OVERVIEW

This document is offered to the Design Teams for information and guidance. It will be used by The University of New Mexico, PPD-Engineering and Energy Services as a guideline for submission review.

These standards are not intended to be all-inclusive but are intended to highlight specific UNM requirements and concerns. Applicable items shall be addressed at the appropriate submission phase. All designs are expected to meet or exceed code requirements and follow good professional practice.

For convenience, this document is organized using the CSI Master Format 2004 Edition Numbers & Titles. Designers and consultants are therefore expected to supply specifications and submittals in accordance with that format.

TABLE OF CONTENTS

DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

00 70 00 Conditions of the Contract

00 72 00 General Conditions

Include the UNM General Conditions and an edited version of Division 00 as part of the contract.

DIVISION 01 – GENERAL REQUIREMENTS

01 11 00 Summary of Work

Describe unusual project work, such as extensive utility relocations, contractor licensing requirements, etc.

01 11 16 Work by Owner

1. UNM PPD Utilities personnel are the only parties authorized to operate UNM utilities equipment. This includes all devices connected to utility piping such as valves, switches, pumps, etc. and the primary electrical distribution system, such as primary electrical switches, etc. Any party that requires operation of a UNM utilities device must coordinate that operation through the UNM project manager.

2. Prior approved control system contractors shall be utilized on all projects. Selection of controls system shall be made by UNM PPD Engineering & Energy Services and the price negotiated and approved prior to award for project. PPD Energy Services will be responsible for programming and graphics development of project. Allowances for controls installation shall be provided for prime contractor to include in their bid price.

01 30 00 Administrative Requirements

1. Verify that all floor plan base sheets match Architectural plans
2. Verify that column gridlines, room numbers, key plan, necessary labels are indicated on appropriate plans
3. New work shall be adequately delineated/differentiated from existing facilities. (line width/weight, symbols, etc.)
4. Duplication of information is to be avoided, i.e., same information shown in two different places, in different scales, etc. More or less duplicate plans are to be avoided. Try to economically use all parts of drawing sheets. “D” size drawings are preferred.
5. Indexes shall match actual documents.
6. Legends shall be appropriate for project and correct.
7. Provide title strip along right vertical margin with lettering at least ½” high.

8. Include specific building name, address and building number in the title strip. Note that address used for building permits must be the actual assigned physical street address – not a general university address.

01 10 00 Summary

1. Future work – are appropriate mechanical, electrical and IT rough-ins being provided for any future items?
2. Owner Furnished Products –include primary pad-mount switch and primary pad-mount transformer, if applicable.

01 21 00 Allowances

Schedule of Allowances – discuss if appropriate to include allowances for unknowns, such as utility relocations, additional SFM requirements based upon their final inspection, etc.

01 29 00 Payment Procedures

Schedule of Values– Contractor MUST include a separate "Project Closeout" line item for each project as defined in the project manual. Contractor is not to be paid any amount on this line item until all closeout items have been completed (e.g., training, O&Ms, record drawings, commissioning, etc.)

DESIGN DOCUMENT SUBMITTAL REQUIREMENTS

The following outlines the general requirements and scope for project design phase document submission. It will be used by UNM PPD-Engineering and Energy Services as a guideline for submission review. This information is offered to the Design Teams for guidance.

Note: All information required for replication of design shall be shown on drawings.

Note: The following statement shall be clearly printed on each electrical, mechanical and plumbing design drawing and specification set issued for construction:

All UNM personnel working on "Annual Permit" or "New Permit" projects, and all contractors working at UNM on work requiring CID permits are required to contact the applicable UNM Inspector(s) [Electrical (277-7829 / 321-5627), Mechanical/Plumbing (228-4769)] at applicable project milestones (underground, distribution, rough-in, final) and prior to "Substantial Completion" to allow them the opportunity to inspect the work for "Code" and "UNM Specification" compliance either along with or prior to the CID inspector making the associated inspection. Inspections are completely at the discretion of the applicable UNM Inspector. All UNM Entities that engage in, manage, coordinate, or otherwise are involved

with construction activities on the UNM campus are to adhere to the requirement above, and to advise their contractors of this requirement. ***Please be advised that failure to comply with the above may require the contractor, workmen, UNM personnel, and/or UNM Entity to expose any portion of the work that has been covered or concealed, if necessary, for the Inspector to inspect the work.***
Any defects found by the UNM Inspectors will be noted in a "Correction Notice" issued to the project, and is to be abated and re-inspected **PRIOR TO** the acceptance of the project by UNM.

During additions or alterations to existing facilities at UNM, all existing electrical work that is disturbed in any way, or that is deemed to be unsafe by the UNM or CID Inspector, must be corrected so as to conform to the New Mexico Administrative Code (NMAC) requirements for new buildings and to meet the specifications contained in this document.

Program Phase

1. Provide a written description of the project from the Programming phase standpoint. It is especially helpful if any unusual or special criteria, particularly those relating to Mechanical, Electrical, Civil and Structural engineering are identified.
2. The Owners Project Requirements (OPR) should be defined at this time and submitted to the design team.
3. Identify systems which are to be commissioned.
4. Identify all proposed utility tie-ins required and suggested tie-in points.
5. Initial LEED scorecard.

Schematic Design Phase

It is expected that the following listed issues will be responded to in the Schematic Design submission. This submission shall also address the applicable technical items as listed on the technical design checklists.

1. Geotechnical report.
2. Written description of soils conditions and anticipated foundation requirements and design plan.
3. Preliminary Site Survey.
4. Written description of the Fire Sprinkler, Plumbing, HVAC, HVAC Controls, Power, Lighting, Lighting Controls, and Special Systems that are intended for the project, particularly any unusual or special features. This document will comprise the Basis of Design (BOD) document needed for commissioning activities.

