test nozzles shall be directed outside whenever possible. Directing the test discharge to a slop sink or floor drain should be avoided due to damage of over-spray and/or over-loading of the drain line. Test nozzles directed outside shall be located such that the spray will not affect pedestrians or damage lawns. Concrete splash blocks shall be provided when location requires. Review alternate testing devices with OUA.
13. A pressure gage with ball valve and double check valve (similar to Watts 904) shall be installed at all limited area sprinkler connections to the domestic water system. Limited area sprinkler system piping shall be of a material matching the domestic water system to which it is connected.
14. Fire pumps shall be avoided when possible due to increased generator size and maintenance requirements. When required, system shall be reviewed with the OUA. Bell & Gossett, Peerless, Patterson, or equivalent per OUA approval.
15. Fire department connection to be 4" "Storz" type for Kent campus; all Regional campuses to review with local fire department prior to design. Exterior riser piping shall be painted with durable red paint – coordinate final color with the OUA. Device shall be permanently labeled for use.

DIVISION 22 PLUMBING

22 10 00 PLUMBING PIPING AND PUMPS

1. Codes & Standards

- 1.1. Hydraulic Institute Compliance: Design, manufacture and install plumbing pumps in accordance with "Hydraulic Institute Standards."
- 1.2. National Electrical Code Compliance: Components shall comply with NFPA 70 "National Electrical Code."
- 1.3. UL Compliance: Plumbing pumps shall be listed and labeled by UL and comply with UL Standard 778 "Motor Operated Water Pumps."
- 1.4. NEMA Compliance: Electric motors and components shall be listed and labeled NEMA.
- 1.5. SSPMA Compliance: Test and rate sump and sewage pumps in accordance with the Sump and Sewage Pump Manufacturers Association (SSPMA) Standards.

2. All plumbing and Lab piping systems shall be tagged for type of service.

3. Pumps

3.1. In-line Hot Water Circulators brass or stainless steel construction:

3.1.1. Taco

3.1.2. Bell & Gossett, ITT

3.1.3. Watts

3.1.4. Others to be reviewed with OUA.

4. Sump Pumps:

4.1. Sump pumps shall be installed in a manner to facilitate easy removal for maintenance. Review type with OUA.

4.2. Sump pumps installed in pits subject to debris and trash accumulation shall be installed in a manner to minimize clogging.

4.3. Provide alarm panel and level alarms communicating through the BAS when required and review construction and features with OUA.

4.4. Sumps – Review all material types and size with OUA.

4.5. Acceptable manufacturers:

4.5.1. Hydromatic

4.5.2. Weil

4.5.3. Little Giant – Elevator Sump only or approved equal.

4.5.4. Others to be reviewed and approved by OUA.

5. Domestic Water Booster Pumps:

5.1. Pumps shall be duplex and 100% redundant for both flow and pressure. Main headers shall be of stainless steel construction. Control panels shall be BACnet supplied completed with HOA functions, dual control circuits and power distribution. All packages shall be provided with VFD of manufacturers indicated in design guide. Exceptions on VFD's shall be reviewed and approved by OUA. Pumps shall be able to operate at low flow conditions without backpressure or hammering. The pumps shall be designed with Bacnet IP interface so KSU is able to communicate with Johnson Controls Metasys system.

5.2. Manufactures: Tigerflow, Patterson Pump, Delta-P, Canariis, Aurora and Quantum Flow.

22 11 00 FACILITY WATER DISTRIBUTION

1. Regulatory Requirements: Comply with the provisions of the following:
 - 1.1. ASME B 31.9 “Building Services Piping” for materials, products and installation. Safety valves and pressure vessels shall bear the appropriate ASME label.
 - 1.2. ASME “Boiler and Pressure Vessel Code” Section IX, “Welding and Brazing Qualification” for Qualifications for Welding Processes and Operators.
 - 1.3. OBBC Ohio Basic Building Plumbing Code.
 - 1.4. Domestic Water Systems and Components shall be furnished Lead Free up to weighted average 0.25% for wetted surfaces. Variance shall be reviewed by OUA.
2. Maintenance Stock: Furnish one valve key for each key operated hydrant, Bibb, or faucet installed.
3. Materials: The following is a list of approved manufacturers for major components. Other manufacturers may be submitted for consideration by the Owner during design. Where less than three are listed, the manufacturer listed shall be used as minimum requirements and the Associate shall submit cut sheets for approval.
 - 3.1. Basket Strainers: Screens shall be removed, cleaned and reinstalled prior to project closeout. Strainer screens to be stainless steel.
 - 3.2. Circuit Setter Balance Valves: Taco, Inc., Autoflow, B&G or approved equal.
 - 3.3. Bibbs and Faucets: Chicago Faucet Co., Zurn, Sloan, Kohler, American Standard, Moen (commercial grades).
 - 3.4. Exterior Wall Hydrants:
 - 3.4.1. Smith, (J.R.) Manufacturing Co.
 - 3.4.2. Zurn Industries Inc., Hydromechanics Division
 - 3.4.3. Wade
 - 3.4.4. Prier
 - 3.4.5. Woodford
4. Backflow Preventers:
 - 4.1. Reduced pressure backflow preventers shall be installed on the incoming water service of all new buildings and installed on existing buildings whenever there is substantial work in the area of the service entrance. Analyze affect on existing pressures and review requirements

before installation on existing systems with OUA. Provide parallel backflow preventers with 100% redundant capacity unless reviewed with OUA.

4.2. A funnel and drain line shall be attached to the relief port of the backflow preventer, full size and routed and safe wasted into the floor drain. Associate to determine if floor drain will accept discharge rate or extend to outside of building. Drainage layout shall be reviewed with OUA. Floor calculation shall be performed and evaluated by Associate so risk and be assessed by KSU.

4.3. A floor drain shall be installed near the water service entrance on all new installations or as directed by OUA. Leak detection shall be located as required and shall alarm through the BAS.

4.4. Reduced pressure backflow preventers shall be installed on all makeup water lines to mechanical equipment.

4.5. The reduced pressure backflow assembly shall be tested and a certificate of approval inserted in a vinyl sleeve and supported from the device or mounted on the wall nearby. Copies shall be furnished to local and or state authorities as required.

4.6. Manufacturers: Watts Regulator Co., Febco, Conbraco, Ames (preferred).

5. Domestic Water Pressure Regulating Valves:

5.1. Spence Engineering Co., Inc. (preferred)

5.2. Spirex Sarco Co.

5.3. Watts Regulator Co.

5.4. Equipment must be labeled with Design Pressures. Include pressure gauges upstream and downstream of device.

6. Water Meters:

6.1. Neptune, Inc. (Kent Campus)

6.2. Water meters shall be required on the Kent campus. The meters shall be provided with Neptune “Tri-Con E3” and City of Kent’s Remote Reader device shall be required if direct connection to water service on city mains. Meters shall read in gals per cubic feet and communicate with a 4-20ma signal non –pulse signal. Tri-Con reader shall be connected to building BAS.

6.3. Water meters at regional campuses must be coordinated with the local water utility and the OUA and water meter or flow device shall be installed so flow meter or meter can communicate to the BAS.

- 6.4. Water “deduct” meters shall be installed on all cooling tower make-up service lines or lawn irrigation, fountains or service in which the water is not discharged into sanitary system. Remote reading features above apply.
7. Relief Valves: Watts Regulator Company or approved equal:
- 7.1. Relief valves shall be piped to discharge in a floor drain with only one elbow. If more than one elbow is required, a union shall be installed close to the valve to facilitate easy replacement. In no cases shall there be more than three elbows from valve to point of discharge.
8. Water Hammer Arresters: PPP, Inc. or approved equal:
- 8.1. Water hammer arresters shall be installed in an accessible location and provide an isolation valve.
- 8.2. Water hammer arresters shall be installed at all major fixture groupings and wherever there is a potential for water hammer.
- 8.3. Inverted air tube not acceptable.
9. Dielectric Waterway Fittings (Watts) or approved equal
- 9.1. Dielectric fittings are required at all dissimilar metal waterway connections on domestic water systems. Bronze or brass valve is an acceptable dialectic.
10. Y-Pattern Strainers: Permanent strainer screens shall be of stainless steel construction. Strainers 6” and above shall also be furnished with steel start up screens. Complete installation with nipple, ball valve with hose threads connection cap and chain.
11. Pipe and Tube Materials:
- 11.1. Install type L copper with wrought copper fittings on domestic water lines 3” and smaller. Piping 2” and smaller shall have wrought copper fittings with 95-5 tin antimony solder. 2½” and 3” copper piping shall use wrought copper fittings with Silfos 7 silver solder. Coordinate 4” and above piping materials with OUA.
- 11.1.1. Mechanical coupling systems shall be coordinated with OUA.
- 11.2. Install type K copper pipe for all domestic water piping below grade. Where joints below grade are unavoidable, the joints shall be made with silver solder.
- 11.3. All pipe penetration through concrete or any building structure shall be isolated with Flexcraft wall sleeve (PVC or Galvanized), Proline Sleeve for poured concrete, and EPDM rubber links, Link-seal, Westatlantic, or approved equal as appropriate. All concrete wall penetration sleeve shall have a Puddle Flange configuration.

- 11.4. There shall be no pro-press or grooved piping connections in concealed spaces, above rigid ceilings or in concealed chases or shafts. This type of fitting can only be installed in accessible locations or above a lay-in ceiling. Do not install this type of fittings above 2-1/2" diameter without authorization from the OUA. All piping within mechanical, electrical or tele/data shall be soldered, brazed or welded. Screwed or flanged shall be reviewed with OUA.
12. Drain valves shall be installed at all low points in the system to facilitate drainage and shall incorporate minimum 3/4" threaded hose adapter with chained end cap. Larger sizes shall be reviewed with OUA.
13. Consideration shall be given to future alteration and expansion of the system i.e. over-sizing lines or providing capped branches for future connections.
14. Whenever possible, the domestic water piping shall be designed and installed in public areas such as over corridors, shafts. Avoid electrical, tele/data, elevator, computer classrooms or research areas unless piping systems serve that area.
15. Isolation valves shall be installed on all fixture groups and main branch lines. All domestic water valves shall be full port on 2 1/2" and smaller. Apollo, Milwaukee or Hammond as manufacturers. (Review isolation valve requirements with OUA prior to final design.) There shall be NO combined water service which cannot be isolated with valves to separate bathroom groups. Each remote fixture shall be provided with isolation ball valve of any main or branch circuit. Plumbing fixtures shall have independent isolation valves by type or group but not more than 4 fixtures in any one group. Men's or woman's toilet groups shall have separate feeds so not more than one toilet room is required to be shut down if fixture and branch lines develops a leak.
16. Isolation valves shall be installed on all equipment, and shall be installed to sectionalize any system by floor or wing. Review maintenance isolation and drain location requirements with OUA.
17. All exterior wall hydrants shall be non-freeze type and include anti-siphon device.
18. Supports, clamps and hangers: specify materials that incorporate continuous insulation, dielectric and vapor barrier (cold water). Hydra-sorb insulated type pipe clamps preferred for all domestic hot, cold or hot water recirculating piping systems.
19. Domestic cold water lines, ice machines drain lines, roof drains, basin, first 10'-0" of riser and any horizontal rain leaders shall be insulated to maintain thermal barrier at all times, cutting of insulation to be limited and all raw edges of insulation to be sealed to maintain thermal barrier.

22 13 00 FACILITY SANITARY SEWERAGE, 22 14 00 FACILITY STORM DRAINAGE

1. Comply with the provisions of OBBC Ohio Basic Building Plumbing Code.
2. The following is a list of approved manufacturers for major components. Other manufacturers may be submitted for consideration by the Owner during design. Where less than three are listed, the manufacturer listed shall be used as minimum requirements and the Associate shall submit cut sheets for approval.
 - 2.1 Drainage piping specialties, including air admittance valves, backwater valves, expansion joints, drains and trap primers:
 - 2.1.1 Smith (Jay R.) Manufacturing Co.
 - 2.1.2 PPP, Inc. (trap primers)
 - 2.1.3 Tyler Pipe; Subsidiary of Tyler Corporation
 - 2.1.4 Zurn Industries, Inc.; Hydromechanics Division
 - 2.1.5 Wade Manufacturing Co.
 - 2.1.6 Studer Inc. (air admittance valves)
3. Floor drains installed in all public toilet rooms, all other toilet rooms' review with OUA. Trap primer to be flow type or electronic unless pressure drop can be designed into system.
4. Roof and floor drains shall be no smaller than 3" pipe size; floor drains in mechanical rooms shall be 4" minimum floor sink type. Mechanical room floor drains shall have grating cuts or funnels specified to allow drain piping to spill into floor drain with minimal splashing. Floor drain type of construction shall be specified to account for type of waste. Review material selection with OUA.
5. Roof drain overflows shall be reviewed with OUA for Locations and Termination methods. Designs need to be coordinated with Architectural roofing systems and details.
6. Associates shall consider Symphonic Roof drain type of designs on flat roofs of 1000 sf ft. and above along with a ½" pond roof design structure. Review design parameters with OUA.
7. Drainage and Vent Pipe and Fittings:
 - 7.1 PVC, Type DWV pipe and fittings, ASTM D2665, with solvent cemented joints; DWV plastic fitting patterns shall conform to ASTM D3311. Solvent: ASTM D2564.
 - 7.1.1 PVC pipe and fittings shall not be utilized in return air spaces, unless specified with appropriate accessories for code compliance.

- 7.1.2 PVC pipe and fittings shall be used for above grade piping unless specifically approved by OUA. Can be used for vent system if not exposed to ceiling plenum system or passing through fire rated assembly.
- 7.2 DWV piping below grade 6" size and above, material shall be coordinated with OUA.
- 7.3 Cast-iron soil pipe, ASTM A74, service weight, hub-and-spigot soil pipe and fittings. Clamps and compression gaskets, ASTM C564.
- 7.4 Hubless cast-iron soil pipe, CISPI Standard 301, service weight, cast-iron soil pipe and fittings, with neoprene gaskets conforming to CISPI Standard 310.
 - 7.4.1 Clamp-All brand, no-hub 4 band heavy duty couplings shall be used on all 2½" and larger sanitary piping, Huskey (or approved equal) Heavy Duty on piping 2½" and below. Min. of four band heavy duty shall be min. base of design.
 - 7.4.2 Bottom of all stacks greater than one story shall incorporate no hub pipe restraint fittings. Holdrite, Romac, Charlotte Pipe, Tyler Pipe or approved equal.
- 7.5 Review all storm drainage piping with OUA on material type.

22 20 00 HYDRONIC PIPING

1. The first choice for piping material for heating water and dual temperature water is copper. The Associate shall review the maximum size of piping and maintain all copper if the largest pipe size is 2½" or possibly even 3". KSU allows T-drill and Pro-Press fittings on copper systems only. See limitations of use on Pro-Press fittings.
2. All black steel piping over 2" in size shall have welded or grooved fittings using Victaulic or Grinnell type couplings.
3. Non-ferrous piping is preferred for all condenser water piping and other piping which is drained annually.
4. Drain valves (see section on valves) shall be installed on all low points in the piping and manual air vents shall be installed on all high points of the system. All drain valves to have threaded hose connections with hose cap and chain.
5. Manual air vent or automatic air vent with ball isolation valve, with extended drain to non-damaging locations shall be installed on all closed systems. Fill systems shall include reduced pressure backflow devices. System to include pressure gauge downstream of fill valves and tagged with final system pressure setting.
6. Hydronic Piping Specialties:

7. Expansion tanks, bladder tanks, buffer tanks, storage tanks approved manufacturers: Amtrol, Inc., Bell & Gossett ITT; Fluid Handling Division, Taco, Inc. Chemline or approved equal for chilled water. Associate shall review selection of these with OUA.
8. Multi-purpose pump discharge valves are acceptable in some cases. The Associate shall review with the University Engineer. All balance ports shall be extended to past the insulation thickness for use access.
9. Flexible connectors shall be braided Stainless Steel style; neoprene type isolators are not acceptable. Products Metraflex,
10. Associate's design shall be verified by Manufacturer and engineered by associate for all Expansion Joints designs including, Guides and Anchors. CxA shall ensure spacing between Guides, Anchors and Joint and means of attachment to structure meets details. Associates shall indicate and provide installation details and shall review the Installation and Design with KSU-OUA engineers. No 100% delegated design will be acceptable to KSU.
11. All fittings and piping associated with sample ports, pressure gauge, etc. shall be Schedule 80. (Typical for all system types.)
12. Provide adequate fittings to allow flushing and chemical pre-treatment of the entire piping system after initial installation.

22 30 00 PLUMBING EQUIPMENT

1. All domestic water heating equipment shall be of a high level of energy efficiency. This shall include insulation values, flue dampers, special controls, etc. Details of available options shall be evaluated by the Associate and presented to OUA for discussion. Point of use water heating equipment shall be considered where appropriate to reduce stand by losses and eliminate the need for recirculation systems. Domestic hot water re-circulating systems, where required shall be controlled by the BAS to allow scheduled operation. Provide a BAS temperature sensor in the pipe delivering hot water to the building.
2. Codes and Standards
 - 2.1 Provide water heater components, which are UL listed and labeled.
 - 2.2 NSF Compliance: Construct and install water heaters located in food service establishments in accordance with NSF 5, "Standard for Hot Water Generating Equipment for Food Service Establishments using Spray Type Dishwashing Machines."
 - 2.3 NEC Compliance: Install electric water heaters in accordance with requirements of NFPA 70, "National Electrical Code."

2.4 NFPA Compliance: Install gas fired water heaters in accordance with requirements of NFPA 54, "National Fuel Gas Code."

2.5 ASHRAE Compliance: Provide water heaters with Performance Efficiencies not less than prescribed in ASHRAE 90A, "Energy Conservation in New Building Design."

2.6 Designs shall incorporate all ASSE, ASTM, and ANSI standards and practices.

3. Warranty on Coil, Heat Exchanger and Burner: 5 years from date of Substantial Completion.

4. Gas Fired Domestic Water Heater Manufacturers:

4.1 Lochinvar Water Heater Corporation

4.2 Smith Corporation (A.O.); Consumer Products Division

4.3 State Industries, Inc.

4.4 PVI

4.5 RECO

4.6 Patterson Kelly

4.7 Bradford White

4.8 Rheem

5. Electric Resistance Domestic Water Heater Manufacturers:

5.1 Lochinvar Water Heater Corporation

5.2 Smith Corporation (A.O.); Consumer Products Division

5.3 State Industries, Inc.

6. Steam Fired Domestic Water Heat Exchanger Manufacturers:

6.1 Taco or approved equal.

6.2 SARCO

6.3 Patterson Kelly

7. Semi-Instantaneous Domestic Water Heater Manufacturers:

7.1 A.O.Smith

7.2 Patterson –Kelly

7.3 SARCO

7.4 Thrush Co. Inc.

7.5 Cemline Corp.

8. Steam heat exchangers used for domestic hot water production shall have straight thru or u-tube design (depending on budget) to facilitate cleaning.
9. Domestic hot water heat exchangers shall be installed in pairs when possible to maintain hot water production during cleaning. This is especially critical in laboratory buildings and residence halls. Each heat exchanger shall be sized to handle at least two thirds of the total peak load, if budget allows provide 100% redundant installations.
10. Piping to the exchangers shall be installed in a manner to have clear access for tube repairs and cleaning. Valving shall allow cleaning of one exchanger while the other remains active. Steam traps shall be dual set to allow for maintenance.
11. Capped threaded connections shall be installed between the exchanger isolation valves and the exchanger for the addition of chemical cleaning solutions thru the exchanger. A drain valve shall be located at the lowest level.
12. Domestic Hot Water Storage Tanks: Tanks shall be glass lined and include a ten-year warranty on the tank.
13. A bladder type expansion tank shall be installed on all domestic hot water systems. Expansion tank to be tagged for system operating pressure and provided with pressure gauge. All domestic water heaters on main distribution piping to be designed/engineered with temperature sensor and connected into KSU Building Automation System.
14. Solar thermal domestic hot water active system. Any System shall be considered with evacuated tube, or approved equal using a Glycol type design. The design shall include thermal insulated storage tanks, pumps, back up heating system. The design shall be of a drain down/back design with conventional water heater backup system. The system shall include all of the system main components and shall have a control system, which is Bacnet IP compatible with full read/write control interfaced to the KSU BAS/FMS. All systems shall be designed with an ROI, Energy analysis and will provide on-site training. Factory start-up and commissioning will be included in any design. The design shall be coordinated and approved by OUA. Manufacturers Rheem, AO Smith, and other as approved by OUA.

22 40 00 PLUMBING FIXTURES

1. Furnish special wrenches and other devices necessary for servicing plumbing fixtures and trim to Owner with receipt in a quantity of one device for each 10 fixtures, not less than 1 device.

2. Furnish faucet repair kits complete with all necessary washers, springs, pins, retainers, packings, O-rings, sleeves and seats in a quantity of 1 kit for each 2 faucets, no less than 1 kit.

3. Plumbing Fixtures:

3.1 Water Closets and Urinals:

3.1.1 Water closets and urinals shall be wall mounted whenever possible, with carriers. Fixtures to 1.6 gal. for WC and 1/2 to 1/8 gal. for UR.

3.1.2 Residence hall water closets can be tank type pressure assist with locking, cover, top push button flush actuator and dual flush volume capability.

3.1.3 Water closets and urinals shall be “wash-out” style with water saver features, coordinate with OUA.

3.1.4 Acceptable manufacturers:

3.1.4.1 American Standard; U. S. Plumbing Products (preferred)

3.1.4.2 Crane Company

3.1.4.3 Kohler Company

3.1.4.4 Gerber

3.1.4.5 Zurn Co.

3.1.4.6 Toto

3.2 Lavatories:

3.2.1 Note: All wall hung lavatories to be furnished with carriers.

3.2.2 All lavatories shall have integral overflows.

3.2.3 Acceptable manufacturers:

3.2.3.1 American Standard; U. S. Plumbing Products (preferred)

3.2.3.2 Crane Company

3.2.3.3 Kohler Company

3.2.3.4 Gerber

3.2.3.5 Zurn Company

3.2.3.6 Toto

3.3 Stainless Steel Sinks:

- 3.3.1 Stainless steel sinks shall be self centering and fully sound deadened, minimum 304 stainless steel, 16 ga. Construction
- 3.3.2 All sinks shall have integral overflows.
- 3.3.3 Acceptable manufacturers:
 - 3.3.3.1 American Standard; U. S. Plumbing Products
 - 3.3.3.2 Elkay Manufacturing Company
 - 3.3.3.3 Just Manufacturing Company (preferred)
 - 3.3.3.4 Tabco

3.4 Mop Basins:

- 3.4.1 Fiat products or equal.
- 3.4.2 Mop basins shall be Fiat molded floor mop sink or equivalent. Sink shall be 24"X36"X10" high preferred where possible and provided with mop hanger, hose and hose support, stainless steel rim guards and stainless steel splashguards on all adjacent surfaces. Provide faucet with vacuum breaker, pail hook and wall support bracket.

3.5 Faucets:

- 3.5.1 Public Lavatories faucets shall be meter of infrared type for all public restrooms. Review with OUA.
- 3.5.2 Specify 0.5 GPM aerators or Moen 0.35 GPM. OUA approval required for higher flow aerators.
- 3.5.3 Associated tempering/mixing valve locations to be coordinated with OUA.
- 3.5.4 Acceptable manufacturers:
 - 3.5.4.1 Chicago Faucet Co. (preferred)
 - 3.5.4.2 Delta Faucet Co.; Division of Masco Corp.
 - 3.5.4.3 American Standard; U.S. Plumbing Products (OUA approval required)

3.5.4.4 Moen (OUA approval required)

3.5.4.5 Toto

3.5.4.6 Speakman

3.6 Flush Valves:

3.6.1 Battery or Hard wired infrared hands free operated for all ADA fixtures and at public urinals. Installation type to be reviewed by OUA.

3.6.2 Acceptable manufacturers:

3.6.2.1 Sloan Valve Company (Campus standard) (Zurn, Toto, Kohler and Moen subject to OUA review)

3.7 Showers and Shower Valves

3.7.1 One-piece acrylic fiberglass units complete with dome light, fully hinged tempered glass shower door with full length magnetic latching. Showers shall be set level and concrete bedded for uniform support. ADA units shall be supplied with Stainless Steel Supports, ADA folding or permanent seat, Temperature and pressure shower valves with hand held shower with stainless steel slide bar, low flow shower head. Provide unit with stainless steel curtain rod and anti-microbial shower curtain.

3.7.2 Shower shall be furnished with temperature and pressure balanced mixing valves with integral stops. Review internal components with OUA.

3.7.2.1 Approved manufacturers for Shower valves: Symons, Kohler, Grohe, Chicago Faucet, Toto, Moen, Others as approved by OUA

3.7.3 Approved Shower manufacturers:

3.7.3.1 Aqua Glass Corporation

3.7.3.2 Clarion Bathware

3.7.3.3 Kohler

3.7.3.4 Sterling

3.7.3.5 Review all ADA shower units with OUA

3.8 Water Closet Seats:

3.8.1 Specify anti-loosening hardware to minimize maintenance.

3.8.2 Seats with lifting tab are preferred.

3.8.3 Acceptable manufacturers:

3.8.3.1 Bemis Manufacturing Co. (Campus Standard) Use with quick lift and locking head device)

3.8.3.2 Beneke Corporation

3.8.3.3 Forbes-Wright Industrial, Inc; Church Products

3.8.3.4 Olsonite Corporation; Olsonite Seats

3.8.3.5 Other manufacturers accepted with OUA approval.

3.9 Water Coolers: Oasis or approved equal.

3.9.1 University standard drinking fountain is the Oasis or Elkay, automatic run handicap accessible water cooler with wall mounting frame. Other drinking fountain styles are acceptable, but shall be submitted to OUA for review prior to incorporation into the project.

3.9.2 Provide a minimum of one (1) bottle filling station at the expected high traffic water cooler location to advance sustainability efforts and reduce single use bottled water on campus. Elkay EZH2O preferred.

3.10 Supplies and Stops for Lavatories and Sinks: Brass construction with polished chrome finish, lead free, having a loose key quarter turn angle stop having ½" inlet and ⅜" O.D. x 12" long flexible stainless or solid copper with chrome plated tubing supplies to outlet, wall flange and escutcheon. Chicago Faucet, Brasscraft, Watts or McGuire preferred, others to be reviewed by OUA.

- 3.11 Installation: Faucets for mop sinks and similar faucets shall include an integral anti-siphon device.

DIVISION 23 HEATING, VENTILATING and AIR CONDITIONING

23 05 93 TESTING, ADJUSTING AND BALANCING (TAB) FOR HVAC– Review with OUA

All testing shall be done to AMCA standards, specifications shall indicate TAB contractor to be certified and shall have performed work at KSU in the past. Specifications shall indicate the qualifications needed to perform work associated with the type of project being installed. 5 years' minimum experience will be required. All balance reports are to indicate the type of interments to be used, last time equipment has been calibrated. Reports shall be submitted in hard copies and in electronic format to the engineer of record, CxA agent if present on project and to OUA as part of the closeout documents. Tab contractor to provide testing methods and shall review documents so all testing ports are present and that the specifications and contract documents are complete. If deficient contractor is to notify engineer of record and CxA agent and Owner so the required equipment gets installed prior to testing. Failure of associate to coordinate with Tab contractor during the shop drawings and coordination-drawing phase of the project will be addressed as an error in the design process.

23 10 00 FACILITY FUEL SYSTEMS

1. Codes and Standards:

- 1.1 NFPA 54 – National Fuel Gas Code, for gas piping materials and components, gas-piping installations, inspection, testing and purging of gas piping systems.
- 1.2 Ohio Building Mechanical Code and Related Codes (OBC)
- 1.3 Contractors shall also be (OQ Certified) by Dominion East Ohio Gas (DEOG) is Natural Gas supplier.
- 1.4 Contractors shall be current in the Columbia Gas (Participating contractor program) if work is required on service lines associated with Columbia Gas.
- 1.5 ANSI Z223.1/NFPA 54, ANSI/NFPA 70
- 1.6 AGA/GPTC Guide
- 1.7 All Installations shall also comply to PUCO standards.

2. Factory Mutual Insurance.

- 2.1 All high-pressure gas lines above 90 lbs. to be radio graphed socket welded systems, and report data submitted to the A/E. Gas valves and associated fittings shall be reviewed with OUA.
- 2.2 Gas lines in building 1 psi or above and or 2" size to be welded using socket or butt fittings. Gas lines below this pressure and size may be threaded.

3. Gas Valves

3.1 Gas Cock Manufacturers:

- 3.1.1 DeZurik
- 3.1.2 Jenkins Brothers
- 3.1.3 Lunkenheimer Company
- 3.1.4 NIBCO, Inc.
- 3.1.5 Stockham
- 3.1.6 Hammond
- 3.1.7 Milwaukee Valve

4. Gas Cocks 2" and Smaller: 150psi WOG, bronze body, straightaway pattern, square head, threaded ends or approved ball valves.

- 4.1 Gas Cocks 2½" and Larger: MSS SP-78; 175psi, lubricated plug type, semi-steel body, single gland, wrench operated, flanged ends.
- 4.2 Provide dirt leg prior to any equipment connection.

5. Pipe and Fittings

- 5.1 Steel Pipe: ASTM A120, Schedule 40, seamless, black steel pipe, beveled ends.
- 5.2 Malleable-Iron Threaded Fittings: ANSI B16.3, Class 150, standard pattern, for threaded joints. Threads shall conform to ANSI B1.20.1.
- 5.3 Steel Fittings: Socket joints.

6. All exterior piping and fittings shall be painted with one coat of primer and two coats of protective paint. Exposed high-pressure lines to be painted orange. Coordinate all colors with A/E and OUA.

23 21 23 HYDRONIC PUMPS

1. Pump motors shall be premium efficiency, inverter rated motors.

2. Pump Manufacturers

2.1. Inline Circulators:

2.1.1. Bell & Gosset, ITT

2.1.2. Taco, Inc.

2.1.3. Armstrong

2.2. Vertical Inline Pumps:

2.2.1. Armstrong Pumps, Inc.

2.2.2. Aurora Pumps

2.2.3. Bell & Gossett, ITT

2.2.4. Peerless Pump

2.2.5. Taco, Inc.

2.2.6. Patterson

2.3. Base-Mounted, Close-Coupled, End-Suction Pumps:

2.3.1. Aurora Pumps

2.3.2. Bell & Gossett, ITT

2.3.3. Peerless Pump

2.3.4. Taco, Inc.

2.3.5. "Paco pumps"

2.3.6. Patterson

2.4. Base-Mounted, Separately-Coupled, End-Suction Pumps:

2.4.1. Aurora Pumps

2.4.2. Bell & Gossett, ITT

2.4.3. Federal Pump Corp.

2.4.4. Peerless Pump

2.4.5. Taco, Inc.

2.4.6. Paco Pumps

2.4.7. Patterson

2.5. Base-Mounted, Separately-Coupled, Double-Suction Pumps:

2.5.1. Aurora Pumps

2.5.2. Bell & Gossett, ITT

2.5.3. Federal Pump Corp.

2.5.4. Peerless Pump

2.5.5. Taco, Inc.

2.5.6. Weil Pump Company

2.5.7. Patterson

2.6. In-Line Electronic Commutated Motor Driven Pump

Pumps shall be variable-speed with micro controlled operation providing BACnet read write technology. Pumps shall be capable of transferring fluids with temperatures from 14 deg to 230 deg. Pumps shall be design when applicable to handle up to 50% glycol solution. All pumps shall be furnished with lockout security feature for field programming. Consultants shall make sure that pump installation is never in the horizontal position with motor/drive assembly in the upright position while in a horizontal plane. ECVM pumps shall have flanged connections and consultants shall specify matching flanges for field installation. Gaskets shall be metal manufactured by flexitallic or approved equal (KSU approved) rated for the temperature and pressure of the system being designed or specified. Pumps shall be designed to ANSI/NSF 61 for domestic water application. Pumps shall be designed for non-overloading conditions. Pump casing shall be cast iron (class30 or better), internal parts shall be stainless steel. Shaft, O-rings, seals and bearings, **shaft-grounding rings** shall be reviewed with KSU. ECM pumps shall be specified to provide all maintenance tools or hand held programmable/diagnostic devices that may be required for programming of pump's drive. Pumps shall also be provided with flow directional indicators. Motor and drive assembly shall meet all NEC power requirements and be UL listed.

2.6.1. Taco

2.6.2. Grundfos

2.6.3. Wilo

3. All base mounted pumps shall be mounted on a 4" high housekeeping pad as a minimum. All pumps to be grouted after final alignment. (Outline alignment qualifications for contractors.)
4. All pumps to be designed for non-overloading and review pump seals with OUA.
5. All pumps must be aligned using laser or highest technology available to insure true operation and long life.
6. Keep all pump openings covered during construction to reduce chance of debris entering the pump casing?

23 22 00 STEAM AND CONDENSATE PIPING AND PUMPS

1. Copper piping shall be kept to a minimum in steam and condensate piping systems. Steel Schedule 80 shall be used for condensate piping, Schedule 40 steel for steam distribution.
2. Quarter turn valves shall not be used in steam and condensate piping systems.
3. All major steam valves shall be insulated with removable insulation covers. See insulation section (wire connections only).
4. Safety relief valves shall be discharged outside and in an area clear of public access. All safety steam pressure relief valves to be furnished with drip pan elbows and drains extended to nearest floor drains. Review pressure settings with OUA when used with pressure reducing station. Insulate relief piping located 8'-0" or below or as needed for personnel protection. Provide signage indicating high temperature and possible danger associated with the pipe near termination point.
5. Steam and Condensate Piping Specialties

5.1 Safety Pressure Relief Valves:

- 5.1.1 Armstrong Machine Works, A-Y Division
- 5.1.2 Kunkle Valve Co., Inc.
- 5.1.3 Lunkenheimer Co.
- 5.1.4 Spirax Sarco
- 5.1.5 Watts Regulator Co.
- 5.1.6 Consolidated

5.2 Pressure Regulating Valves

- 5.2.1 Armstrong Machine Works, A-Y Division
- 5.2.2 Fisher Controls International, Inc.

5.2.3 Hoffman Specialty ITT; Fluid Handling Division

5.2.4 Spirax Sarco(Preferred)

5.2.5 Spence Engineering Co., Inc.

5.3 Steam Traps:

5.3.1 Armstrong Machine Works, A-Y Division

5.3.2 Spirax Sarco (Preferred)

5.3.3 Spence Engineering Co., Inc.

5.3.4 Watson McDaniels

5.3.5 Inverted bucket to be Armstrong Machine Works or approved equals (review with OUA).

5.4 Air Vents:

5.4.1 Armstrong Machine Works

5.4.2 Eaton Corp.; Controls Div.

5.4.3 Hoffman Specialty ITT; Fluid Handling Div. (Preferred)

5.4.4 Spirax Sarco

6. Receiver Vents Flash Tank Vent:

6.1 Extend fully outdoors to safe location, roof preferred (review with OUA). Insulate flash tank and vent piping indoors and outdoors for personnel protection.