5. Preliminary Site Utility Plan indicating sanitary sewer, storm drainage, domestic water, gas, power, fire protection, chilled water, steam, exterior lighting, telecommunications, IT and special systems intended for the project. Clearly indicate points of connection to existing systems.
6. Indicate current existing site drainage pathways including offsite drainage entering the site and analysis of basic drainage through site. All drainage calculation must use the City of Albuquerque's DPM Section 22.2. These calculations must be available for review on a separate drawing or section in the submittal. The calculations must include the existing conditions as well as the proposed conditions for the 100 year storm and a 20 year storm.
7. Schematic floor plans with proposed fire walls indicated.
8. Code Analysis drawing.
9. Statement outlining the Mechanical/HVAC Design Criteria to include winter and summer design temperatures, degree days, outside air and ventilation requirements, filtration requirements, humidity requirements, exhaust criteria, noise criteria and any other significant design requirements.
10. Statement outlining the Power Design Criteria to include voltages, grounding, special power quality requirements, lighting levels and any other significant design requirements.
11. Statement that UNM Standards and Design Criteria will be incorporated into the design of the project. Statement that UNM HVAC design standards will be incorporated into the project. Conflicts and conditions not covered by the UNM Standards should be clearly noted for resolution at this phase.
12. Statements that the following will be incorporated into the design as applicable:
    a. USGBC LEED Silver design criteria (include initial LEED scorecard showing which credits will be attempted)
    b. Executive Order 2006-001 State of New Mexico Energy Efficient Green Building Standards for State Buildings: http://www.emnrd.state.nm.us/ECMD/documents/EO_2006_001.pdf
    c. If applicable, Executive Order 2007-053 State of New Mexico Increasing Energy Efficiency in State Government by 2015 and Statewide by 2012 and 2020: http://www.governor.state.nm.us/orders/2007/EO_2007_053.pdf
13. Preliminary block (building) heating and cooling loads. Preliminary estimates for yearly energy consumption and energy costs using current rates.
14. Preliminary total building energy budget in BTUs per year.
15. Preliminary power one-line diagram.
16. Preliminary electrical loads, including emergency power loads.
17. Proposed lighting and lighting controls layout for each typical area.
18. Proposed mechanical, electrical and telecommunications rooms.
19. Proposed design and construction schedule.
20. Define any known unusual conditions that might affect design or construction.

21. Updated LEED scorecard.

Design Development Phase

1. Final floor plan drawings.
2. Final Code Analysis drawing.
3. Mechanical, electrical and telecommunications room equipment layouts (confirming that proposed final room sizes and locations meet project needs and maintenance access). At this stage, all important HVAC and Electrical design decisions shall be made. The DD submission shall define the main systems to be incorporated within the project and how they coordinate with other design requirements and the architecture and structure. Details and all sizes need not be included but enough design must be shown to insure the system and distribution plan is clearly defined. Significant main distribution systems should be sized to be sure they fit and allow access for maintenance.
4. Proposed near final power riser/one-line diagram indicating service, new service equipment, engine-generator, etc. Include a preliminary building electrical load calculation (connected & demand), service size and transformer size.
5. Updated HVAC design criteria where appropriate when changes from the schematic submission occur or when criteria are added. The design criteria for specific spaces, i.e. classrooms, labs and the like should be defined.
6. Heat loss and heat gain calculations for all spaces and verification of the estimates for yearly energy consumption and energy costs using current rates. Also verify the total building energy budget in BTU's per year.
7. Major duct layout, sizes and verification that space is adequate for congested areas, duct crossing, coordinates with other facilities and construction, etc.
8. Major piping layout, sizes and verification that space is adequate for congested areas, coordinates with other facilities and construction, etc.
9. All HVAC equipment selections made, with start of Equipment Schedules including not less than equipment identification, location and major sizes and capacities. And, determination of whether required to be on standby power.
10. Proposed near final Site Utility plans as far as showing all connection points and proposed routing, including but not limited to power, telecommunications, steam, chilled water, electric, gas, water and sanitary sewer.
11. Proposed utility metering – meter types, locations, tie-ins.
12. Final Site Survey.
13. Proposed construction fencing and contractor laydown area(s). Address contractor access to/from site, maintaining pedestrian/ADA access, temporary drainage, etc.
14. Proposed drainage plan shall include all drainage whether generated on site or not.

15. Outline Specifications to include suggested deviations from UNM standards or unusual concepts.
16. All critical information that the owner will need for equipment and material replacement shall be incorporated on the drawings and not buried in the spec books. This includes but is not limited to:
    a. Window schedules with thermal & solar performance
    b. Climate assumptions
    c. Sequences of operation (HVAC & lights)
    d. DDC points lists
    e. Envelope thermal properties
    f. Clear indication of floor loading capacities.
    g. DDC sensor locations (duct static pressure, outside air, etc.)
    h. Electrical panel schedules
    i. Luminaire schedule (proposed fixture description, lamps and ballasts (type & B.F.) for ALL fixtures, as a minimum)
    j. Lighting and lighting control layouts for all areas
    k. Lighting control diagrams (or intended operational description)
17. Updated LEED scorecard.

<u>50% Construction Documents</u> (in addition to the above requirements).

1. Floor plan layout for power, telecommunications and mixed media devices.
2. Floor plan layout for lighting, including lighting controls for all areas, and start of circuiting.
3. Complete electric service design and all panel locations.
4. Completion of luminaire schedule (all fixture types with proposed manufacturer/model #).
5. Final lighting control diagrams/operational description.
6. Essentially near final/final riser diagrams.
7. Final grounding scheme and solutions to power quality issues.
8. Engine-generator if required.
9. Duct layout including all terminal units, valves, sectioning valves, balancing valves, etc.
10. Piping layout including all terminal units with CFM, dampers, etc.
11. Advanced composite equipment room and equipment layouts, including roof top units.
12. More complete mechanical schedules.

13. Finalization of design criteria.
14. Substantially complete schematic diagrams
15. Initial controls diagrams with start of sequence of operation.
16. HVAC detailed calculations indicating design parameters, minimum and maximum air flows.
17. Final summary of utility loads (gas, water, steam, chilled water and power)
18. Indicate the final anticipated energy costs and energy consumption.
19. Final site utility plans with sizes, connection points, valves, vaults, major equipment items, etc. Start of details.
19. Complete index in project manual. Not less than 50% complete specifications including parts for all divisions. Proposed phasing and sequencing issues addressed. Proposed bid alternates addressed. Owner furnished equipment addressed. Commissioning addressed. Division 1 should be essentially complete, containing special interest items; UNM assistance needed for this.
20. Proposed drainage topographic drawings shall be complete with critical spot elevations specified and cross-section volumetric flow analysis completed. Drain pathway arrows shall be included.
21. P&ID diagrams for all air and water systems clearly showing system components, flow paths and sensors.
22. Updated LEED scorecard.