7. Condensate Pumps – Steam Power Pressure Type – Preferred Manufacturers:

7.1 Watson McDaniels (Preferred)

7.2 Armstrong

7.3 Spirax Sarco

8. Steam Gaskets: “Metal Spiral Wound” rated for 150# steam, Manufacturers: Flexitallic, Mercer, Expert Gasket and Seal LLC

9. Air Purge units shall be reviewed with OUA as to location and use.

10. Air and Dirt separators, Spirotherm is preferred vendor, other vendors shall be submitted for review by associate and with OUA prior to bidding.

11. Expansion tanks shall be properly tagged for system set pressure and labeled. Air gauge on tank will be required under the designs.
12. System volume tanks, bladder tanks, buffer tanks shall be reviewed by all associates and with OUA to ensure the designs account for the proper system volume to keep boiler, chillers, pumps etc from short cycling and for keeping the system stable on low load conditions.

23 23 00 REFRIGERANT PIPING

1. Refrigerant piping shall be type ACR copper with long radius fittings and silver solder joints. Specifications to include testing procedures applicable to system and reviewed with OUA.
2. Refrigerant piping shall be isolated from all hangers with an approved pipe wrap, gasket or isolator to prevent transmitting vibration to the building. Any piping exposed to outside conditions shall have UV protective coating, white finish, and covered in PVC pipe wrap or ASJ where insulated.
3. The Contractor shall provide and pay for pressure piping permits associated with refrigerant systems. A copy of the approval certificate is to be supplied to Kent State University. Associate shall also obtain contractors pressure piping welding certificates.
4. All refrigerant piping systems shall require field reports listing system quantity, evacuation procedure and maintain an EPA log on any system that requires field addition or subtraction once system is installed at KSU. This applies to systems which have 50# or more of refrigerant.
5. Any system or piece of equipment which has a greater amount than 50 # at any one location (Room) shall be supplied with a refrigerant monitoring system connected into our BAS. System type shall be reviewed with OUA. All system shall also be supplied with personal safety Kits complete with training MSA approved. This devise shall be reviewed with OUA. Manufacturers Sherlock, Halogard, and Emerson.

23-25-00 CHEMICAL TREATMENT HVAC

PART 1 –GENERAL

All associates shall coordinate the chemical treatment designs and specifications with “Applied Specialties, Inc., PO Box 307, Avon Lake, Ohio 44012, Ph: 440-933-9442” for all Kent Campus Projects.

Contact person: Mike Peters, peters.mike@appliedspecialties.com, Cell 330-606-9391

For all Projects at Regional Campuses review systems and design with “Gardiner (Chemtex), 31200 Bainbridge Road, Solon Ohio, 44139”

Contact person: Brian Riegel briegel@whgardiner.com, Ph: 440-248-3400

1.1 SUMMARY

1. HVAC water-treatment systems.

2. Chemical treatment test equipment.

3. HVAC water-treatment chemicals.

All three of the above items shall be reviewed with Applied Specialties and OUA. For Regional Campus Projects review with Gardiner and OUA.

1.2 PERFORMANCE REQUIREMENTS

A. Water quality for HVAC systems shall minimize corrosion, scale buildup, and biological growth for optimum efficiency of HVAC equipment without creating a hazard to operating personnel or the environment.

B. Base HVAC water treatment on quality of water available, HVAC system equipment material characteristics and functional performance characteristics.

C. Provide temporary water treatment for systems until facility has final connections.

1.3 SUBMITTAL REQUIREMENTS

A. Insure contractors and design provide product data: Including rated capacities, operating characteristics, furnished specialties, and accessories for the following products:

1. Water meters.

2. Inhibitor injection timers.

3. pH controllers.

4. TDS controllers.

5. Chemical solution tanks.

6. Injection pumps.

7. Chemical test equipment.

8. Chemical material safety data sheets.

9. Coupon rack assemblies

B. Shop Drawings are required under the CD Phase: Pretreatment and chemical treatment equipment showing tanks, maintenance space required, and piping connections to HVAC systems. Include plans, elevations, sections, details, and attachments to other work.

1. Record actual locations of equipment and piping, including sampling points and locations of chemical injectors.

2. Provide Wiring Diagrams: Power and control wiring.

C. Specify level of field quality-control test reports which will be required. Reports at Minimum shall include inhibitor levels, pH, conductivity, equipment conditions, chemical inventory and water usage projections.

D. Operation and Maintenance manuals shall be included into design and shall indicate training hours for systems. Number of hours shall be reviewed with KSU vendors and OUA to best determine level of training required.

E. Minimum Chemical treatment design shall include:

1. Water-Treatment Program: Written sequence of operation on an annual basis for the application equipment required to achieve water quality defined in the "Performance Requirements" Article above.

2. Water Analysis: Illustrate water quality available at Project site.

3. Certification of compliance: Submit certificate of compliance from authority having jurisdiction indicating approval of chemicals and their proposal disposal.

4. Provide all MSDS sheets and amounts required to be stored and installed into system start-up.

1.4 DESIGN QUALITY ASSURANCE

A. Outline the HVAC Water-Treatment Service Provider Qualifications: An experienced HVAC water treatment service provider with certified water technologists, capable of analyzing water qualities, qualifications for contractor installing water-treatment equipment.

1.5 MAINTENANCE SERVICE

A. Scope of Maintenance Service: Provide chemicals and service program to maintain water conditions required above to inhibit corrosion, scale formation, and biological growth for cooling, chilled-water piping, heating, hot-water piping, condenser-water piping and

equipment. Services and chemicals shall be provided for a period of one year from date of Substantial Completion, and shall include the following:

1. Initial makeup and (and subsequent analysis of water quality changes) system water analysis with HVAC water-treatment recommendations.
2. Startup assistance for Contractor to flush the systems, clean with disinfectant detergents, and initially fill systems with required chemical treatment prior to operation.
3. Minimum 4 hours of on-site training of plant engineers to use water treatment equipment, to handle and administer treatment chemicals.
4. Weekly field service and consultation.
5. Customer report charts and log sheets need to be provided were applicable.
6. Laboratory technical analysis when applicable review with OUA.
7. Analyses and reports of all chemical items concerning safety and compliance with government regulations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following airport wide water treatment vendor:

1. Applied Specialties, Inc. (Kent Campus) Chemtex (Gardiner) Regional Campuses

2.2 AUTOMATIC CHEMICAL-FEED EQUIPMENT REVIEW WITH OUA

A. Inhibitor Injection Timers:

1. Microprocessor-based controller with LCD display in NEMA 4X, Type 12 enclosure with gasket and lockable door. Interface for start/stop and status indication at BAS.
2. Programmable timers with infinite adjustment over full range, and mounted in cabinet with hand-off-auto switches and status lights.

3. Test switch.

4. Hand-off-auto switch for chemical pump.

5. Illuminated legend to indicate feed when pump is activated.

B. Chemical Solution Tubing: Polyethylene tubing with compression fittings and joints except ASTM A 269, Type 304, stainless steel for steam boiler injection assemblies.

F. Injection Assembly:

1. Quill: Minimum NPS 1/2 (DN 15) with insertion length sufficient to discharge into at least 25 percent of pipe diameter.

2. Ball Valve: Two-piece, stainless steel.

3. Packing Gland: Mechanical seal on quill of sufficient length to allow quill removal during system operation.

4. Assembly Pressure/Temperature Rating: Minimum 600 psig (4137 kPa) at 200 deg F (93 deg C).

5. Materials of construction: Stainless steel 316, Nickel alloy, Carpenter 20, PVC.

G. Fail-Safes and Alarms

1. Corrosion safety interlock: Alarm indication, lock-out all chemical feed, open bleedoff valve to flush corrosive water from system.

2. PH interlock: Alarm indication, lock-out all chemical feed, open bleed-off valve to reduce total dissolved solids in cooling tower water.

3. Flow interlock (on loss of flow): Alarm indication, lock-out all control outputs and chemical feeds.

H. Low Level Alarms

1. Low level alarm system to monitor chemical solution level in inhibitor, pH modifier (acid or alkali), biocide, and dispersant drums.

2. Alarm probes, suitable current system capacity and connected with flexible cable.

3. Signal output suitable for remote alarm function in addition to local alarm.

2.3 CHEMICAL TREATMENT TEST EQUIPMENT REVIEW WITH OUA

A. Test Kit: Manufacturer-recommended equipment and chemicals in a wall-mounting cabinet for testing pH, TDS, inhibitor, chloride, alkalinity, phosphate, silica and hardness; oxygen scavenger and testable polymer tests for high-pressure boilers, and oxidizing biocide test for open cooling systems.

B. Sample Cooler:

1. Shell: Cooling water.

a. Material: ASTM A 666, Type 304 stainless steel.

b. Pressure Rating: Minimum 250 psig (1725 kPa).

c. Temperature Rating: Minimum 450 deg F (232 deg C).

2. Capacities and Characteristics:

a. Tube: Sample.

1) Flow Rate: 0.25 gpm (0.016 L/s).

2) Entering Temperature: 400 deg F (204 deg C).

3) Leaving Temperature: 88 deg F (31 deg C).

4) Pressure Loss: 6.5 psig (44.8 kPa).

b. Shell: Cooling water.

1) Flow Rate: 3 gpm (0.19 L/s).

2) Entering Temperature: 70 deg F (21 deg C).

3) Pressure Loss: 1.0 psig (6.89 kPa).

C. Corrosion Test-Coupon Assembly: Constructed of corrosive-resistant material, complete with piping, valves, and mild steel and copper coupons in accordance with ASTM D2688. Locate copper coupon downstream from mild steel coupon in the test-coupon assembly.

1. Two-station rack for closed-loop systems.

2. Two station rack for open systems.

2.4 CHEMICALS

A. Chemicals shall be as recommended by water-treatment system manufacturer that are compatible with piping system components and connected equipment, and that can attain water quality specified herein.

2.5 GLYCOL SYSTEMS – HEATING AND COOLING SHALL BE REVIEWED WITH OUA

A. Use "Environmentally Friendly" glycol. Polypropylene Glycol (C₃H₈O₂) Only! shall be used.

B. Coordinate compatibility of glycol with materials used in piping, valves, equipment and accessories.

C. Provide glycol feed system on all designs having the need for this type of system.

PART 3 - EXECUTION

3.1 WATER ANALYSIS

A. Perform an analysis of supply water to determine quality of water available at Project site.

3.2 INSTALLATION

A. Install chemical application equipment on concrete bases, level and plumb. Maintain manufacturer's recommended clearances. Arrange units so controls and devices that require servicing are accessible. Anchor chemical tanks and floor-mounting accessories to substrate.

B. Install seismic restraints for equipment and floor-mounting accessories and anchor to building structure.

C. Install water testing equipment on wall near water chemical application equipment.

D. Install interconnecting control wiring for chemical treatment controls and sensors.

E. Mount sensors and injectors in piping circuits.

F. Install automatic chemical-feed equipment for condenser water and include the following:

1. Install inhibitor injection pumps and solution tanks with injection timer sensing contacts in water meter.

a. Pumps shall operate for timed interval on contact closure at water meter in makeup water supply connection for the heating and chilled water loops only. Pumps for the cooling towers and steam boilers shall operate base on the actual chemistry of the water.

2. Install test equipment and provide test-kit to KSU. Install test-coupon assembly in bypass circuit around circulating pumps, unless otherwise indicated on Drawings.

3. Install TDS controller with sensor and bleed valves.

a. Bleed valves shall cycle to maintain maximum TDS concentration.

4. Install pH, conductivity and Oxidation-Reduction Potential (ORP) sensors with integral controller, injection pumps and solution tanks.

a. Injector pumps shall operate to maintain required pH and ORP.

5. Install biocide feeder alternating timer with two sets of injection pumps and solution tanks.

a. Injection pumps shall operate to feed biocide on an alternating basis.

G. Install corrosion resistant drip pan, a minimum of 3 in (75 mm) high, under tanks and pumps.

Intent is to contain minor leaks.

3.3 CONNECTIONS

A. Install piping adjacent to equipment to allow service and maintenance.

B. Make piping connections between HVAC water-treatment equipment and dissimilar-metal piping with 6-inch-long brass nipple for the pipes 1 ½ inch and smaller and dielectric flange for the pipes 2 inch and larger. Dielectric flanges are allowed in the pump and fan rooms only.

C. Install unions, shutoff valves on HVAC water-treatment equipment inlet and outlet.

D. Provide backflow preventers.

E. Provide appropriate equipment grounding.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

Report results in writing.

B. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing. Install and retrieve corrosion coupons every 90 days to generate quarterly reports on corrosion rates of steel and copper with photographic images of the coupons.

C. Tests and Inspections:

1. Inspect field-assembled components and equipment installation, including piping and electrical connections.

2. Inspect piping and equipment to determine that systems and equipment have been cleaned, flushed, and filled with water, and are fully operational before introducing chemicals for water-treatment system.

3. Place HVAC water-treatment system into operation and calibrate controls during the preliminary phase of HVAC systems' startup procedures.

4. Do not enclose, cover, or put piping into operation until it is tested and satisfactory test results are achieved.

5. Test for leaks and defects. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

6. Leave uncovered and unconcealed new, altered, extended, and replaced water piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.

7. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow test pressure to stand for four hours. Leaks and loss in test pressure constitute defects.

8. Repair leaks and defects with new materials and retest piping until no leaks exist.

D. Remove and replace malfunctioning units and retest as specified above.

E. At four-week intervals following Substantial Completion, perform separate water analyses on hydronic systems to show that automatic chemical-feed systems are maintaining water quality within performance requirements specified herein. Submit written reports of water analysis advising KSU of changes necessary.

F. Comply with ASTM D 3370 and with the following standards:

1. Silica: ASTM D 859.

2. Acidity and Alkalinity: ASTM D 1067.

3. Iron: ASTM D 1068.

4. Water Hardness: ASTM D 1126.

5. Chloride: ASTM D4458

6. Copper: ASTM D1688

7. pH: ASTM D5464

3.5 TRAINING

A. Engage a factory-authorized service representative to train KSU's Maintenance personnel to adjust, operate, and maintain HVAC water-treatment systems and equipment.

B. Provide a minimum of 12 hours (3 shifts) of classroom and hands on training to KSU Maintenance personnel on handling and testing of treatment chemicals with "how-to-use" video that details exact operating procedures of equipment.

3.6 FINAL CONNECTION TO SITE UTILITIES

A. Do not circulate any water from the site chilled and high temperature hot water mains until the CUP water treatment contractor has certified the water quality of both sides of the site utility isolation valves.

B. After connection to plant utilities are achieved remove temporary bypass pipes and cap.

END OF SECTION 23 25 00

23 30 00 HVAC AIR DISTRIBUTION

1. Codes and Standards

1.1. SMACNA Standards: Comply with SMACNA's "HVAC Duct Construction Standards, Metal and Flexible" for fabrication and installation of metal ductwork.

1.2. ASHRAE Standards: Comply with ASHRAE Handbook, Equipment Volume, Chapter 1 "Duct Construction," for fabrication and installation of metal ductwork.

2. Field Reference Manual: Have available for reference at project field office a copy of SMACNA "HVAC Duct Construction Standards, Metal and Flexible."

3. Shop Drawings: The sheet metal contractor shall be responsible for the coordination drawings associated with large projects. The lead contractor shall be responsible for ultimate coordination between the other trades with utilities in the ceiling spaces (electric, sprinkler, lighting, plumbing, etc.).

4. Fiberglass ductwork shall not be allowed, however, fabric ductwork, where applicable is allowed subject to OUA review.

5. Due to lower installed costs, round ductwork shall be utilized wherever space allows.

6. All duct joints shall be sealed with and approved joint compound to keep leakage below 1%.

7. Chemical exhaust ductwork shall be tested by an approved testing agency to guarantee duct leakage is below 1% of the design air flow.

8. Chemical fume hoods types shall be reviewed with the OUA- Engineers. All fume hoods are to be tested to ASHRAE 110-1995, ASHRAE Handbook Applications, SEFA-1 & 1.2-2010, SEFA 8, 9 & 10 Standards and meet NFPA 45-2014 and OSHA 1910.1450 & EPA Guidelines, LABS21 Handbook of Laboratory Safety and ACGIH.

9. Large ductwork shall not be supported from the roof deck unless approved by the structural engineer.

10. All ductwork ends shall be covered during construction until completely connected to minimize debris from entering.

11. Prohibited Installations:

- 12.1 Ductwork shall not be installed below grade or under floor slabs unless otherwise approved by OUA.
- 12.2 Ductwork shall not pass thru electrical vaults or elevator equipment rooms.

23 31 00 HVAC DUCTS AND CASINGS

- 1. Quality Control: The contractor fabricating and installing the sheet metal work shall be a firm regularly engaged in such work and shall have a minimum of three years of experience.
- 2. All ductwork shall meet ANSI/SMACNA 3rd 006-2006, 2005 edition and NEBB air testing requirements. All ductwork shall be tested. Reports are to be turned over to OUA and CxA where applicable.

23 33 00 AIR DUCT ACCESSORIES

- 1. This section describes requirements for dampers (manual, control, fire and smoke); turning vanes, duct access doors, etc.
- 2. Ductwork accessories shall be provided by the sheet metal contractor and therefore all quality assurance and standards listed under that section shall apply to this section.
- 3. Balance or volume dampers shall be provided at all branches for balancing purposes. These dampers should be shown on the drawings. High quality is to be used and shall accommodate insulation thickness where required. Extend actuators as required if damper will not be accessible after construction is complete. All Damper designs shall include Quadrant locking with ball bearing and nylon sleeves or bushing at duct penetrations. Dampers shall be designed with insulated stem extension when dealing with duct wrap or insulated board. Low leakage and insulated were applicable is also required.
- 4. Manual dampers shall be installed over public areas whenever possible. When dampers are located over rigid ceiling the use of gear driven actuators and flexible extensions shall be utilized and prior submittal approval shall be provided by associate for OUA approval.
- 5. Outside air dampers shall be low leakage type and have a maximum air leakage of 2% of the air quantity calculated at 2,000 FPM face velocity through the damper and 4.0 inches W.G. pressure differential. If the installation is questionable, the contractor shall be required to test the leakage rate of the damper to verify specified maximums. Designs for OA dampers shall accommodate service to the outside air intake louver and screen so cleaning of screen can be done without going through the OA damper assembly. Review layouts and access with OUA.

6. Fire and Smoke Dampers

- 6.1. Fire dampers shall be out of the air stream type wherever possible.
- 6.2. Access shall be provided to all fire and smoke dampers. If damper cannot be reached via a distribution opening, an access door shall be provided. For smoke dampers the access door shall include a view port window located so a person can verify from below.
- 6.3. Access door shall be large enough to access and reset the fire or smoke damper, but no less than 12" x 12".
- 6.4. Access doors (on the duct, not chase access doors) shall be labeled indicating access for the fire or smoke damper.
- 6.5. Motorized smoke and fire dampers shall be labeled as such at the operator so as not to be confused with temperature control dampers.
7. Turning Vanes: Turning vanes shall be installed at all bends in the supply air ductwork unless recommended otherwise by the Architect/Engineer. Return ductwork having large volumes or velocity shall have turning vanes. Exhaust ductwork similar.
8. Test holes shall be provided at each section of air handlers for testing purposes. The test slots shall include a cover to minimize duct leakage.
9. Quadrant locks shall be provided at all dampers. Insulated ductwork shall have the bearing plates extended so that the insulation does not interfere with the damper operation. (See balance dampers)
10. Duct access doors with vision windows shall be provided wherever required to maintain equipment in the ductwork including the following:
 - 10.1. Fire and smoke dampers. (Ruskin) others approved by OUA
 - 10.2. Control dampers in order to verify operation.
 - 10.3. On the inlet side of coils (including air handler coils) for cleaning purposes.
 - 10.4. At the inlet of in-line fans for cleaning and operation verification.
11. Sound Attenuators – Review requirements with OUA.

23 33 43 FLEXIBLE CONNECTORS

1. Connections to equipment shall be made with a flexible duct connection 3" to 4" wide. All flexible ductwork shall be designed for less than 5'-0" offset and shall be tapped to surrounding equipment and ductwork to insure vapor barrier on SA ductwork not exposed to conditioned air space. All

roof mounted equipment shall be furnished with full perimeter curbs or rails with flexible vibration isolators. These types of systems shall be reviewed with OUA.

Flexible duct connections and flexible air connectors on ductwork shall be UL 181 listed and tested and flexible air connectors shall be rated to Class (0) or Class (1) based on system pressure and shall be installed per OMC to section 304.1. No field made joints will be acceptable for flexible air connectors.

23 33 46 FLEXIBLE DUCTS

1. Flexible Ductwork shall be used for the connection to distribution diffusers where feasible. The use of the flexible duct allows for minor adjustment to the location of the diffuser during future space modifications as well as lowers initial installation costs. 3'-0" maximum horizontal distance and 5'-0" maximum vertical and include no more than 90 degrees (one elbow) of direction change. Flexible Ductwork shall be taped and clamped sealed to terminal unit's main box and shall also be and clamped and taped to any SA ductwork having wrapped insulation. To ensure a positive vapor barrier.
2. Flexible ductwork to VAV terminal unit shall be secured and taped tight to terminal unit with no exposed fiberglass edges.
3. In no case can any flexible duct longer than (5'-0") or sock system be longer than 14'-0" be indicated in the design documents without review by OUA.

23 33 53 DUCT LINERS

1. Duct liner shall be kept to a minimum on distribution duct supplying terminal control boxes but may be used downstream of the boxes for sound control and insulation. All insulation to be fiber free antimicrobial and comply with UL 181, UL723.
2. Duct liner shall be of a non-friable type to prevent entrainment of fiberglass particles in the air stream.
3. Project with commissioning agents shall be required to inspect systems for compliance.
4. All duct liner ductwork systems shall be reviewed with OUA. The construction and availability of such a system shall be verified and noted on the construction documents. No substitutions will be allowed. Make sure this system is included under the general conditions and also in the submittal requirements. Associates shall review in detail the construction design intent and cost impact to the project.

23 34 00 HVAC FANS

1. Terminal Units: Units to be provided by Krueger, Titus or Price. Reheat to be hot water if central system is available. Use fiber-free insulation when utilized for sound attenuator.
2. Fan powered terminal units with or without reheat to be furnished by Krueger, JCI, Titus or Price.
3. Electric reheat coils shall be PWM, multistage circuits. Associate to field verify building electrical and base selection on most energy efficient model. Use only after approval by KSU OUA.

23 36 00 AIR TERMINAL UNITS

1. Air Terminal units: Shall be supplied with minimum, two row, and reheat coil. DDC controls unless existing systems are pneumatic, provide sound attenuators (if budget allows) and insulated box with antimicrobial lining using fiber lock type system, coordinate with KSU OUA.

2. Preferred manufacturers:

2.1. Titus (Preferred)

2.2. Kruger

2.3. Price

2.4. Anemostat

2.5. Johnson Controls (limit to 8" dia inlet and smaller unless reheat coil inlet sizes are increased)
Review with OUA on selections.

Power Ventilators and Exhaust Fans

1. Codes and Standards
 - 1.1. AMCA Compliance: Provide power ventilators which have been tested and rated in accordance with AMCA standards and bear AMA Certified Ratings Seal.
 - 1.2. UL Compliance: Provide power ventilators which are designed, manufactured and tested in accordance with UL 705 "Power Ventilators."
2. Preferred Manufacturers (Roof Mounted and Inline):

2.1. Loren Cook - Preferred

2.2. Greenheck

2.3. Twin City

2.4. Lab exhaust - Twin City, Strobic

2.5. All equivalents as approved by OUA

3. Green technology toilet exhaust fans with direct drive, electrically commutated motors and speed control shall be considered to minimize campus maintenance requirements. All exhaust fans shall have means of disconnecting power to drive unit externally located at or close to the unit. Exhaust fans with 3 phase motors may be belt driven. Control toilet room exhaust system with occupancy sensor controls and/or through the BAS when applicable. Review with KSU OUA.
4. Roof mounted fans with dampers, gravity or motorized, shall be installed with access to the damper via a hinged mounting or with access doors.
5. Lab Exhaust Fans: Strobic or Twin City vertical discharge fan with louvered curb housing if budget allows. Associate to review coating requirements for lab application. All lab exhaust systems to discharge minimum 7'-0" above roof line or per applicable code.

5.1. Review all exhaust fan application with the use of energy recovery coils and systems.

6. Kitchen exhausts fans and curbs to be reviewed with OUA.
7. Belt driven fans shall incorporate cogged v-belts or synchronous drive belts on 10 MHP and above to reduce drive losses.

23 37 00 AIR OUTLETS AND INLETS

1. This section describes requirements for diffusers, grilles, registers and louvers.
2. Air outlets and inlets shall be provided by the sheet metal contractor and therefore all quality assurance and standards listed under that section shall apply to this section.
3. Codes and Standards
 - 3.1. ARI Compliance: Test and rate air outlets and inlets in accordance with ARI 650 "Standard for Air Outlets and Inlets."
 - 3.2. ASHRAE Compliance: Test and rate air outlets and inlets in accordance with ASHRAE 70 "Method of Testing for Rating the Air Flow Performance of Outlets and Inlets."
 - 3.3. ABC Seal: Provide air outlets and inlets bearing ABC Certified Rating Seal.
 - 3.4. AMCA Seal: Provide louvers bearing AMCA Certified Rating Seal.
4. Ceiling diffusers and registers shall be lay-in type whenever possible. This reduces initial installation as well as future renovation costs. Architectural flat plate "plaque" style preferred.
5. Air outlets should be balanced by a manual damper in the ductwork instead of a damper at the diffuser. This minimizes tampering of the balanced system by room occupants and reduces noise.

6. Return air shall be via a return air ceiling whenever possible. Consult with OUA if the return air system will be otherwise. The use of return air ceilings will save both installation and future renovation costs.
7. The University prefers a supply diffuser which the throw directions may be changed in the field with baffles such as the "Plaque Style."
8. Diffuser throw directions and grille/register louvers shall be adjusted to the proper position by the balance contractor. A note should be included in the specifications and on diffuser schedule directing the contractor to perform this final setting.
9. Egg crate type grilles shall not be used for exhaust or return systems due to the difficulty in cleaning. Prefer 1/2" spacing horizontal blade grilles.
10. Preferred manufacturers are Titus, Krueger, and Price. Other type will be considered after review with OUA.

23 40 00 HVAC AIR CLEANING DEVICES

1. Access to the filters shall be made without the use of tools wherever possible.
2. Larger air handling units (greater than 10,000 CFM) shall include a pre-filter section and a bag filter section. Review filters selection and efficiency with OUA. Filters to have a minimum of 30% pleated MERV 8 rating. Lab and research centers shall be equipped with Merv 8 pre-filter and Merv 13 or higher final filter. Lab and research building shall be reviewed with OUA for filter requirements of HVAC equipment. Include a differential pressure sensing device across the filter. Review communications requirements with OUA. Sensors shall be compatible with Johnson Controls Metasys.
3. The contractor shall replace all filters prior to balancing of the project.
4. The contractor shall be responsible for filter maintenance if the unit is used for ventilation purposes while construction continues. The filter media shall be of a Merv 13 rating. Additional filtration to prevent debris entering duct systems must be included. This would include all outside air intakes, return air grilles or registers which could be subject to contamination due to area construction. This requirement shall be reviewed on project by project bases with the OUA. Complete unit cleaning prior to acceptance must be specified.
5. Extra Stock: The contractor shall supply one complete set of filters and belts at the close of the project. Where the unit has pre-filters and final filter, provide both spare sets. If used during construction the contractor shall furnish prefilters, filters and final filters to ensure equipment is protected from dust, Merv rating of 13 is the minimum filtration during the use under construction phase. Cost of filter change out shall be borne by the contractor and not the owner.
6. Ultraviolet lamp applications shall be reviewed with KSU OUA and is preferred.

23 50 00 CENTRAL HEATING EQUIPMENT

All boilers, heat exchangers, heat recovery units, etc. and their systems shall be reviewed with the OUA prior to determining manufacturers, system layouts or manufacturers which are to be specified. Consultants to avoid Aerco see boiler section below.

23 51 00 BREECHINGS, CHIMNEYS AND STACKS

1. Codes and Standards

1.1. NFPA: Comply with NFPA 211 “Standard for Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances.”

1.2. UL: Comply with applicable portions of UL Safety Standards; provide products which have been UL listed and labeled.

1.3. SMACNA: Comply with SMACNA 3rd addition Low Pressure Duct Standards 2005 for fabricated breaching and smoke pipe.

1.4. NEBB Duct leakage testing

1.5. Factory Mutual Standards.

1.6. All stack roof penetration details shall incorporate specific roof mfr. Requirements and be reviewed with OUA.

1.7. All breeching which have horizontal runs shall be tested for proper slope and cleanouts for any change in directions shall be reviewed with OUA. Designs shall indicate engineered anchor points and expansion expectations. Roof penetrations shall require full penetration detail on both the mechanical and coordinated into any architectural drawing were applicable. Flashing and counter flashing shall be coordinated with roof manufacturer were applicable to roof warranty. All roof penetrations with hot ductwork or pipe shall be reviewed with OUA for approval.

23 52 00 HEATING BOILERS

1. Campus Steam (Kent campus Only) shall be utilized for heating and domestic water whenever feasible. Regional campuses shall be reviewed prior to design for type and utility service available.

2. Where boilers are required, natural gas is the preferred fuel.

3. Boilers shall be high efficiency and include all accessories and controls necessary to maximize efficiency within the constraints of the project budget.

4. Equipment shall have electronic ignition in lieu of standing pilots.

5. Gas fired pulse combustion boiler:
 - 5.1. Fulton
6. Gas Fired Condensing Boilers:
 - 6.1. Viessmann
 - 6.2. Weil-McLain
 - 6.3. Burnham
 - 6.4. Fulton
 - 6.5. Harsco Patterson Kelly
 - 6.6. Bosch
7. Gas Fired Cast Iron Boilers:
 - 7.1. Hydrotherm
 - 7.2. RBI
 - 7.3. Smith
8. Gas Fired Hot Water Boilers:
 - 8.1. PVI
 - 8.2. Harsco Patterson Kelly
 - 8.3. Lockinvar Powerfin
 - 8.4. A.O. Smith Shell & Tube
 - 8.5. RBI
 - 8.6. Discuss other manufacturers with OUA.
9. Electric Water Boilers:
 - 9.1. Consult with Kent State University and OUA for specific requirements.
10. BOILER ACCESSORIES
 - 10.1. All boiler accessories shall be discussed with the University, describing benefits, disadvantages, efficiencies, etc.

23 57 00 HEAT EXCHANGERS FOR HVAC

1. Codes and Standards

- 1.1. TEMA Compliance: Construct and install heat exchangers in accordance with “Standards of the Tubular Exchanger Manufacturers Association.”

2. Equipment - Preferred Manufacturers:

2.1. Bell & Gossett ITT: Fluid Handling Division

2.2. Taco, Inc.

2.3. Spirax Sarco

2.4. Alfalaval (Plate and Frame)

- 3. Heat exchangers shall be mounted with adequate access for tube pull, cleaning and tube replacement.
- 4. Heat exchanger supports shall be painted with primer and two coats of enamel paint.
- 5. Heat exchangers for building heat shall be installed in fully redundant pairs whenever possible. Valving shall be installed to facilitate concurrent cleaning of one unit while the other is in operation. Utilize 1/3-2/3 steam supply piping and valve arrangement.
- 6. Taps with ball valve and capped hose connection shall be installed on the equipment side of the isolation valves for the purpose of circulating chemical cleaners through individual exchangers. Utilize a dual steam trap design for steam condensate.
- 7. Thermometers and pressure gauges shall be installed on the inlets and outlets of water piping and pressure gauges on inlet of steam piping.
- 8. Heat exchangers for heating domestic hot water shall have a straight through tube arrangement to allow for tube cleaning from both ends.
- 9. Heat exchangers for hydronic heating also will have straight tubes as the preferred arrangement if budget allows otherwise u-tube are acceptable.
- 10. Use optimal Maximum tube thickness for system longevity.

23 60 00 CENTRAL COOLING EQUIPMENT

1. Do not specify equipment using refrigerant scheduled for phase out within 20 years of design project design date. All system types shall be reviewed with OUA.
2. Geothermal system consideration shall be reviewed with OUA.

23 62 00 PACKAGED COMPRESSOR AND CONDENSER UNITS

1. Codes and Standards

- 1.1. Capacity ratings for condensing units shall be in accordance with ARI Standard 360 “Standard for Commercial and Industrial Unitary Air Conditioning Equipment.”
- 1.2. Refrigeration system of condensing units shall be constructed in accordance with ASHRAE Standard **ASHRAE 15 & 34** “Safety Code for Mechanical Refrigeration.”
- 1.3. Condensing units shall meet or exceed the minimum COP/Efficiency levels as prescribed in **ASHRAE 90.1** “Energy Conservation in New Building Design.”
- 1.4. Condensing units shall be listed by UL and have UL label affixed.
- 1.5. Provide written material and labor warranty (five year), signed by manufacturer, agreeing to replace/repair, within warranty period, motors/compressors with inadequate or defective materials and workmanship, including leakage, breakage, improper assembly, or failure to perform as required; provided manufacturer’s instructions for handling, installing, protecting and maintaining units have been adhered to during warranty period. Replacement is limited to component replacement only; include labor for removal and reinstallation. All refrigeration equipment shall include a complete refrigerant charge by the installing contractor.

2. Equipment – Preferred Manufacturers:

- 2.1. Carrier Air Conditioning; Div. of Carrier Corp.
- 2.2. **Daikin(McQuay)** Air Conditioning Group; Daikin(McQuay), Inc.
- 2.3. Trane (The) Co; Div. American Standard, Inc. **(Not to be selected at this time)**
- 2.4. **Johnson Controls(York) (Base specification)**

3. All condensing units shall include low and high pressure cut out controls.
4. All condensing units shall include controls necessary to prohibiting short cycling.
5. Provide for low ambient operation control or automatic low ambient lock out as requirement.
6. Provide convenience lighting and GFCI receptacles for service. Coordinate with KSU OUA.

23 63 00 REFRIGERANT CONDENSERS

23 63 13 AIR COOLED CONDENSERS

1. Codes and Standards
 - 1.1. Air cooled condensers shall meet or exceed the minimum COP/Efficiency levels as prescribed in ASHRAE 90A “Energy Conservation in New Building Design.”
 - 1.2. Air cooled condensers shall be listed by UL and have UL label affixed.
2. Equipment – Preferred Manufacturers:
 - 2.1. Carrier Air Conditioning; Div. of Carrier Corp.
 - 2.2. Daikin(McQuay) Air Conditioning Group; Daikin(McQuay), Inc.
 - 2.3. Trane (The) Co; Div. American Standard, Inc. (not to be selected at this time)
 - 2.4. Johnson Controls (Base specification)
 - 2.5. Rooftop condensers shall match the compressor equipment.
3. Roof mounted equipment shall be mounted such that the roof may be maintained below the unit. For larger equipment, the unit shall be mounted minimum 24" preferred, above the roof. Utilize full perimeter roof curb where appropriate to eliminate roof maintenance below unit.
4. Equipment shall be mounted such that there is a minimum of ten feet to the edge of any drop-off or roof edge (unless otherwise approved by OUA). Review fall protection requirements with KSU OUA.
5. Ground mounted equipment shall be mounted on a reinforced concrete pad designed to support the weight of the unit.
6. Ground mounted equipment shall be located to minimize public access by location or by installation of a visual barrier, review with KSU OUA.