<u>95% Construction Documents</u>

1. Essentially Complete Drawings and Specifications.
2. Complete details.
3. Complete references.
4. Complete HVAC control diagrams with sequence of operation.
5. Final short circuit electrical calculations.
6. DDC control panels design shall be either UL listed or shop drawings stamped by a licensed engineer.
7. Final layout of proposed laydown yards and staging areas to accommodate construction. All phasing and sequencing issues addressed.
8. Final LEED scorecard.

<u>Addenda</u>

Provide the opportunity for PPD Engineering & Energy Services to review and contribute to addenda.

POST CONSTRUCTION

Provide as-built drawings which include all addendums and field changes, plus the contractor's field mark-ups. These drawings shall be transmitted to the PDC Construction Manager in both AutoCAD and PDF formats with a courtesy copy to UNM PPD Engineering & Energy Services along with soft-copy specifications and requested submittals.

01 35 00 Special Procedures

Smoking is prohibited in UNM buildings, including those under construction.

01 35 23 Owner Safety Requirements

1. Contractor shall comply with applicable federal, State and local statutes and regulations relating to environmental health and safety.
2. Indicate that it is the General Contractor's primary responsibility to ensure that all sub-contractors comply with all safety issues. Also note that the Contractor is fully responsible for having an Environmental, Health and Safety compliance program that is acceptable to UNM SRS and applicable regulatory agencies. The Contractor shall affirm, in writing, that all entities working on the project have in place and in operation such programs prior to representatives entering the project site.
3. Any fines or citations issued to the University that were the result of any action or inaction by any contractor, sub-contractor or others working on the project, shall be the responsibility of such contractor, subcontractor or others. Moreover, such contractor, subcontractor or others shall reimburse the University for all expenses associated with such action or inaction.
4. For any work areas that are posted as biohazardous, the UNM Biosafety Officer (272-8001, alternate 277-5488) must be contacted for clearance prior to start of work.
5. All persons performing electrical work at UNM must use and adhere to UNM "Lock-out/Tag-out" policies.
6. The contractor will be responsible for providing an onsite welding permit system according to OSHA 29CFR1926 and NFPA 51B. The contractor will ensure that all welders are properly trained and certified in the specific type of equipment they are to use on the project. The contractor will ensure that welding operations do not occur when other fire hazard situations exist in their area, other hazardous operations are in process or flammable liquids are in the area
7. When exposure to gases, fumes, vapors or dust may exceed the OSHA PEL, the contractor shall be responsible for the establishment and maintenance of a

respiratory protection program. All respirators shall be approved by NIOSH and shall be suitable for the airborne hazards at the worksite. Self-contained breathing apparatus must be worn when employees work in an oxygen-deficient atmosphere. Appropriate respiratory protection is required for painters during spraying operations.

8. Smoking is prohibited within 50 feet of any paint spraying operations. Paint spraying operations are prohibited in confined spaces. Smoking is prohibited on campus
9. Hearing protection is required when employees use tools and equipment, which produce noise in excess of 85 dBA and would require the contractor to manage a Hearing Conservation Program. This program would require training, provision of a selection of hearing protectors, audiometric testing and noise monitoring.
10. The contractor is responsible for ensuring proper usage of personal protective equipment. All workers within the construction site or area must wear personal protective equipment at all times, including hard hats, eye protection, safety shoes, and protective clothing (long pants and shirts with sleeves covering the shoulders at a minimum). Workers must use additional protective gear, such as ear protection, respirators, face protection (shields), and gloves, as appropriate.

01 35 43 Environmental Procedures

1. Chemical Safety - All hazardous materials and wastes shall be properly labeled and stored while on site. Bulk chemical storage for drums or other containers of hazardous or otherwise regulated liquids larger than 25 gallons requires secondary containment and grounding for flammables.
2. Contractor shall maintain on-site copies of Safety Data Sheets (SDSs) for all hazardous material brought onto the site. These SDSs must be kept readily accessible for employee use.
3. Chemical spills shall be reported to SRS.
4. Hazardous materials that could cause illness if released or not properly used shall be kept properly stored. If any report of serious illness on site is reported, the contractor shall shut down that particular operation until the situation is corrected.
5. Contractor shall not idle vehicles and equipment not in use to protect the air quality of the campus.

01 40 00 Quality Requirements

01 41 00 Regulatory Requirements

01 41 13 Codes

Design criteria must include the use of NFPA standards. The standards include 12 volumes and 248 individual standards. Also, since New Mexico operates under

different jurisdictional codes such as the International Fire and International Building Codes, the most stringent requirement will apply on all UNM projects.

01 41 16 Laws

All UNM buildings shall comply with the following:

1. NM Executive Order 2006-001, State of New Mexico Energy Efficient Green Building Standards for State Buildings
   http://www.emnrd.state.nm.us/ECMD/documents/EO_2006_001.pdf

2. Executive Order 2007-053 State of New Mexico Increasing Energy Efficiency in State Government by 2015 and Statewide by 2012 and 2020
   http://www.governor.state.nm.us/orders/2007/EO_2007_053.pdf

3. Also, note that UNM President Dr. David Schmidly signed the "American College & University Presidents Climate Commitment," committing UNM to pursue WATER AND CARBON NEUTRALITY for the campus.
   http://www.presidentsclimatecommitment.org/

01 50 00 Temporary Facilities and Controls

Indicate construction work site limits, fencing, laydown yard, etc.

01 55 00 Vehicular Access and Parking

Ensure special requirements for work site entrances, handicap access, walkways to remain open, fire truck and emergency vehicle access etc., are noted and must be maintained at all times

01 55 26 Traffic Control

Indicate if traffic flow or road access must be interrupted or roads closed, the contractor shall obtain approval not less than 10 days prior.

01 55 19 Temporary Parking Areas

Indicate contractor worker parking.

01 56 00 Temporary Barriers and Enclosures

1. The contractor will be responsible for preventing access to the building site to unauthorized persons. Pedestrians can create safety hazard issue as well as fire safety hazards. Barriers to prevent unauthorized pedestrian traffic will not cause obstructions to emergency vehicle access unless the emergency services are notified of a specified time when access will be impaired.
2. Do not obstruct existing streets, walkways, access corridors, etc. unless specific written permission is granted by owner.

3. The contractor must maintain pedestrian access (in particular, ADA access) to UNM facilities adjacent to the construction site whenever practical.

01 56 16 Temporary Dust Barriers

Do not generate airborne dust, which may contain asbestos- or lead-containing materials.

01 57 00 Temporary Controls

1. For projects disturbing more than one acre of soil or pavement, prior to breaking ground, the Contractor must make required EPA notifications, obtain an NPDES permit or waiver, and develop and comply with any required site-specific Storm Water Pollution Prevention Plan (SWPPP). SRS may request revision of contractor's SWPPP. UNM may be required to collect damages for Contractor non-compliance with the NPDES or SWPPP of up to $1000 per day per violation.
2. All projects disturbing more than 3/4 acre of soil or pavement must obtain a Fugitive Dust Permit from the City Air Quality Division (AQD) prior to breaking ground and must comply with the associated AQD-approved Dust Control Plan. Required dust controls must be maintained over project duration, including site watering, track-out prevention and street sweeping, and covering all truckloads of soil to/from site. Any required erosion/dust controls must be regularly inspected & maintained over project duration.
3. The SWPPP and the Air Quality permit should use the Best Management Practices that work in conjunction with each other, i.e. watering, perimeter silt fencing etc. The Project Engineer should review and discuss the SWPPP and Air Quality permit with the contractor prior to submission of these applications.

DIVISION 02 – EXISTING CONDITIONS

Photographs and/or videotapes of existing conditions including adjacent structures shall be taken and submitted. Existing conditions before the start of work shall be documented.

02 01 00 Maintenance of Existing Conditions

1. Support and protect existing structures & utilities.
2. Promptly repair damages to adjacent structures and facilities if incurred.

02 20 00 Assessment

02 21 00 Surveys

Require that a professional surveyor document the existing conditions of adjacent structures prior to start of work. Establish benchmarks including elevations and

maintain a project log to become part of the as-built records. Survey/resurvey to verify that there is no adverse project impact. Notify the Architect and UNM of changes in elevations, cracks, sags, or other damage in adjacent structures.

02 30 00 Subsurface Investigation

02 32 00 Geotechnical Investigations

1. Soils testing laboratory and other required specialty testing to be retained by owner.
2. Concrete testing laboratory to be retained by contractor. ~~S~~pecifications shall indicate required testing; i.e. number of cylinders, maximum fill lifts, etc.

02 60 00 Contaminated Site Material Removal

Prior to the start of work, verify with UNM-SRS that there are no hazardous materials at the site. If so, request direction as to what needs to be done to remove the hazard prior to start of work. Documents need to advise the contractor that if hazardous materials are found during the performance of work, stop work and contact UNM and the Architect for direction

02 80 00 Facility Remediation

1. Ozone Depleting Substances (e.g. freons & related refrigerants) - Refrigerants must be recovered by EPA-certified technicians prior to demolition of refrigeration & HVAC equipment.
2. Prior to demolition or removal, any equipment containing hazardous or otherwise regulated materials must have those materials abated/removed.
3. If asbestos and/or lead-containing materials are known to be present in the work area as determined by the pre-construction survey, then asbestos and/or lead awareness training must be completed prior to any construction workers being sent/assigned to work in such a work area, and appropriate PPE must be worn when required by work conditions.
4. Installation and/or application of lead-based paint and asbestos-containing materials during renovation are prohibited.

DIVISION 3 – CONCRETE

SECTION 032000 – CONCRETE REINFORCING

GENERAL

SUMMARY

Related Documents:

Drawings and general provisions of the Subcontract apply to this Section. Review these documents for coordination with additional requirements and information that apply to work under this Section. Section Includes: Concrete reinforcement and accessories.

Related Sections:

Division 01 Section "General Requirements."
Division 01 Section "Special Procedures."

REFERENCES

General:

The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work. Refer to Division 01 Section "General Requirements" for the list of applicable regulatory requirements.

ACI – American Concrete Institute:
- ACI 117 Tolerances for Concrete Construction
- ACI 301 Specifications for Structural Concrete
- ACI 315 Standard Practice for Detailing Reinforced Concrete Structures

ASTM International:
- ASTM A185 / A185M Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
- ASTM A615 / A615M Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
- ASTM A706 / A706M Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
- ASTM A970 / A970M Standard Specification for Headed Steel Bars for Concrete Reinforcement

CRSI - Manual of Standard Practice.
ICBO - Evaluation Reports.

SUBMITTALS

Submit under provisions of Division 01 Section "General Requirements." Shop Drawings: Prepare placing drawings in accordance with ACI 315. Show size, shape and location of bars and wire fabric in structure. Show splice locations and lengths. Where details are not shown, conform to standards of practice indicated in ACI 315 and submit for approval.

Reinforcing bars for walls shall be billed on elevations. Bill reinforcing bars for slabs on plans. Plans and elevations need not be true views. When more than one wall or slab are identical, only one such wall or slab is required. Take sections to clarify the arrangement of reinforcement. Identify, but do not bill bars on sections. Unless the location of reinforcing is clear, give dimensions to some structural feature that will be readily distinguishable at time bars are placed. Make placing drawings complete, including the location of support bars and chairs, without reference to the design drawings. Submit data required to evaluate proposed mechanical splices. Submit manufacturer's certified mill test reports on each heat of reinforcing steel delivered, showing physical and chemical analysis before placing reinforcement.