23 64 33 PACKAGED WATER CHILLERS

1. Targeted Phase-out HCFC's shall not be allowed in any new chillers.
2. Review chiller type (absorption, electric, steam, magnetic or multistack, etc.) with KSU OUA.
3. The University is continually searching for methods to reduce energy costs on the campus; therefore, the Associate shall consider lowest KW/Ton efficiency and sound power levels. Thermal energy storage systems should also be considered on all projects with chillers 100 tons or larger if

budget allows. Lift cycle cost analysis shall be required for equipment selection on units above 100 tons.

4. Codes and Standards

4.1. ARI Compliance: Test and rate reciprocating chillers in accordance with ARI STD 590, "Standard for Reciprocating Water Chilling Packages."

4.2. ASHRAE Compliance: Fabricate and install chillers in accordance with ASHRAE STD 15, "Safety Code for Mechanical Refrigeration." Provide Energy Efficiency Ratio (EER) for reciprocating chillers not less than prescribed by ASHRAE Std 90A, "Energy Conservation in New Building Design."

4.3. NEMA Compliance: Provide high-efficiency motors for reciprocating chillers which comply with NEMA Stds. Pub/No.'s MG 1, 2, 3, 10 and 11.

5. All reciprocating compressors shall carry a minimum of a five (5) year parts and labor warranty.

6. Equipment - Preferred Manufacturers (centrifugal and reciprocating):

6.1. Trane (not to be selected at this time)

6.2. Carrier

6.3. JCI/York

6.4. Daikin(McQuay)

7. Preferred Manufacturers (screw):

7.1. Trane(not to be selected at this time)

7.2. Dunham Bush

7.3. Carrier

7.4. JCI/York

7.5. Daikin

8. Preferred Manufacturers (absorption):

8.1. Trane(not to be selected at this time)

8.2. Carrier

8.3. JCI/York

8.4. Daikin

9. The majority of chiller equipment installed on Kent campus is Trane and York.
10. Access shall be maintained for unrestricted removal of the tubes. Marine water boxes are preferred; connection method.
11. The consultant shall plan for future removal of the chiller by providing removable access panels, adequately sized equipment wells, aisles, etc.
12. Piping shall be designed and installed in a manner to enable the annual cleaning of the tubes with system still operational as applicable. Coordinate with KSU OUA.
13. The chiller controls shall enable chilled water reset by the energy management system and monitoring/control of most other chiller functions. Review with KSU OUA.
14. Chillers shall be mounted on a 4" high (minimum) chamfered reinforced concrete housekeeping pad.
15. Heat rejection chillers shall be reviewed with OUA prior to selecting or designing this type of equipment.
16. Magnetic Chillers shall be reviewed with OUA prior to selecting or designing this type of equipment.
17. Heating and cooling chillers shall be reviewed with OUA prior to selecting or designing this type of equipment.

23 65 00 COOLING TOWERS

1. Codes and Standards
 - 1.1. UL and NEMA Compliance: Provide electric motors and electrical components required as part of factory fabricated cooling towers which have been listed and labeled by UL and comply with NEMA Standards.
2. Tower performance
 - 2.1. Tower performance will need to be reviewed with OUA. Base of design should meet 95 deg DB with 87 deg WB for ambient conditions. Water temperature performance should be based on 85 deg LWT and 95 deg EWT for normal application. Towers associated with steam drive chillers or elevated equipment discharge temperatures should be accounted for in the towers performance and tower fill.
 - 2.2. High efficiency motors shall be considered since designs are to incorporate VFD for fan speed control. Gear drives shall be considered and provided as base of design. Alternate for going with belt or direct drive units.

2.3. Tower level controls shall be reviewed with OUA design with digital control preferred and programmed for JCI controls interface. Each cell shall be supplied with level device. Other methods of unit's make-up water system shall be reviewed with OUA engineers.

2.4. All towers selections and designs with require consultant to provide lift cycle cost analysis as part of equipment selection.

2.5. All cooling towers shall be stainless steel construction unless written approval by OUA to construct in another material type. Galvanized steel construction shall be avoided.

3. Equipment - Preferred Manufacturers:

3.1. Marley (Preferred)

3.2. Baltimore Air Coil

3.3. Evapco

3.4. Tower Tech and Delta (Review with OUA)

4. The consultant shall review each of the manufacturers for size when developing the design documents.

5. If budget allows, an indoor sump tank is preferred in order to conserve water, electricity and chemical treatment.

6. The towers shall be mounted on structural steel, primed and painted with coats of quality exterior grade paint. If budget allows, the towers shall be mounted on galvanized steel support. Towers hot basin and cold basin and wetted surfaces to be stainless steel. PVC honey comb fill is preferred and shall be rated for 115 deg. Review with KSU OUA.

7. Roof mounted cooling towers shall be mounted a minimum of 24" above the roof (24" to lowest portion of support steel) to facilitate future roof work.

8. Cooling towers shall be provided with distribution basin covers.

9. Provide mist and drift eliminators.

10. Tower makeup lines shall have a winter shutoff valve located such that the tower lines can easily be drained to avoid freezing. Makeup float valve shall be 1¼" minimum. If towers are to be used for winter operation the winter mode of operation shall be reviewed in detail with OUA.

11. Open tower system piping shall be a non-ferrous pipe such as fiberglass, PVC, or ABS. This eliminates the continual cleaning problems associated with rust flaking in steel piping. Thrust restraints shall be incorporated into the piping design.

12. Cooling tower fan shall be controlled by a frequency drive whenever possible. Two speed fans shall have a soft start on the low speed as a minimum. Two speed fans should only be considered if budget is concern. Review with OUA prior to making this decision.
13. Cooling towers for absorption chillers shall include a tower water bypass for control of condenser water temperature at initial startup. Water must be bypassed to the tower cold basin. Review design needs with OUA.
14. Cooling tower sump outlet shall be a minimum of 48" higher than the suction inlet of the tower water pump.
15. Cooling tower design and construction shall include an access ladder to the hot basin and fans. The ladder shall include guards to prevent injury due to falling.

23 70 00 CENTRAL HVAC EQUIPMENT

1. Air handling units shall be located in a completely enclosed mechanical room whenever possible. Roof and ground mounted equipment is unacceptable unless approved by OUA.
2. Generally, all air handling units shall include outside air economizer, CO2 sensors, internal face and bypass, VIFB coils when possible, unless otherwise approved. Damper actuators to be by JCI or equivalent and on custom units JCI or equivalent shall provide dampers and actuators. Access doors shall be provided with windows and interior lighting where possible, double wall construction. Only select units with the highest quality of components.
3. Provide units with energy recovery were possible. Units shall be sized for economizer consideration.
4. Codes and Standards
 - 4.1. AMCA Compliance: Test and rate air handling units in accordance with AMCA standards.
 - 4.2. ARI Compliance: Test and rate air handling units in accordance with ARI 430 "Standard for Central Station Air Handling Units;" display certification symbol on units of certified models.
 - 4.3. NFPA Compliance: Provide air handling unit internal insulation having flame spread rating not over 25 and smoke developed rating no higher than 50, and complying with NFPA 90A "Standard for the Installation of Air Conditional and Ventilating Systems."
 - 4.4. Systems shall meet or beat ASHRAE 90.1 and comply with ASHRAE 62.1, 2004 guide lines.
5. Preferred Manufacturers (Pre-Built):
 1. Trane(not to be selected at this time)
 2. Carrier

3. JCI/York
4. Daikin(McQuay)
5. Aeon (Prior approval required)
6. Petra (Prior approval required)
7. Air Enterprise
8. Buffalo Air Handling
9. Governair LLC
10. Reznor
11. Temtrol Inc.

6. Preferred Manufacturers (Custom), if others review with OUA:

- 6.1. Air Enterprise
- 6.2. Engineered Air
- 6.3. Governair
- 6.4. Buffalo
- 6.5. JCI /York Custom
- 6.6. Trane(not to be selected at this time)
- 6.7. Temtrol Inc.

7. Units shall be mounted on appropriate equipment bases or housekeeping pads.
8. Adequate space shall be provided for coil replacements. Coil pull space shall be indicated on the construction documents.
9. The Engineer shall design installation with future replacement of the unit in mind.
10. Louvers: Utilize drainable, sight proof with removable bird screens, custom Kynar finish (color by A/E), velocity to minimize water and snow penetration, complete perimeter caulk/sealant both sides, coordinate with A/E and General Contractor. Design shall provide access between OA damper assembly and insect screen on louvers.

11. Casing: 2" insulated double wall aluminum or galvanized steel wall panels. Provide hinged access doors with cam lock handles and view window where required for maintenance. Provide interior fluorescent lighting as needed with on/off switch. Switch to include long lasting (LED or Neon) pilot light "on" indication and accessory GFCI receptacle. Exterior units shall have sloped horizontal surfaces to shed water.
12. Dampers: Provide low leakage dampers with damper blade orientation to facilitate air blending and minimize stratification. Damper actuators shall be by JCI or approved equal.
13. Coils: All piping and valving arrangements to allow coil removal. Preheat: Prefer steam VIFB coil with redundant double steam trap arrangement. Provide control valve with bypass. Cooling: Provide minimum ½" O.D., 0.035" wall copper thickness with 0.01" minimum aluminum fins, maximum 11 fins per inch. Stainless steel IAQ insulated double wall construction condensate drain pans (stacked coils with intermediate pans); slope drain pans for complete drainage to accessible side of unit, maximum 500 fpm face velocity, and SS casing, maximum 6 row coils. Heating/Reheat: Provide minimum 5/8" O.D. tubes, 0.035" wall copper thickness with 0.01" minimum aluminum fins, maximum 11 fins per inch.
14. Humidification: Steam dispersion tube type with rapid absorption characteristics. Coordinate with OUA prior to equipment selection. Air handling units shall include humidifying systems when applicable and approved by KSU OUA. Utilize steam for pre-heat coils, galvanized steel coil casing shall be avoided, where possible. Stainless steel is preferred when budget allows. Review with OUA.
15. Ultraviolet lamp sterilization: Provide on inlet and outlet side of cooling coils. Review with KSU OUA.
16. Fans: Include vibration isolation; multi-belt with toothed design, VFD duty motors, grease lubricated long life bearings with lube lines extended to access side of unit with plastic tubing and zerk fittings.
17. Fan Walls: Can be considered, review with KSU OUA.
18. Unit wiring shall be by manufacturer with single point wiring connection complete with separate circuit for controls.
19. Controls: See Division 25 INTEGRATED AUTOMATION.

23-70-01 ADVANCED HVAC SYSTEM DESIGN

1. Glycol systems with make-up package shall be reviewed with OUA.
2. Thermal storage tanks or systems shall be reviewed with OUA.
3. Glycol materials and radiant floor systems, piping material shall be reviewed with OUA
4. Energy recovery units shall be reviewed with OUA
5. Snow melting system shall be reviewed with OUA. Connection into BAS will be required.
6. Geothermal system shall be reviewed with OUA. Field study will be required and tested for proper soil conditions prior to formalizing the design for this type of system. Geothermal fields will

require a balanced system. Associate shall provide documentation to OUA. Life cycle and ROI will be required prior to system selection. No delegated design will be allowed without prior approval by KSU-OUA.

7. The use of delegated designs shall be avoided or if used shall be stamped by engineer of record.

23 80 00 DECENTRALIZED HVAC EQUIPMENT

1. This section includes the following types of terminal equipment:

1.1. Finned-Tube Radiation Heaters

1.2. Electric Baseboard Radiation

1.3. Radiant Ceiling Systems

1.4. Convectors

1.5. Unit Heaters

1.6. Cabinet Heaters

1.7. Fan Coil Units

1.8. Unit Ventilators

2. Codes and Standards

2.1. I=B=R Compliance: Test and rate baseboard and finned tube radiation in accordance with I=B=R, provide published ratings bearing emblem of I=B=R.

3. Equipment – Preferred Manufacturers:

3.1. Finned Tube Radiation: No specifically preferred manufacturer. Review with OUA.

3.1.1. Radiation covers shall include manual dampers with occupant accessible operation and slant top housing design/pencil proof design. Review with OUA.

3.2. Electric Baseboard Radiation: No specifically preferred manufacturer. Please coordinate and get OUA Approval prior to listing base of design.

3.2.1. Electric baseboard in occupied areas shall include accessible temperature control and on/off switch and BAS controls.

3.3. Radiant Ceiling Panels: Aerotec, Airtex, Sun-el. Provide BAS seq. of operations, panels shall be coordinated into reflected ceiling system and panels shall have insulation installed above units as determined by manufacturer.

3.4. Convectors: No specifically preferred manufacturer. Vulcan, Runtal, Sterling, Trane(not to be selected at this time), JCI York, Airtherm

3.5. Unit Heaters: Trane (not to be selected at this time), Vulcan, Modine, Chromalox, Resnor. Coordinate with wall finish and architects for final selection and review control seq. of operation with JCI and OUA.

3.6. Fan Coil Units: IEC, Nailor, International, Daikin, and Trane (not to be selected at this time). Coordinate control seq. of operations and configuration with OUA.

3.7. Cabinet Heaters: If provided, furnish two pipe with control valve pre-piped with ¼ turn isolation ball valves, circuit setter balancing system, factory mounted disconnect switch with speed control and temperature control device suited for building application and fan cycling to minimize fan energy when temperatures are satisfied. Trane (not to be selected at this time) JCI, Daikin, Sterling, Airtherm and Vulcan preferred.

3.8. Fan Coil Units: Provide 4-pipe system when applicable to building systems. Units to be supplied with motorized O.A. damper controls, prepiped with isolation ¼" turn ball valves, plastic or stainless steel A/C condensate drain pans, pleated filters, circuit setter and control valve coordinated with BAS. Unit control shall allow full communication with KSU BAS.

3.9. Unit Ventilator: Provide 4-pipe system when acceptable to building conditions. Unit to be furnished with bar grilles, microprocessor controlled, insulated unit construction, plastic or stainless steel condenser drain pans, motorized face and bypass damper controls, OA temperature sensor and freeze protection. If DX cooling system to have low ambient lockout controls, hot gas bypass and economizer. Unit control shall allow full communication with KSU OUA. Associate to use hot water and chilled water coils when available. DX systems must be approved by KSU OUA. Unit Ventilators: Trane(not to be selected at this time), Daikin, International, or others shall be reviewed with OUA

23 81 23 COMPUTER ROOM AIR CONDITIONERS

1. Preferred manufacturers

1.1. Liebert/Emerson

1.2. Data Aire

2. Each unit to be furnished with micro base unit controls, BACnet interface capability with Johnson controls, humidifier with infrared lamp (setpoint based on room conditions with range 35% to 55% RH) self contained system, dual refrigeration circuits and compressors, CFC refrigerant system based on EPA class 2 or better for clean air act, water leak detection system for raised floor applications, 5 year parts and labor refrigeration warranty, high efficiency units, DX, glycol or chilled water coils (review this option with OUA) .

23 81 24 TELA/DATA ROOM AIR CONDITIONERS

1. Preferred manufacturers

- 1.1. Sanyo – ECO-I
- 1.2. Daikin
- 1.3. LG - Multi V
- 1.4. Mitsubishi - CITY MULTI (PREFERRED VENDOR)
- 1.5. Mitsubishi - MR. SLIM

Each unit to be furnished with micro base unit controls, BACnet interface capability with Johnson controls, CFC refrigerant system based on EPA class 2 or better for clean air act, a/c leak detection system, 5 year parts and 1-year labor warranty, high efficiency units, VRF system to have A410 refrigerant, (review this options with OUA)

23 81 24 VRF HEATING AND COOLING SYSTEMS

1. Preferred manufacturers

- 1.1. Sanyo – ECO-i
- 1.2. Daikin
- 1.3. LG - Multi V
- 1.4. Mitsubishi - CITY MULTI (PREFERRED VENDOR)

Each unit to be furnished with micro base unit controls, BACnet interface capability with Johnson controls, CFC refrigerant system based on EPA class 2 or better for clean air act, a/c leak detection system, 5 year parts and 1-year labor warranty, high efficiency units, VRF system to have A410 refrigerant, (review this options with OUA)

Each of the designs shall utilize state of the art a/c condensate pumps and the pumping system shall have the ability to shut down the units if drain pans are overloaded and not draining. The refrigeration systems shall also be provided with isolation valving to ensure that maintenance personnel can isolate each of the system refrigerant lines from both the distribution unit and also at the terminal unit. All outside equipment will be provided with support structure to account for snow loading and be equipped with freeze, ice and snow protection for lower sections of condensing units. Outdoor units shall also be provided with hail guards for protection of coils. Systems which require cooling in winter mode of operation shall also be provided with low ambient controls.

VRF systems shall also be provided with all support maintenance devices for field diagnostics so technical are equipment with interface panel, handheld devices etc. These components shall be built into the specifications and issued as an alternate to the contract documents.