LEED Submittals:

<Retain subparagraph below if recycled content is required for LEED-NC or LEED-CI Credits MR 4.1 and MR 4.2. An alternative method of complying with Credit MR 4.1 and MR 4.2 requirements is to retain requirement in Division 01 Section "Sustainable Design Requirements" that gives Contractor the option and responsibility for determining how Credit MR 4.1 and MR 4.2 requirements will be met.>

Product Data for Credit MR 4.1[and Credit MR 4.2]: For products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
Include statement indicating costs for each product having recycled content.

QUALITY ASSURANCE

Codes and Standards: Comply with provisions of ACI 301 CRSI's "Manual of Standard Practice", except where more stringent requirements are shown or specified.

Requirements of Regulatory Agencies: Proprietary products, including bar couplers, shall have an active ICBO Evaluation Report.

Material Quality Assurance: Mill test reports including chemical analysis, tensile properties and bend test shall be examined for all reinforcing. Conform to one of the following:

Maintain positive identification of reinforcing by heat number. Provide certified mill test reports to Testing Laboratory.

Where positive identification cannot be made and procedures are not deemed adequate to ensure compliance, Testing Laboratory will randomly sample and make one tensile and one bend test from each 2-1/2 tons or fraction thereof of each size of reinforcement. Subcontractor will bear the cost of testing.

PRODUCTS

REINFORCING MATERIALS

Bar Reinforcement: ASTM A615, Grade 60, deformed billet bars. ASTM A706, where noted on Drawings. Recycled content shall be a minimum of 75 percent recycled post-consumer steel.

Headed Bar Reinforcement: ASTM A970.

Spirals: ASTM A82.

Welded Wire Fabric: ASTM A185.

Threaded Bars: Grade 75, manufactured by DYWIDAY Systems International, Williams Form Engineering Corp. or equal substituted per Division 1. Smooth Dowels, ASTM A615, Grade 40 or 60, smooth; sawcut or grind one end to remove offsets; shop paint with iron oxide zinc chromate primer.

Welded Deformed Bar Anchors: ASTM A-108 fy = 70,000 psi, flux-filled deformed bar anchors welded to structural steel as shown; Nelson D2L, or equal substituted per Division 1.

Mechanical Bar Couplers: Provide mechanical couplers with a current ICC evaluation report. Coupler shall develop 160% percent of specified minimum yield strength of spliced reinforcement. Subject to compliance with requirements provide one of the following, or approved equal:

Barteck, Dextra Inc.
Lenton Taper Threaded Connection, Erico Inc.
Bar Lock, Dayton Superior Inc.

ACCESSORIES

Tie Wire: Minimum 16-gage black annealed wire.

Bar Supports: At surfaces not exposed to view in completed structure: Precast concrete bar supports with two 16 ga. embedded wires or CRSI Class 2 wire supports. Supports placed against ground or on top of vapor barrier: Precast concrete blocks not less than 3 inches square (1935 mm^2) with two 16 ga. embedded wires. At Architectural Concrete and surfaces exposed to weather: CRSI Class 2 stainless steel or CRSI Class 1 plastic protected. Where support is no closer to concrete surface than 1/2 inch (13 mm): CRSI Class 3 wire supports.

FABRICATION

Fabricate reinforcement in accordance with ACI 315 where specific details are not shown.

EXECUTION

PLACEMENT

Surface Condition of Reinforcement: Before placing concrete, clean reinforcement of loose scale, dirt, grease and other substances which would impair bond with concrete. Place reinforcement in accordance with the Drawings and the CRSI Manual. Steel bars shall be of size and length indicated, accurately bent or formed to shapes detailed or scheduled by experienced shops by methods that will not injure the materials. Reinforcing bars shall be shop fabricated to lengths and bends shown on the drawings. Fabrication tolerance shall be in accordance with the requirements of ACI 315. Reinforcing bars shall be as long as possible with a minimum number of joints. Steel reinforcement shall not be bent or straightened in a manner that will injure the material or the embedding concrete. Bars with kinks or bends not shown on the Drawings shall not be used. Heating of reinforcement for bending will not be permitted. Reinforcement shall

be tagged with suitable identification to facilitate sorting and placing. Place reinforcing bars accurately as to spacing and clearance and securely tied at intersections and supports with wire and in such a manner as will preclude displacement during pouring of concrete. Placing tolerances shall be in conformance with the requirements of ACI 117. Place and secure reinforcement to maintain the proper distance and clearance between parallel bars and from the forms. Provide vertical steel with metal spreaders to maintain steel properly centered in the forms. Horizontal reinforcement shall be supported at proper height on concrete pads, chairs or transverse steel bars. After placing, maintain bars in a clean condition until completely embedded in concrete. Bars shall not be spaced closer than 1-1/2 diameters of the largest of two adjacent bars, 1-1/2 times the maximum aggregate size, nor one inch, except at bar laps. Where reinforcement in members is placed in two layers, the clear distance between layers shall be not less than one inch (25 mm) or more than 1-1/2 inches (13 mm) unless otherwise noted on the drawings. The bars in the upper layer shall be placed directly above those in the bottom layer unless otherwise detailed. Coverage of bars shall be as shown and scheduled. Conform to ACI 301 where not indicated. Where obstruction prevents the intended placement of reinforcement, provide additional reinforcement as directed by the University around the obstruction. Splice bars as indicated by lapping and securely wiring together. Splices at locations other than those indicated are subject to the approval of the University. Splices of reinforcement shall not be made at the point of maximum stress. Splices shall provide sufficient lap to transfer the stress between bars by bond and shear. Bars shall be spread the minimum distance specified. Stagger splices of adjacent bars where possible. Reinforcing bars shall not have welded joints.

Mechanical Bar Couplers: Install in accordance with applicable ICC evaluation report. Maintain clearance and coverage at coupler. Stagger couplers wherever practical.