Training on system will include system setup, wiring of system, sequence of operation, refrigerant quantity and verification, control sequence and numbering of circuits. Complete O&M manuals of system including any support software. Software license shall be good for five years from date of installation.

The system design for a building layout shall be reviewed with OUA.

DIVISION 25 – INTEGRATED AUTOMATION (TEMPERATURE CONTROLS)

1. Johnson Controls, Inc. shall be basis of design. Review system layout with OUA and JCI prior to system selection and design. JCI shall be designated as a separate Prime Contractor in the contract documents. Division 25-Integrated Automation guide specifications will be sent to the A/E for editing and coordination with the local JCI representative assigned to Kent State University.

25 90 00 INTEGRATED AUTOMATION CONTROL SEQUENCES

1. Most control sequences of operation have been developed by KSU OUA and JCI. This information will be given to the A/E for their project use.

END OF MECHANICAL GUIDE

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PART 1 KSU DIVISION 27 - TELECOMMUNICATIONS

1.1 KSU Master Specifications.

All construction at Kent State University facilities is governed by the KSU Master Specifications. The most current version can be found here:

https://www-s3-live.kent.edu/s3fs-root/s3fs-public/file/KSU-OUA_DesignAndEngineeringGuidelines_1.pdf

TeleData specifications are in Division 27, consisting of the following sections:

- SECTION 270526 - GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS
- SECTION 270528 - PATHWAYS FOR COMMUNICATIONS SYSTEMS
- SECTION 270529 - HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS
- SECTION 270536 - CABLE TRAYS FOR COMMUNICATIONS SYSTEMS
- SECTION 270543 - UNDERGROUND PATHWAYS AND STRUCTURES FOR COMMUNICATION SYSTEMS
- SECTION 270544 - SLEEVES AND SLEEVE SEALS FOR COMMUNICATIONS PATHWAYS AND CABLING
- SECTION 270553 - IDENTIFICATION FOR COMMUNICATIONS SYSTEMS
- SECTION 271100 - COMMUNICATIONS EQUIPMENT ROOM FITTINGS
- SECTION 271116 - COMMUNICATIONS RACKS, FRAMES, AND ENCLOSURES
- SECTION 271313 - COMMUNICATIONS COPPER BACKBONE CABLING
- SECTION 271323 - COMMUNICATIONS OPTICAL FIBER BACKBONE CABLING
- SECTION 271333 - COMMUNICATIONS COAXIAL BACKBONE CABLING
- SECTION 271513 - COMMUNICATIONS COPPER HORIZONTAL CABLING
- SECTION 271533 - COMMUNICATIONS COAXIAL HORIZONTAL CABLING

This KSU Division27 Consultants guide is a quick reference that highlights many of the KSU specifications detailed in the Master Specification and may be particularly useful in smaller renovations and projects.

Reference to the KSU Master Specifications is made throughout this document in this format:
[Section \ Part]

1.2 KSU TeleData Projects

Work Coordination

KSU has many construction projects in progress across campus at all times. There is typically a lead contractor or construction manager responsible for coordination among all trades on each project. Where there is other work taking place on campus, the contractor will be responsible for coordinating all work through the other contractors at that location. KSU's typical office hours are Monday through Friday from 8:00 a.m. until 5:00 p.m.; however, there are classes that are held in various buildings throughout the year that take place in the evenings, weekends, and on holidays. Once specific installation locations are identified KSU will make every effort to allow the contractor to work during regular business hours. The contractor will not be permitted, under any circumstances, to interrupt regular KSU business, classes, or student activities at any time. This will most likely require the contractor to work some "odd" hours in specifically identified areas. In general, contractors may work within the teledata closets and in utility areas during normal working hours as long as the existing systems or other work is not impacted.

Project Documentation

1. **JACK LIST** A jack list is required to be included in the specifications by the consultant/engineer and is to be maintained through the duration of the project to its completion. This jack list is to contain a listing of all outlets with the associated building designation, closet designation, floor where the outlet is located, room # of the outlet, faceplate designation, connectivity code used, # of drops, # of cat5E or Cat 6A cables. A sample of this jack list is available upon request
2. **AS-BUILTS** An As-built drawing is required and is to be maintained through the duration of the project. A formal As-Built in PDF form is to be submitted in the project completion documentation.

PART 2 MDF/IDF TeleData Closets

2.1 Room size

[271100 / 4.0]

1. Telecom Room shall be a minimum of 10' in width.
2. Telecom Room Length to be determined by the number of racks to be installed. For space planning purposes, a 19" equipment rack has a total rack width of 21.5".
3. A 6" vertical wire manager is required at each end of the rack row and between each rack.
4. Total Length of racks with vertical wire management in inches = $(21.5 \times \text{Quantity of racks}) + (6 \times (1 + \text{quantity of racks}))$
5. Total length of room equals Total Length of racks with wire management plus a minimum of 36".

2.2 Room ceiling

[271100 / 4.0]

Telecom Room shall not have ceiling/drop ceiling installed

2.3 Room Power

[271100 / 4.0]

1. Provide a dedicated panelboard in each telecom room, minimum 100A, 208/120V, 3 phase, 4W, 30 CCT. With minimum thirty (30) 20A/1P circuit breakers unless noted otherwise on drawings.
2. Provide duplex receptacles with one dedicated 20A 120V circuit per rack. These should be on emergency power if available. Receptacles to be mounted on back of vertical wire management.
3. Provide duplex receptacles at 18" AFF at 8-ft centers around telecom rooms with minimum of two per wall.

2.4 Cooling

Dedicated cooling is desired for all MDF/IDF locations. This should be 24/7/365 availability and be on emergency power if available. For smaller IDF closets this requirement may not be necessary or practical

2.5 Lighting

[271100 / 4.0]

Lighting fixtures are to be vaportight, 4' LED, 120 V, wet location, high impact lens fixtures, 70FC minimum. Fixtures installed behind and in front of equipment racks. Provide emergency power if available, or battery-operated wall pack in Telecom Room

2.6 Wall backboards

[271100 / 2.1]

1. Cover all walls with 3/4" plywood from 6 inches to 8 feet, 6 inches above finished floor.
2. Plywood, 3/4 by 48 by 96 inches, 4 ply, one side Grade A facing out, one side Grade C facing wall.
3. Cover front, back, and all edges with gray fire-retardant paint
4. Fire rated plywood is not permitted, all backboards shall be painted as described.

2.7 In closet cabling

[271100 / 4.0]

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There shall be no cables in conduit in the Telecom Room. Stubs into the wall/floor/ceiling shall be provided and all cables within the closet shall be on ladder.

2.8 Racks

[271100 4.0]

1. The front of the rack row shall be located 3'6" from the opposite wall.
2. The first rack will be the Infrastructure rack and be a 19" 4-post rack. The location of this rack is to be determined on a project basis
3. Each horizontal cable rack shall terminate a maximum of 192 cables (have a maximum of 4 x 48 port patch panels).
4. Horizontal cables from different floor are not to be terminate on the same rack.

2.9 Rack Power

[271116 / 2.2]

Provide one power strip at each vertical wire management panel mounted vertically on horizontal cable ladder.

2.10 Rack wire management

[271116 / 2.1]

1. A 6" vertical wire manager is required at each end of the rack row and between each rack
2. Equip each rack with the following horizontal management (beginning at top of rack):
 - a. Rack Unit 45: 1RU Wire Manager
 - b. Rack Units 44 – 42: 3RU Wire Manager
 - c. Below, and between copper termination panels: 2RU Wire Manager.

PART 3 Grounding

Busbar - A grounding busbar is required in each teledata closet. [270526 / 2.4]

1. The MDF must have the Telecommunications Main Grounding Busbar (TMGB). Predrilled, wall-mounted, rectangular bars of hard-drawn solid copper, 1/4 by 4 inches in cross section, length as indicated on Drawings. Stand-off brackets that provide a 4-inch clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
2. Each IDF must have a Telecommunications Grounding Busbar (TGB). Predrilled rectangular bars of hard-drawn solid copper, 1/4 by 2 inches in cross section, length as indicated on Drawings. Stand-off brackets that provide at least a 2-inch clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.

Bonding [270526 / 3.2]

1. Bonding shall include the ac utility power service entrance, the communications cable entrance, and the grounding electrode system. The bonding of these elements shall form a loop so that each element is connected to at least two others
2. The bonding conductors between the TMGB and structural steel of steel-frame buildings shall not be smaller than No. 2 AWG
3. The bonding conductors between the TGB and structural steel of steel-frame buildings shall not be smaller than No. 2 AWG

Connections [270526 / 3.6]

1. Interconnections: Interconnect all TGBs with the TMGB with the telecommunications backbone conductor. If more than one TMGB is installed, interconnect TMGBs using the grounding equalizer conductor. The telecommunications backbone conductor and grounding equalizer conductor size shall not be less than No. 2 AWG conductor.
2. Structural Steel: Where the structural steel of a steel frame building is readily accessible within the room or space, bond each TGB and TMGB to the vertical steel of the building frame with No.2 AWG.

3. Telecommunications Equipment Racks: Bond metallic components of enclosures to the telecommunications bonding and grounding system. Install top-mounted rack grounding busbar unless the enclosure and rack are manufactured with integral the busbar or bonding lug. Bond the equipment grounding busbar to the TGB No. 6 AWG bonding conductors’
4. Electrical Power Panelboards: Where an electrical panelboard for telecommunications equipment is located in the same room or space, bond each TGB to the ground bar of the panelboard with No.2 AWG.
5. Bond metallic equipment in a telecommunications equipment room to the grounding busbar in that room, using equipment grounding conductors not smaller than No. 6 AWG.

PART 4 Identification for Communications Systems

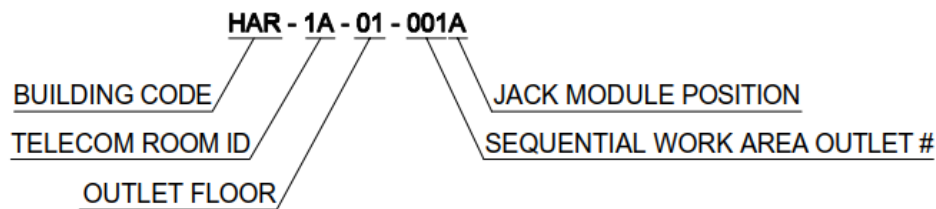
IDENTIFICATION SCHEDULE [271116 / 3.3]

- A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations with high visibility. Identify by system and circuit designation.
- C. Accessible Fittings for Raceways and Cables within Buildings: Identify covers of each junction and pull box with self-adhesive labels containing wiring system legend.

4.1 Faceplates

[271116 / 3.3 D] Label individual faceplates with mechanically-printed labels. Place label behind label window on faceplate. Each faceplate shall be labeled with its unique alphanumeric designation composed of the following, in the order listed:

1. 3-Digit Building designation (confirm with Owner).
2. 2-Digit Telecom room designation (confirm with Owner).
3. 2-Digit Work area outlet’s floor.
4. Three digit sequence to represent faceplate (e.g. “001”, “002”, “003”, etc,) and letter to designate.
5. Jack position (e.g. A, B, C, or D)
6. Example: The example faceplate label below indicates a faceplate located on the first floor of Harbourt Hall containing a jack module connected to telecom room “1A” and terminated on patch panel port “001A”.



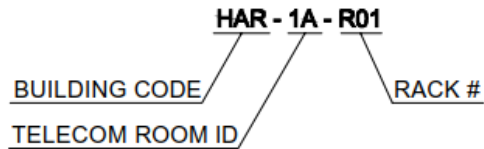
4.2 Equipment Room Labeling

[271116 / 3.3 E1] Racks: Identify front of each rack on top rail with nylon plates embossed with rack label.

- a. Building designation (confirm with Owner)
- b. Telecom room designation.
- c. Rack number.

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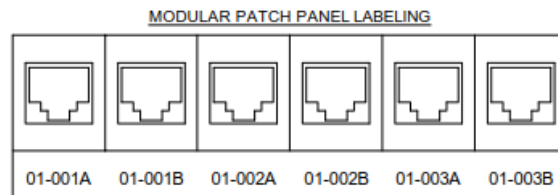
d. Example: The example rack label below indicates the first rack located in telecom room “1A” in Harbour Hall



4.3 Patch Panels

[271116 / 3.3 E2]: Label each patch panel port with a mechanically produced label with the terminating cable’s faceplate identifier:

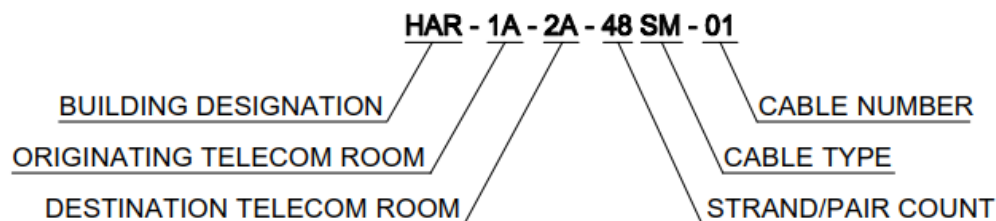
- Two digit work area outlets floor.
- Three digit work area outlet number (sequence to reflect corresponding faceplate label) + letter to designate jack position.
- Example: The example patch panel port label below indicates a port terminating the cable from floor 01 jack, position “A” located in work area outlet “001.”



4.4 Intra-building backbone Cable

[271116 / 3.3 F1]

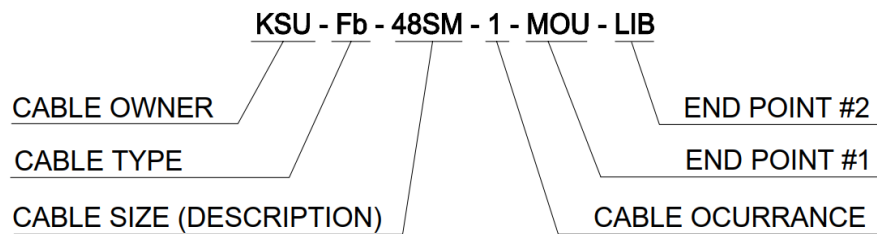
- 3-Digit Building designation.
- Origination Telecom Room.
- Destination Telecom Room.
- Strand-count + Type: e.g. “SM” (singlemode fiber), “MM” (multimode fiber), “C3”(CAT3).
- 2-digit sequential cable number (e.g. 01, 02.. etc)
- Example: The example backbone cable label below indicates the first 48-strandsinglemode fiber optic cable originating in closet “1A” and terminating in closet “2A”



4.5 Inter-building backbone cable

[271116 / 3.3 F2]

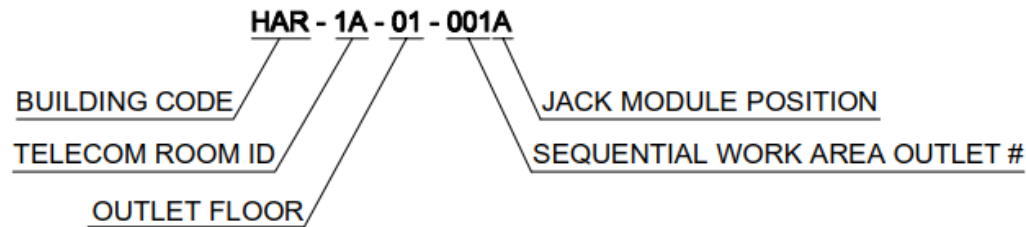
- a. 3-Digit cable owner (i.e. KSU, ATT, TWC).
- b. 2-Digit cable type (i.e. Fb, Cu, Cx).
- c. Up to 10-Digit cable size (i.e. 100pr, RG11, OMM/65m, etc.).
- d. Occurrence of this cable (i.e. 1, 2, 3, etc.).
- e. End point #1 (i.e. Bldg. TLA, MH#, splice #, etc.).
- f. End point #2 (i.e. Bldg. MOU, MH#, splice #, etc.).
- g. Example: The example backbone cable label below indicates a Kent State University 48-strand singlemode fiber optic cable originating in Library and terminating in the Moulton Hall



4.6 Horizontal Cables

[271116 / 3.3 G] Label each cable with a vinyl-wraparound label indicating the following, in the order listed:

1. 3-Digit Building designation (confirm with Owner).
2. 2-Digit Telecom room designation (confirm with Owner).
3. 2-Digit Work area outlet's floor.
4. Three digit sequence to represent faceplate (e.g. "001", "002", "003", etc,) and letter to designate jack position (e.g. "A", "B", etc,)
5. Example: The example horizontal cable label below indicates a cable originating from patch panel port "001A" in Harbourt Hall telecom room "1A" connecting jack module "A" within work area outlet "001" located on floor "01".



PART 5 Cabling

5.1 KSU TeleData Cabling Standards

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KSU uses its own standard which closely follows the EIA-TIA commercial building standards for Cat 5E and Cat 6A cabling and pathways.

The wiring installed MUST NOT violate any NEC codes as well.

Cable Length [271513 / 1.4] The maximum allowable horizontal cable length is 295 feet. This maximum allowable length does not include an allowance for the length of 16 feet to the workstation equipment or in the horizontal cross-connect.

Cable Type [271513 / 4.0] BLUE Cat 6A is required for all horizontal cabling in new building construction and major building renovations projects. Small projects with horizontal cable being pulled to existing TeleData closets may possibly use yellow Cat 5E cabling. KSU Engineer to determine if Cat5E is acceptable for use on project.

[271513 / 2.2] ALL horizontal cable must of type: Communications, Plenum Rated: Type CMP complying with UL 1685 be plenum rated.

Termination Spec [271513 3.3] All horizontal copper cable shall be terminated per T-568B specification.

Documentation [271513 / 4.0]

Designer shall include a jack list matching contract document design created in Excel

Installation contractor to provide as-built drawings with jack list matching installation in Excel. Design engineer to provide installer with electronic copy of spreadsheet

5.2 Copper Horizontal Cabling

Category 6A cable

Cat 6A cable color [271513 / 2.5] All Cat 6A cable must have a BLUE jacket.

Cat 6a termination [271513 / 2.6] All Cat 6A horizontal cable is to be terminated with appropriate cat6A Belden REVConnect Insert, Media faceplates, and Keyconnect patch panels.

Flush mount faceplates consist of Belden MediaFlex Angled Edge faceplate, REVConnect inserts, Blank face place insert, and Blank port inserts.

Surface mount faceplates consist of Belden Keyconnect Side Entry box of the appropriate port count and REVConnect insert.

Category 5E cable

Cat 5E cable color [271513 / 2.3] All Cat 5E cabling must have a YELLOW jacket.

Cat 5E termination [271513 / 2.4] All Cat 5E horizontal cable is to be terminated with appropriate Cat 5E Belden REVConnect Insert, Media faceplates, and Keyconnect patch panels.

Flush mount faceplates consist of Belden MediaFlex Angled Edge faceplate, REVConnect inserts, Blank face place insert, and Blank port inserts.

Surface mount faceplates consist of Belden Keyconnect Side Entry box of the appropriate port count and REVConnect insert.

Lightning Protection [271513 / 2.7] Outdoor, Rooftop, and buried drop cable must be protected with Lightning Protection at both ends.

Drops serving Talk-a-Phones shall be CAT 3 buried drop rated cable and use Manufacturer/Model: Circa 502-A350.

All other outdoor drops use buried drop rated CAT 6A cable should use lightning protection from Porta Systems series 505 lightning protection with 65 fuses with Manufacturer/Model: Porta Systems 505E4-65

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Outlet - Elevator [271513 / 4.0] The elevator outlet is to be located in the elevator machine room next to the elevator controller enclosure. Standard Cat 6A flush or surface faceplates are used. The outlet is to be a dual port configuration. The left (“A”) port is to be a standard single Cat 6A drop from the MDF. The right (“B”) port is to be connected into the elevator controller phone terminals. The circuit is completed with a jumper between the left port and right port.

Outlet - Fire Alarms [271513 / 4.0] will always require (2) Cat 6A cables to each device. Standard Cat 6A flush or surface faceplates are used - RJ31x style outlets are NOT to be used. Also, one cable #18/2 STP plenum rated cable should be installed from fire alarm panel to local building automation head end panel (JCI).

Outlet – Camera [271513 / 4.0] A security camera outlet shall consist of one Cat 6A cable/jack.

Outlet – Wireless Access point [271513 / 4.0] shall consist of one Cat 6A cable/jack.

[271513 / 4.0] Teledata outlets in areas where furniture partitions are located need to keep clear access to the outlets. Consider eliminating modesty panels in these areas

Cable testing [271513 / 4.0] All cabling (backbone fiber, backbone copper, cat 5E, and cat 6A) is to be tested with test reports provided in electronic format. Fiber is to be tested using an OTDR. Cat 5E is to be tested using the standard EIA/TIA Cat5E test. Cat6A is to be tested using the standard EIA/TIA Cat6A test. Cat3 copper is to be tested via BISCII standard using the wire map test for all pairs in backbone and other than horizontal cabling shall be performed and recorded for all segments. Wire map tests include:

- a. Continuity to the remote end.
- b. Shorts between any two or more conductors.
- c. Crossed pairs
- d. Reversed pairs
- e. Split pairs
- f. Any other miswiring

5.3 Backbone Cable

KSU current general design practices

INTER-building backbone cable

1. Inter-building backbone cable will only be pulled to and terminated in the MDF
2. Each TeleData MDF shall be connected over diverse paths preferably to two Dnode locations. If direct paths are not practical, then to intermediate buildings with fiber connections to Dnode buildings
3. The standard is fiber optic cable; Single mode, 96 strands per building.
4. There will be no copper Cat3 backbone cable required between the MDF other buildings
5. There will be no Coax cable required between the MDF other buildings

INTRA-building backbone cable

1. Each IDF will connect back to the MDF with fiber optic cable; Single Mode, 48 strands.
2. There will be no copper Cat3 backbone cable required between the MDF and any IDFs
3. There will be no Coax cable required between the MDF and any IDFs

5.4 Fiber Optic cable

Termination Hardware [271323 / 2.3]

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All fiber optic cable terminations shall be made by fusion splicing pigtails on the fiber strands. No strands shall be directly terminated in a connector.

Fiber optic cable shall be terminated in the appropriately sized enclosure in the Infrastructure rack. A unique fiber enclosure will be used to terminate the optic cable fiber from each discrete location.

Intra-building fiber [211323 / 4.0] Each TeleData IDF shall be connected back to the MDF with a minimum of 48 strands.

Testing [271323 3.5]

1. It is Kent State University's standard to test all fiber optic cable strands for continuity and attenuation utilizing a Fiber Optic Time Domain Reflectometer (OTDR).
2. Singlemode testing procedures shall conform to 526-7 - Method A.1 – One-Jumper Reference
3. Singlemode strands shall be tested at 1310 and 1550 nm.
4. Tests shall be performed bi-directionally.
5. Measured results shall be plus/minus 1 dB of loss budget guidelines.
6. As a minimum, the fiber test reports must shall include
 - Fiber Cable Number
 - Test Date
 - Fiber Type
 - Fiber Length
 - Wavelength of Test
 - Attenuation (Loss) in dB
 - Technician's Name

PART 6 Parts List

Manuf.	Part #	Description
MISC		
Velcro	31086	One wrap, 1/2" Hook & Loop, 1 PC black, 25 yard roll
Velcro	31090	One wrap, 3/4" Hook & Loop, 1 PC black, 25 yard roll
FIBER TERMINATION - Master Specifications Section 271323 Part 2.3		
Leviton	5R1UM-S03	1000i SDX enclosure with sliding tray 1RU - USE for 1-24 STRANDS
Leviton	5R2UM-S06	1000i SDX enclosure with sliding tray 2RU - USE FOR 25-72 STRANDS
Leviton	5R3UM-F12	1000i SDX enclosure with sliding tray 3RU - USE FOR 73+ STRANDS
Leviton	5F100-2LL	12-Fiber SDX Adapter Plate, OS2, Duplex, LC, Blue
Leviton	5F100-PLT	SDX Blank adapter plates
Leviton	T5LHS-P06	12-fiber Splice tray; Standard
Leviton	SPLMT-HKT	Lightspace splice tray hardware mounting kit
Leviton	UPPLC-KIT	SM 12 Fiber color coded pigtail kit, LC, UPC Polish SM, OS2
Leviton	FSSD-60	Splice Sleeve Fusion 60MM (50 pk)
RACK - Master Specifications Section 271116 Part 2.1		
Chatsworth	46353-703	Universal Rack; 2-Post, 45U 7'H x 19", Black
Chatsworth	50120-703	Quadra rack, 4-post, 19", 45U 7'H x 19"
Chatsworth	40605-005	Rack; Screws, Pan head 12-24 black, pk (of 50)
POWER STRIP - Master Specifications Section 271116 Part 2.2		
Tripp-Lite	PDUMV40	Power strip; Vertical, DUAL CIRCUIT, Surge protected, Metered, 20A
CABLE MANAGERS - Master Specifications Section 271116 Part 2.1		
Chatsworth	30092-703	Vertical, SINGLE sided, 6"W, 84"H, 8"D
Chatsworth	30139-719	Horizontal wiremanager, 19"W x 4.96"D x 1 RU H
Chatsworth	30130-719	Horizontal wiremanager, 19"W x 5.14"D x 2 RU H
Chatsworth	30131-719	Horizontal wiremanager, 19"W x 5.14"D x 3 RU H
LADDER - Master Specifications Section 271116 Part 2.3		
Chatsworth	11252-720	Ladder, Black, 20" W, Telco style cross members 9" intervals
Chatsworth	11252-712	Ladder, Black, 12" W, Telco style cross members 9" intervals
Chatsworth	11421-712	Wall Angle support kit, cable runway; 12", Black
Chatsworth	11309-701	Foot kit, Cable Runway, black
Chatsworth	11298-701	Heavy duty junction-splice kit, Black
Chatsworth	11302-701	Junction-Splice Kit, 90 degrees, Black
Chatsworth	11301-701	Butt-splice kit, black, 1-1/2" x 3/8" strinters
Chatsworth	11308-701	J-bolt kit, cable runway, black,
Chatsworth	10487-701	Swivel splice kit; Butt-swivel, black
Chatsworth	10489-701	Swivel splice kit; Veritcal-swivel, black

DIVISION 27 – Consultants Guide

Manuf.	Part #	Description
HORIZONTAL CABLE - Master Specifications Section 71513 Part 2.5		
Commscope	UN874035104/10	CSP446 Cat6A cable, blue, 1,000' REEL
Commscope	UN874035114/10	CSP446 Cat6A cable, blue, 1,000' COMM PAK
Commscope	UN874035184/30	CSP446 Cat6A cable, blue, 3,000' REEL
TERMINATION, HORIZONTAL CABLE - Master Specifications Section 271513 Parts 2.4 and 2.5		
Belden	RVAMJKUBL-S1	REVConnect Cat6A Jack; Blue - Single Pack
Belden	RVAMJKUBL-B24	REVConnect Cat 6A Jack; Blue - Bulk Pack(24)
Belden	RVUCOEW-B50	Bulk pack of 50 cable managers and caps
Belden	RV5MJKUBK-S1	REVConnect Cat5E Jack; Black - Single Pack
Belden	RV5MJKUBK-B24	REVConnect Cat 5E Jack; Black - Bulk Pack(24)
Belden	AX103115	Patch panel; Keyconnect PP Flat 48 2U
Belden	AX102200	Keyconnect Patch Panel Labels (*)
Belden	AX106669	MediaFlex Angled Edge Single-Gang Faceplate
Belden	AX106673	MediaFlex Angled Edge Double-Gang Faceplate
Belden	AX104483	MediaFlex Keyconnect Style insert 2-port, Angled
Belden	AX101757	MediaFlex Filler Insert 1-unit
Belden	AX101761	MediaFlex Filler Insert 2-units
Belden	AX107026	Keyconnect Blank insert (qty 50)
Belden	AX101821	MediaFlex Faceplate Labels
Belden	AX107030	Keyconnect Side Entry Box 1-Port Gray
Belden	AX107031	Keyconnect Side Entry Box 2-Port Gray
Belden	AX107032	Keyconnect Side Entry Box 4-Port Gray
Belden	AX107033	Keyconnect Side Entry Box 6-Port Gray
Belden	RVUTT01	REVConnect Universal termination tool
Belden	RVUTB01	Tool Spare Blade Set
Belden	RVUCT01	Replacement Cable Prep Tool

(+) A cap and core is included with each insert.

(*) Labels are included with each patch panel and faceplate. These are additional label sheets

(*) Labels can be printed with Free Belden LabelFlex labeling software

A standard end user flush wall jack would consist of:

Single gang face place	AX106669
1 Angled 2 port face plate	AX104483
1 Insert, Cat6A, Blue	RVAMJKUBL-S1 (or -B24)
1 Blank port insert	AX107026
1 blank 1U faceplate insert	AX101757
1 blank 2U faceplate insert	AX101761

For ceiling jacks for APs and Cameras:

1 Surface jack, 1 port	AX107030
1 Insert, Cat6A, Blue.	RVAMJKUBL-S1 (or -B24)

PART 7 Sample rack elevation

TLA-XX-R01		TLA-XX-R03		TLA-XX-R02		
45	1RU Fiber mgr	45	1RU Fiber mgr	45	1RU Fiber mgr	Fiber Optic Cable Termination
44		44		44		Fiber Optic cables will be
43	3RU cable manager	43	3RU cable manager	43	3RU cable manager	terminated in a separate
42		42		42		enclosure for each location
41	INTER-building fiber #1	41	Cat 6A 48 port pp	41	Cat 6A 48 port pp	
40		40	1st fl horizontal	40	2nd fl horizontal	Horizontal Cable Termination
39		39		39		There will be a maximum of
38	INTER-building fiber #2	38	2RU Cable manager	38	2RU Cable manager	five 48 port patch panels per
37		37	Cat 6A 48 port pp	37	Cat 6A 48 port pp	rack.
36		36	1st fl horizontal	36	2nd fl horizontal	Cables shall be separated by
35	INTRA-building fiber #1	35	2RU Cable manager	35	2RU Cable manager	floor; with a rack containing
34		34		34		only cables from the same floor
33	INTRA-building fiber #2	33	Cat 6A 48 port pp	33	Cat 6A 48 port pp	
32		32	1st fl horizontal	32	2nd fl horizontal	Vertical Cable Managers
31	INTRA-building fiber #3	31	2RU Cable manager	31	2RU Cable manager	Installed far left, far right, and
30		30		30		between each rack.
29		29	<i>future</i>	29	<i>future</i>	
28		28	1st fl horizontal	28	2nd fl horizontal	Power Strip
27		27		27		Mounted on the back of the
26	2RU Cable manager	26	2RU Cable manager	26	2RU Cable manager	rack horizontal cable vertical
25		25		25		ladder of each rack.
24	Building switch 1	24	Edge stack switch 1	24	Edge stack switch 2	2 Post Rack
23		23		23		Total rack width: 20.31"
22	2RU Cable manager	22	2RU Cable manager	22	2RU Cable manager	Floor plate depth: 15.00"
21		21		21		
20		20		20		4 Post Rack
19	Building switch 2	19	Edge stack switch 3	19	Edge stack switch 4	Total rack width: 20.31"
18		18		18		Floor plate depth: 41.27"
17	2RU Cable manager	17	2RU Cable manager	17	2RU Cable manager	
16		16		16		Cable color
15		15		15		All Cat6A cable must be Blue
14		14	Edge stack switch 5	14	Edge stack switch 6	All Cat6A jack inserts must be Blue
13		13		13		
12		12	2RU Cable manager	12	2RU Cable manager	
11		11		11		Building Switches
10		10		10		Are only installed in MDF
09		09	<i>futuire edge switch</i>	09	<i>futuire edge switch</i>	
08		08		08		
07	Eaton 9PX2000RT	07	2RU Cable manager	07	2RU Cable manager	
06	TLA-01-UPS-204-100	06		06		
05		05		05		
04	Eaton 9PX EBM	04		04		
03		03		03		
02		02		02		
01		01		01		

DIVISION 32 – EXTERIOR IMPROVEMENTS

32000 GENERAL REQUIREMENTS

- 32000.1 The associate shall consult the Office of the University Architect (OUA) during the early planning stage of the project concerning site work, excavation, grading and landscaping; removal of obstructions; alterations to existing campus drives, parking areas and walkways; removal of trees and shrubs, and access to and from the site.
- 32000.2 The site survey shall include information on underground utilities and structures (if required by the contract).
- 32000.3 The Associate shall be responsible for preparing a subsurface investigation report which consists of test borings, laboratory testing and engineering analysis.
- 32000.4 Existing utility locations shall be determined by the Associate in the preparation of plans for boring locations. Associate shall locate borings to avoid these utilities. Notify OUA to schedule the work. Significant amounts of underground utility information are available at OUA.
- 32000.5 Boring locations and sections showing all soil conditions shall be shown on the drawings. The specifications shall state that the information is for the contractor's use and shall hold the University harmless for the accuracy of the information.
- 32000.6 The Associate shall consult with OUA during early planning stages of projects to consider emergency vehicle access, service vehicle access, Student Accessibility Services vehicles, snow removal, public transportation, parking and pedestrian access, including construction staging area.
- 32000.7 The associate shall indicate on drawings that the Ohio Utilities Protection Services (OUPS) does not locate utilities on campus nor does KSU personnel. Specifications should require contractor to hire utility location contractor services.

321216 ASPHALT PAVING

- 321216.1 Construction of all roads, drives and parking areas, including sub-grade preparation and all related work, must be constructed by a contractor fully qualified and equipped to perform the work.
- 321216.2 Types of paving materials shall be approved by OUA. Chip and seal pavement is prohibited for any type of permanent construction (Surface).

- 321216.3 Bituminous paving for vehicular installations shall have a minimum load factor of 15.25. Load factors shall be determined by multiplying thicknesses (in inches for each course of material) by the following constants:
- A. Asphaltic concrete 2.00
 - B. Bituminous aggregate 2.00
 - C. Uncoated aggregate 1.00
 - D. Sub-base aggregate 0.75
- 321216.4 Bituminous paving for pedestrian walkways shall only be used where approved by OUA and shall have a minimum load factor of 9.00 with a minimum thickness of 2" compacted, ODOT Item 404. Where no curbs or other lateral containment exists, base shall extend 3" minimum beyond edge of walk.
- 321216.5 Materials for bituminous paving must be specified by reference to the latest edition of the State of Ohio, Department of Transportation, Construction and Materials Specifications (ODOT Specs) with the exception that only limestone aggregate be used in asphaltic concrete.
- 321216.6 HEAVY DUTY
- A. Asphaltic concrete wearing course ODOT Spec Item 448, Type 1, PG 64-22
 - B. Asphaltic concrete interim course ODOT Spec Item 448, Type 2, PG 64-22
 - C. Bituminous aggregate base ODOT Spec Item 301, PG64-22
 - D. Uncoated aggregate base ODOT Spec Item 304 Limestone
- 321216.7 STANDARD DUTY
- A. Asphaltic concrete wearing course ODOT Spec Item 448, Type 1, PG 64-22
 - B. Asphaltic concrete interim course ODOT Spec Item 448, Type 2, PG 64-22
 - C. Uncoated aggregate base ODOT Item 304 Limestone
- 321216.8 Base drainage must be designed over impervious sub-bases. Drainage trenches filled with stone shall be provided through the earth berm perpendicular to the edge of the pavement at low points and at intervals of 100 feet or less.