FIELD INSPECTION

A University-Selected Testing Laboratory shall:

Review Quality Assurance procedures for maintaining identification of steel. Collect certificates of compliance and test reports for reinforcing steel. Special Inspect placement of reinforcement for conformance with the Contract Documents and as required by CBC Chapter 17. Special Inspect installation of mechanical couplers in accordance with requirements of applicable ICC evaluation report. Special Inspect shop and field welding as required by CBC Chapter 17

END OF SECTION 032000

SECTION 03 3000 – CAST-IN-PLACE CONCRETE

1. General: This section outlines requirements for cast-in-place concrete construction.

2. Concrete Design Criteria:

    a. Except for lean concrete, which is typically used for backfill, minimum 28-day concrete strength shall be 3,000 psi, for below grade construction, and 3,500 psi for slabs-on-grade and above-grade construction.

    b. Concrete exposed to freeze / thaw shall have a minimum air content of 4.5%.

3. Design Considerations:

    a. No conduit shall be placed in concrete slabs without approval by the University.

    b. Consideration must be given to the precast connection to the superstructure, prior to commencement of construction.

    c. Precast camber – minimum thickness of topping shall be measured at the high point of camber.

    d. Do not use gypsum-based products for anchorage into exterior exposed concrete.

    e. Epoxy coat all reinforcing in exterior permanently-exposed face of concrete.

    f. Coordinate brick ledges and exterior grades so that soils are not placed against exterior façade materials (e.g. stone, precast concrete, or masonry).

    g. Form tie depressions shall be patched on all vertically formed concrete surfaces that are either exposed to view or are to receive damp-proofing or waterproofing.

h. Perimeter foundation walls shall receive, at minimum, fluid-applied damp proofing. Foundation walls that form the perimeter of a basement or crawl space, and elevator pit walls, shall be waterproofed. Provide a footing / wall water stop at waterproofed locations.

i. Pipe, conduit, and other penetrations through perimeter basement walls shall be provided with an appropriate seal as manufactured by Link-Seal or approved equal.

j. The minimum reinforcing for slab-on-grade and slab-on-deck concrete shall be WWF 6x6 – W1.4 x W1.4, with the WWF supplied in sheets, not rolls.

k. The minimum allowable vapor barrier under interior slabs-on-grade shall be a 12 mil reinforced polyethylene product ("Moistop" or approved equal.) The joints in the vapor barrier shall be sealed with the manufacturer's recommended tape.

l. Concrete placement during cold weather conditions shall be performed in strict accordance with the ACI Standard Specification for Cold Weather Concreting.

m. Concrete slabs (exclusive of mud slabs) shall receive a minimum of a float finish; if indicated to be broomed, the slab shall be floated and then broomed.

n. Apply an acrylic curing compound similar to Sonneborn "Kure-N-Seal" to cast-in-place slab concrete. If there is a specified surface finish product or adhesive that is not compatible with the curing compound, it shall be the finish installer's responsibility to remove the compound (sand, etch, bead blast, etc. as needed) prior to their installation.

4. Tolerances: The University requires proper forming, placement and finishing to meet the following:

   a. Sizes of sleeves, floor openings, and wall openings: Center line of sleeves, floor and wall openings, +/-1/2".

   b. The following are recommended tolerances for finished slab surfaces:

      i. Scratch Finish: For surfaces to receive concrete floor topping or mortar setting beds for tile and other bonded applied cementitious

finish flooring material: Depressions between high spots shall not exceed 1/4" under a 10-foot straightedge.

ii. Float Finish: For surfaces to be covered with membrane or elastic waterproofing, membrane or elastic roofing: Depressions between high spots shall not exceed 5/16" under a 10-foot straightedge.

iii. Trowel Finish: For surfaces to be exposed to view and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or other thin film finish coating system: Achieve level surface plane so that depressions between high spots do not exceed 1/8" under a 10-foot straightedge.

c. Floor Leveling: Contractor, at his own expense, shall provide floor leveling, to the satisfaction of the University, in areas where the above tolerances are not achieved.

5. Quality Assurance:

a. Installer Qualifications: An experienced installer who has completed Concrete Work similar in material, design, and extent to that indicated for the intended Project and whose work has resulted in construction with a record of successful in-service performance.

b. Professional Engineer Qualifications: A New Mexico licensed structural engineer who is experienced in providing engineering services of the kind indicated. Delete this requirement if Contractor is not required to engage the services of a professional engineer.

c. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

i. Manufacturer must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.

d. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.

e. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."

6. Pre-Installation Conference: Architect/Engineer shall review requirements for pre-installation conference with UNM Project Manager.

7. Mockups: Architect/Engineer shall review requirements for mock-ups with UNM Project Manager.

   a. Cast concrete slabs-on-grade mockup to demonstrate typical joints, surface finish, texture, tolerances, and standard of workmanship.

   b. Obtain Architect/Engineer's approval of mockups before starting construction.

   c. If Architect/Engineer determines that mockups do not meet requirements, demolish and remove them from the site and cast another until the mockup is approved.

   d. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

   e. Demolish and remove mockups when directed.

   f. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

8. Delivery, Storage, and Handling:

   a. Deliver, store, and handle steel reinforcement to prevent bending and damage.

   b. Avoid damaging coatings on steel reinforcement. Repair damaged epoxy coatings on steel reinforcement.

9. Accessories:

   a. Vapor Retarder: not less than 15 mils thick.

   b. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand.

   c. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel.

10. Concrete Mixes:

    a. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases.

    b. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.

11. Concrete Mixing:

    a. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.

12. Embedded Items:

    a. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete.

13. Vapor Retarders:

    a. Vapor Retarder: Place, protect, and repair vapor-retarder sheets.

    b. Fine-Graded Granular Material: Cover vapor retarder with fine-graded granular material, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch (0 mm) or minus 3/4 inch (19 mm).

    c. Granular Fill: Cover vapor retarder with granular fill, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch (0 mm) or minus 3/4 inch (19 mm).

14. Steel Reinforcement:

    a. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

        i. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

    b. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.

    c. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

d. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

e. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

f. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating.

15. Joints:

a. Typically joints are to constructed true to line with faces perpendicular to surface plane of concrete. Special requirements shall be indicated on the drawings.