- 321216.9 Protect the surface course from vehicular traffic and parking until the pavement has cured.
- 321216.10 Repair depressions by cutting out the surfacing with vertical cuts to a minimum depth of 1", filling and rolling. Feathered patches are prohibited.
- 321216.11 Parking lots shall be as follows:
- A. Standard Space 9'-0" wide x 18'0" long
 - B. Disabled Space Same as Standard Space with adjacent 5' wide aisle (cross striping required).
 - C. Aisles 24' wide
 - D. Striping Parking spaces and directional graphics to be white. Restricted curbs and "No Parking" areas shall be painted yellow.
 - E. Seal Coat Asphalt paved areas will be seal coated by the University approximately one year after installation. Seal coat is not required within the scope of your work.
 - F. Curbs All parking lots shall have a 6" high concrete curb at perimeter, islands and drives unless otherwise approved by OUA. (Refer to Concrete Paving below.)
 - G. Lighting All parking lots shall be designed for night lighting. See Division 16 for lighting levels. Maximum height for poles shall be no more than 40' from the ground. The University may elect to require concrete base to be Sonotube as standard or decor in locations selected by OUA. Refer to standard details.
 - H. Wheel Stops (bumper blocks) are prohibited unless otherwise approved by OUA.
 - I. Emergency Phones Review regulations with OUA. Refer to standard detail and specifications
 - J. Gates & Security Systems currently under review by the University
Verify requirements with OUA.
 - K. Walks All sidewalks shall have curb cuts. Refer to standard details. Curb cut finish surface shall comply with

current ODOT requirements (Truncated Domes are required).

321313 CONCRETE PAVING

321313.1 All concrete will utilize both polypropylene fibrillated fiber reinforcing (1.5lbs/yd) and wire mesh mat reinforcing with chairs. Sidewalks will be a minimum of 5" thick and 8' wide concrete with polypropylene fibrillated fiber reinforcing (1.5 lbs/ yard) and wire mesh mat over a minimum thickness of 4 inches of #57 Limestone unless otherwise specified by OUA. Surface shall have a light broom finish. Concrete shall be 4,000 PSI compressive strength at 28 days with air-entrained (3%-6%). When repairing cracked or damaged panels, replace entire panel. All concrete pours shall be tested by independent laboratory selected by KSU.

- A. Metal nosings on exterior stairs are prohibited.
- B. Stairs, rails and cheek walls, slopes to drain. Any stairs should be kept to a minimum. Ramps are to be used whenever possible.
- C. All sidewalks, stairs and ramps on yellow pad must withstand vehicular loading.
- D. Curbs to match adjacent 6" x 18" or integral curb and walk or curb and gutter.
- E. Other site finishes: Use concrete for walkways, drives, service courts, parking areas, dumpster pads, compactor pads, loading dock ramps and aprons and bus pull offs. All items shall be designed for particular items and be verified by OUA. Walks adjacent to lawns are to be flush. Walks adjacent to planting beds shall have rolled curb.
- F. Radiused intersections shall be poured monolithic and should extend to the outer limits of the curves. Segmented curves are not permitted.
- G. Scoring type and locations for sidewalks shall be shown on the drawings.
- H. All scoring shall be tooled. Saw cut joints shall only be permitted if routed with round over bit.
- I. Cross slope of all walks shall be 1/4" per foot (2% minimum).
- J. Walks abutting buildings shall bear on the foundation or be dowelled.
- K. The full width of sidewalks adjacent to curbs shall be 1/4" above the curb.

- L. Temperature steel in stair nosings must have a minimum of 1-1/2" of concrete cover.
 - M. Contractors are required to wet sub-base prior to placing the concrete.
- 321313.2 Curbs shall be poured concrete with #4 top and bottom reinforcing and without gutters. Provide expansion joints with asphalt-impregnated filler strips at 30' intervals. Filler strips must be specified.
- A. Dropped curbs for drive and handicapped access shall be formed for all new work.
 - B. Remove existing curb back to nearest existing joint when new curbs extend into existing curb lines.
 - C. Paving base should extend a minimum of 6" beyond the edge of the surface if curbs are not provided.
- 321313.3 Combined fire service/sidewalks shall be designed to accommodate Kent Fire Department's largest vehicles' (minimum 12' wide) turning radius and provisions for outrigger support.

321400 UNIT PAVERS

- 321400.1 Associate to review all types, location and base material for all unit pavers and porous paving with OUA.
- A. Brick Pavers shall be set on a concrete base with 1" sand leveling bed.
 - B. Unit pavers shall be Herringbone pattern with a sailor course border.

321316 DECORATIVE CONCRETE PAVING

- 321316.1 Stamped pattern concrete paving utilized shall be: (include manufacturer's names, etc.)
- A. Refer to 02514 "Concrete Paving" for minimum design requirements.
 - B. Concrete shall be tinted throughout with mottled multi-colored finish.
 - 1. Color Solomon #385 Bark
 - 2. Color 2 # 489 Dark Redwood
 - 3. Colored powdered shake on hardener for Color 2 – Dayton Superior: Charcoal.

4. Pattern shall be Herringbone with perimeter sailor course border. Stamps provided by owner.
5. Seal Decorative concrete with Cure and Seal (Kuhlman Kure and Seal) with 2 pounds or "SharkGrip: per 5 gallons of sealer.

328400 IRRIGATION SYSTEMS

- 328400.1 Permanent planting beds shall have an irrigation system with backflow preventers. On most projects the water supply shall run through a deduct meter. Coordinate requirements through OUA.
- 328400.2 Piping for irrigation systems shall be polyvinyl chloride (PVC).
- 328400.3 All irrigation piping must be drainable.

323113 CONSTRUCTION FENCES

- 323113.1 Construction fence location must be approved by OUA and must be shown on the drawings.
- 323113.2 Construction Fence shall be 6' high chainlink, 2" mesh with green windscreen. The fence shall have a top pipe rail and bottom tension wire and shall be installed under the direction of the OUA.
- 323113.3 Permanent fencing may be required by the program. Specify chain link fence for perimeter protection and as guards around equipment.

329200 LAWNS

- 329200.1 SCHEDULE:
 - A. If the project completion date falls outside of the specified planting times, the OUA may require extending the landscaping portion of the contract to allow for optimum planting conditions and plant health. The dates for this "extension" shall be specified by the Associate in the Contract documents.
 - B. For lawn areas the Contractor shall be required to fine grade the area and install temporary ~~straw mulch~~ **erosion control measures** to prevent the tracking of dirt into the new project. After the planting season arrives, the contractor shall remove the ~~straw~~ **erosion control measures**, seed the area and mulch.

- C. For planting beds the contractor shall fine grade the area and install the mulch specified for that area. After the planting season arrives, the Contractor shall remove the mulch, plant the landscaping and mulch.

329200.2 FINE GRADING OF AREAS TO RECEIVE LAWN:

- A. Lawn areas to include 6" of topsoil. Soil below topsoil shall be rototilled to 6" depth prior to placement of topsoil.
- B. The Contractor shall rake the top layer of lawn areas prior to seeding to remove all rocks over ½" in diameter.
- C. All lawn areas abutting curbs shall be properly compacted and prepared to prevent settlement of lawns behind curbs. The associate shall inspect this situation with OUA during punch list.

329200.3 RECONDITIONING LAWNS:

- A. Soil compaction by construction equipment, staging or storing shall be pulverized to a depth of 12 inches by disking or plowing prior to placing topsoil.
- B. Soil contaminated by oil drippings, sand, stone, gravel or other contaminants into the topsoil shall be removed to a depth of 12 inches, disposed of off-site, and replaced with new planting soil.
- C. Remove diseased or unsatisfactory lawns; do not bury into soil.
- D. Where substantial but thin lawn remains, rake, serrate if compacted, and cultivate soil; fertilize and seed.
- E. Water newly seeded areas. Maintain adequate moisture until new grass is established.

329200.1 PREPARATION OF SOIL AND BEDS PRIOR TO PLANTING:

- A. The Contractor shall locate all existing utilities. Any damage shall be repaired at the Contractor's expense.
- B. The Contractor shall lay out planting locations, mark with stakes, adjust locations if requested and obtain the Associate's and the University's approval of locations before proceeding.
- C. Planting areas to include a minimum of 12" of topsoil. Soil below topsoil shall be rototilled to 12" depth prior to placement of topsoil.

329200.5 SOILS

Topsoil for lawns:

- A. Topsoil shall be fertile agricultural-type soil, free of subsoil, rocks larger than ½" in diameter, clay, toxic matter, plants, weeds and roots.
- B. Topsoil shall contain at least 6% organic matter; have an acidic reaction between 5.5 and 7.0 – inclusive. It shall have the following mechanical analysis:

<u>Sieve Size</u>	<u>Percent by Weight</u>
1"	99-100
¼"	97-99
No. 100 Mesh	40-60
No. 200 Mesh	20-40

Bed Mix Soil:

- A. Bed Mix Soil shall have a minimum of at least 8% organic matter. Mixture shall have mixture of approximately 1/3 topsoil, 1/3 decomposed leaf humus, and 1/3 coarse sand.

329200.6 SOIL AMENDMENTS:

- A. Fertilizer; 18-24-12 for all applications.

329200.7 SEEDING OF LAWN:

- A. Contractor shall submit seed vendor's certification of required seed mixture, indicating percentage by weight and percentages of purity, germination and weed seed for each grass species. Contractor shall also submit evidence of State certification. Contractor shall submit certification to the Associate and the Associate shall submit to OUA for review prior to returning to the Contractor.
- B. Contractor shall notify Associate at least seven working days **prior** to start of seeding operations.
- C. Planting time for seed shall be April 1 to May 15 for spring and August 15 to October 1 for fall.
- D. Contractor shall restrict traffic from lawn areas until grass is established. This will include signs and barriers (blunt safety top 30" posts with rope between).
- E. Associate shall review seed mix location with OUA.

- F. Sun/Part Sun seed mix shall be a Tall Fescue blend (90 tall fescue/10 bluegrass):
Oliger Tall Fescue Mix
- G. Shady Area seed mix shall be:
Oliger Fairlawn “shady” mix
- H. Seed-and-straw is not an acceptable method for installing lawns.
- I. Hydro-seeding is the only acceptable method for lawn installation. Wood cellulose fiber mulch shall be dyed green to facilitate visual inspection for uniformity of seed distribution.
- J. Seed shall be delivered to the site in sealed containers bearing the producer's name and required formula. Seed shall be fresh stock, labeled in accordance with U. S. Department of Agriculture Rules and Regulations under the Federal Seed Act and with the State of Ohio Department of Agriculture.
- K. Wet or moldy seed shall be rejected.
- L. Before construction begins, precautionary measures shall be taken by the Contractor to protect all existing lawn areas that are to be trucked over or staged upon. This may include stripping and stockpiling of topsoil. Any existing lawn areas that have been damaged by the Contractor shall be restored to the satisfaction of OUA at no additional cost.
- M. Seed shall be placed at a rate of 6 lbs. per 1,000 square feet or per manufacturers recommendation. Seeding out of season may require heavier seeding or multiple seedings.
- N. When seeding occurs after acceptable seeding dates, over-winter protection shall consist of applying five bales of clean straw per 1,000 square feet. Anchor mulch by commercial mulch netting or 20 lbs. per 1,000 square feet cellulose fiber. Contractor shall remove netting when directed by OUA.
- O. Provide commercial mulch netting on slopes as required preventing rain washout of seed.

329200.8 SOD:

- A. Sod shall only be utilized in the bottom of drainage ditches where establishing lawn is difficult due to water flow and in areas as directed by the University.

- B. Sod shall be well-rooted Kentucky Bluegrass, *Poa Pratensis*, containing a growth of not more than 10% of other grasses and clovers, free of obnoxious weeds and cut below the root line. Associate to approve compatibility of soils.
- C. Deliver to the site within 24 hours after cutting and install the same day as delivered to the site.
- D. Areas to receive sod shall not be fertilized less than 48 hours prior to installation.
- E. Place sod smoothly, edge to edge, with staggered end joints. Lay sod on slopes with long dimension running parallel to contour lines, starting at the bottom. Stake in alternating rows with stakes staggered. Water sod and tamp to eliminate air pockets.

329300 PLANTS

329300.1 PLANTING OF TREES AND SHRUBS:

- A. According to the kind of trees, planting time for trees and shrubs shall be March 15th to May 15th for spring and October 15th to November 30th for fall.
- B. Plants shall be typical of their species and variety, have normal growth habits, well developed branches, densely foliated and vigorous fibrous root systems.
- C. Plants shall be free from defects, injuries, plant diseases and insect infestations.
- D. All plants of each particular variety shall be reasonably uniform in size and configuration.
- E. Plants shall be freshly dug and nursery grown; shall have been transplanted and root pruned at least once in the past two years; shall have been grown under similar climatic conditions to those of the project locality.
- F. All trees shall be balled and burlapped while shrubs may be container grown or balled and burlapped. Burlap shall be unwrapped and laid back prior to backfilling the soil; wire cage shall be removed.
- G. All new trees shall have straight trunks with full symmetrical crowns.
- H. Tree wrap tape and staking shall be prohibited.
- I. Form a watering basin of mulch around trunk holding at least 5 gallons of water for trees and 2½ gallons for shrubs.
- J. Prune dead or broken branches with sharp instruments.

329300.2 PLANTING OF GROUND COVER, PLANTS AND PERENNIALS:

- A. Planting time for ground cover, plants and perennials shall be March 15 to May 15 for spring and October 15 to November 30 for fall.
- B. Ground cover, plants and perennials shall be typical of their species and variety, have normal growth habits, well-developed branches, densely foliated and vigorous fibrous root systems.
- C. Ground cover, plants and perennials shall be free from defects, injuries, plant diseases and insect infestations.
- D. All ground cover, plants and perennials of each particular variety shall be reasonably uniform in size and configuration.
- E. Shall be free from defects, injuries, plant diseases and insect infestations.
- F. Ground cover plants and perennials may be container grown or balled and burlapped. Burlap shall be unwrapped and laid back prior to backfilling the soil.
- G. Space plants as indicated on drawings.
- H. Excavate holes to accommodate roots, place plants at proper elevation and backfill with planting soil, working carefully to avoid damage to roots and leave no voids.
- I. Water thoroughly immediately after planting. Do not wash soil into crowns of plants.

329300.3 DECORATIVE MULCH:

- A. Shredded hardwood mulch for planting areas and tree rings shall be free of deleterious material and suitable for top dressing of plants.
- B. Apply mulch 3" thick in planting beds and tree rings.

329300.4 INITIAL MAINTENANCE OF LAWN AREAS:

- A. Lawns shall be maintained by the Contractor after final planting until final acceptance by the Associate.
- B. The Contractor shall water regularly for healthy plant growth. The University will provide a water source when available. Associate to verify.
- C. Contractor shall mow a minimum of two times prior to acceptance by OUA.

- D. Fertilize: Contractor shall apply one application of 18-24-12 per manufacturer's recommendations.
- E. Re-grade and re-sod areas if necessary to correct rutted or damaged or improperly graded areas.

329300.5 INITIAL MAINTENANCE OF TREES AND SHRUBS:

- A. Trees and shrubs shall be maintained by the Contractor after final planting until final acceptance by the Associate.
- B. The Contractor shall water regularly for healthy plant growth. The University will provide a water source when available. Associate to verify.
- C. The Contractor shall remove weeds, replace mulch and restore eroded watering basins around trunks if needed.
- D. The Contractor shall remove all plant identification tags and labels.
- E. The Contractor shall apply insecticides, fungicides and herbicides if necessary to prevent or correct insect infestation or disease. Contractor shall apply pre-emergent herbicides for all plant beds.
- F. The Contractor shall dig up and correct any trees that are not plumb.

329300.6 INITIAL MAINTENANCE OF GROUND COVER AND PLANTS:

- A. The Contractor shall water regularly for plant growth. The University will provide a water source when available. Associate to verify. Trees and shrubs shall be maintained by the Contractor after final planting until final acceptance by the Associate.
- B. The Contractor shall remove weeds and replace mulch as directed by the Associate.
- C. The Contractor shall remove all plant identification tags and tags and labels.
- D. The Contractor shall apply insecticides or fungicides if necessary to prevent or correct insect infestation and disease.

329300.7 INSPECTION FOR ACCEPTANCE:

- A. Inspection of planting to determine completion of Contract work shall be made by the Associate and shall include representatives from OUA. The Associate shall

confirm that all landscaping conforms to quantities and sizes listed in the planting schedule.

- B. The Contractor shall give at least 7 days notice requesting the inspection.
- C. The Associate will prepare a punch list and work found not in accordance with plans and specifications shall be subject to re-inspection.
- D. Basis of lawn acceptance shall consist of lawns uniform in texture, density and color; substantially weed free; without gaps or bare spots, and with vigorous growth of proper species and variety. Scattered bare spots up to 6" in diameter will be accepted up to a maximum of 3% of the lawn area.

329300.8 WARRANTIES:

- A. New trees, shrubs, perennials and ground covers shall be guaranteed for one year from the date of issuance of Substantial Completion.
- B. Warranty shall cover death and improper planting, unsatisfactory growth, neglect or damage by others excluded.
- C. The Contractor shall replace unsatisfactory plant materials with healthy, vigorous materials, planted only during the next specified planting season.
- D. Borderline plants shall be replaced.