16. Concrete Placement:

a. Before placing concrete, contractor shall be required to verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

17. Concrete Surface Repairs:

a. Filling In:

i Contractor shall be required to fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place.

b. Defective Concrete:

i Contractor shall be required to repair and patch defective areas when approved by Architect/Engineer. Remove and replace concrete that cannot be repaired and patched to Architect/Engineer's approval.

c. Patching Mortar:

i It is recommended to mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.2-mm) sieve, using only enough water for handling and placing.

d. Repairing Formed Surfaces:

i Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

i. Immediately after form removal, Contractor shall be required to cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension in solid concrete but not less than 1 inch (25 mm) in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill formtie voids with patching mortar or cone plugs secured in place with bonding agent.

ii. Contractor shall be required to repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

iii. Contractor shall be required to repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect/Engineer.

e. Repairing Unformed Surfaces:

i Contractor shall be required to test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

i. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

ii. After concrete has cured at least 14 days, correct high areas by grinding.

iii. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

iv. Correct other low areas scheduled to receive floor coverings with a repair underlayment.

v. Correct other low areas scheduled to remain exposed with a repair topping.

vi. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete.

vii. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar.

18. Polished Concrete Floor Finishing:

a. The desired results of a ground, polished floor should be specified in three categories:

i. Flatness and levelness of the concrete: Manufacturers typically recommend F(f)40 and F(l)25.

ii. Aggregate Exposure: Please note that each finish below will have some percentage of all four finishes. The finish choices are described as:

1. Cream: No exposed aggregates.

2. Salt and Pepper: Exposed sand and small aggregate.

3. Medium: 1/8-inch to 1/4-inch exposed aggregate.

4. Heavy: 1/4-inch to 1/2-inch exposed aggregate.

iii. Sheen:

1. Level A: Hard-shell, satin finish (400 grit).

2. Level B: Hard-shell, medium sheen finish (800 grit).

3. Level C: Light reflective, mirror finish (1800 grit).

b. The depth of the grind to achieve the desired results is dependent on the techniques used for finishing, the concrete mix, and the amount of time between concrete pouring and grinding. To avoid disputes later, however, it is necessary to specify a minimum required depth of the grind of at least 1/4-inch. That gives the contractor a starting point to achieve the desired finish results.

c. Utilize a mock-up to determine the final technique.

d. Do not grind and polish lightweight concrete. Shale aggregates will be pulled from the surface resulting in pits.

19. Field Quality Control – Testing Agency: Typically, UNM will engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement. Architect/Engineer shall review project specific requirements with the UNM Project Manager during the Design Phase of the project.

a. Testing Agency Qualifications: Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

b. Testing Services: The following are recommended minimums for field quality control and testing. Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

i. Testing Frequency:

1. Obtain one composite sample for each day's pour of each concrete mix exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.

2. Obtain at least one composite sample for each 100 cu. yd. (76 cu.
m) or fraction thereof of each concrete mix placed each day.
3. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mix, testing

shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

ii. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.

iii. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.

iv. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.

v. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.

vi. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.

1. Cast and field cure one set of four standard cylinder specimens for each composite sample.

vii. Compressive-Strength Tests: ASTM C 39; test two laboratory-cured specimens at 7 days and two at 28 days.

1. Test two field-cured specimens at 7 days and two at 28 days.

2. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.

3. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

4. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests

equals or exceeds specified compressive strength and no compressive strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

viii. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.

c. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect/Engineer but will not be used as sole basis for approval or rejection of concrete.

d. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect/Engineer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect/Engineer.

SECTION 03 4000 – PRECAST CONCRETE

1. General: This section outlines the requirements for precast concrete. Specific requirements shall be reviewed with the UNM Project Manager during the design phases of the project

2. Submittal Requirements:

a. Submittal requirements shall include fully-engineered shop drawings and design calculations stamped by an engineer registered in the State of New Mexico.

b. Fully-dimensioned shop drawings shall be required that include “closing” dimensions to the Architect/Engineer’s dimensional reference (grid lines, face of foundation, etc.) and that dimension rough opening sizes for windows, etc. bounded by precast components.

c. Shop drawings shall specifically identify the locations and magnitudes of loads that will be imposed on the structure by precast connections.

3. Quality Assurance:

a. Precast pieces that are damaged during shipping, handling, etc. shall be reviewed by the Architect/Engineer and Owner prior to installation.

b. The Architect/Engineer and Owner shall have the discretion to require that damaged pieces be repaired to their satisfaction prior to installation.

END OF SECTION **03 4000**

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

Any green (vegetated) roofs must be a manufacturer standard product and not custom-designed.

07 06 00 Schedules for Thermal and Moisture Protection

07 06 20 Schedules for Thermal Protection

1. Install insulation to match ASHRAE Standard 189P requirements.
2. Borosilicate urethane thermal coatings are approved for all installations and encouraged for retrofit situations.
3. Insulation is to be installed outside the mass of the buildings.

07 06 21 Commissioning for Thermal and Moisture Protection

1. All new building envelope systems shall be commissioned either by UNM PPD's Energy Services group or by a third-party agent paid for by the project but hired and directed by UNM PPD E&ES.

07 80 00 Fire and Smoke Protection

07 84 00 Firestopping

07 84 13 Penetration Firestopping

1. All penetrations through fire rated walls, floors, ceilings, barriers and partitions will be appropriately filled with approved "FIRE STOP" material. The diameter of the penetration hole shall be no more than 1” larger than the diameter of the pipe or pipe plus insulation. Any deviation requires an engineered fire stop submittal.

2. Fire caulk shall be colored red for ease of inspection. The material must carry an Underwriters Laboratory and Factory Mutual listing/approval for the application to be used. Documentation from the manufacturer must be provided to SRS and E&ES for review along with written affirmation that materials were installed in accordance with the manufacturer’s requirements.

3. Show rated walls on all drawings and provide a note in bold letters that all piping and conduits are to be sealed with fire/smoke rated caulk.

DIVISION 08 – OPENINGS

08 10 00 Doors and Frames

1. Visual panels in doors may be used when needed for safe travel through a high traffic area. The visual panel will be limited to a maximum of 12" x 12" and be installed by the door manufacturer. The panel and frame must be stamped as a fire rated unit equal to the rating for the door.
2. Roof access shall be by staircase. In the event that roof hatches are used in retrofit situations, OSHA-compliant access ladders shall be installed.

08 50 00 Windows

1. Window panels in fire rated walls must be stamped by the manufacturer, as meeting the fire rating requirements of the adjacent door/wall. The stamp must be visible when installed. Windows or glass panels cut from a stamped panel will not be authorized.
2. In all cases where operable windows are desired, switches shall be incorporated to put the HVAC system for the space into “unoccupied” mode whenever the window is opened.

08 60 00 Roof Windows and Skylights

All skylights shall incorporate skylight guards, handrails or other guarding mechanism that meets OSHA standards.

08 70 00 Hardware

08 71 00 Door Hardware

1. Self-closing devices will be installed on all fire rated doors. The devices will be manufactured and installed as an Under Writers Laboratory (UL) listed unit. Self-closing hinges, which meet the intent of NFPA 80, may be used with prior approval from SRS and/or the AHJ.
2. Doorstop devices will not be installed on any fire rated door. If the user requires/requests an open flow of traffic through the area with a fire rated door, normally required to be kept closed in an emergency, magnetic door hold open devices shall be incorporated and must be connected to the building fire alarm system, as required by NFPA 80 & 101. The magnetic devices must release when any part of the fire alarm/notification system is activated. All magnetic devices will incorporate smoke detection on both sides of the door.
3. All door hardware shall be in full conformance with the UNM PPD Lock Shop requirements & specifications.

08 80 00 Glazing

For exterior glazing list U-values and SHGC on drawings

DIVISION 09 – FINISHES

09 06 00 Schedules for Finishes

1. Chemical Emissions - Only “low-VOC” architectural coatings, adhesives & solvents can be specified and used. A written inventory of total coatings, adhesives & solvent volumes used and VOC contents must be submitted to SRS at the end of the project.
2. All interior finish materials shall comply with NFPA 101. Only Class A or B material will be used. Class C material is considered to have an unacceptable flame spread rating and will not be permitted in any UNM construction project. Documentation of flame-spread ratings will be made available and provided to SRS upon request. Requests may be made if a questionable material is noted during the specification review or during construction site visits.

DIVISION 10 – SPECIALTIES

10 50 00 Storage Specialties

Custodial Services Main Storage Room: This room is ideally located adjacent to the trash room and loading dock and shall be approximately 250 to 300 sq. ft. with a double

door from the corridor. Room shall have a hot and cold water hose bibb and floor sink/floor drain. The room shall have interior lighting and control switch and several 110 volt receptacles around the perimeter of the space. The room shall have not less than twelve linear feet of utility shelving, the top shelf being not higher than 5 feet

10 56 00 Storage Assemblies

A minimum of three (3) feet of aisle space is required between rack and stack storage.

DIVISION 11 – EQUIPMENT

11 10 00 Vehicle and Pedestrian Equipment

11 13 00 Loading Dock Equipment

Loading Dock: Loading docks require nearby access to a hot and cold water hose bibb. Loading dock requires a drain to a sanitary sewer.

11 50 00 Educational and Scientific Equipment

11 53 00 Laboratory Equipment

11 53 13 Laboratory Fume Hoods

1. All exhausted fume hoods shall be integrated into a variable air volume system for both supply and exhaust. Selection of laboratory VAV air valve and fume hood monitoring systems shall be made in conjunction with UNM PPD Engineering and Energy Services. Controls for laboratory VAV systems shall integrate with ALC or Delta BAS, allowing remote monitoring and airflow control via that controller.
2. All exhausted fume hoods shall incorporate proximity sensors to move to low-flow condition when not in use.
3. All fume hoods shall incorporate a flow monitoring and warning device.
4. As an energy conservation measure, each new fume hood installation shall include a sash alarm consisting of a sash position transducer, a proximity sensor, an alarm buzzer and a BAS or local controller. The sash alarm system shall sound an audible alarm if the fume hood has been vacated for at least thirty seconds and the sash has been left more than 5% open.
5. Fume hoods with chemical filters shall incorporate sensor to detect chemical breakthrough.
6. Fume hoods shall have a minimum face velocity of 100 fpm when in use.
7. Fume hoods shall be certified by the contractor using ACGIH standards.

11 53 13.13 Recirculating Laboratory Fume Hoods
See section 11 53 53

11 53 53 Biological Safety Cabinets
Wherever possible with programmatic requirements, bio-safety cabinets shall be of the recirculating HEPA-filtered variety (e.g., Class II Type A2).

11 80 00 Collection and Disposal Equipment

Trash Rooms: NM Environment Department regulations require an enclosed facility for trash. Trash must be protected from the elements and free of rodent and insect harborage. Minimum size is 120 sq.ft. Trash rooms shall have double doors from the outside loading area and double doors are preferred from the interior corridor into the trash room. Trash rooms shall have a dedicated 110 volt outlet in addition to other required power facilities. Trash rooms shall have sealed concrete floors, a floor drain connected to the sanitary sewer and hot and cold water hose bibb. Trash rooms shall have interior lighting and control switch. Trash rooms shall have adequate ventilation and be protected from freezing.

Recycling Rooms: Provide recycling areas on all floors in accordance with UNM's recycling program

DIVISION 12 – FURNISHINGS

12 90 00 Other Furnishings

12 93 00 Site Furnishings

12 93 13 Bicycle Racks

1. All buildings shall have bicycle racks in close proximity.
2. Bicycle racks shall be of the loop type, firmly anchored to concrete and in compliance with the requirements laid out for UNM Main Campus Standard Outdoor Furniture by the UNM Planning & Campus Development office.
3. Enclosed bicycle lockers should be installed where appropriate
4. Enclosed bicycle lockers shall be mounted on a hard surface with proper drainage to prevent condensation inside and rusting of contents.

DIVISION 14 – CONVEYING EQUIPMENT

14 20 00 Elevators

1. All elevator shafts will incorporate sprinkled shafts, smoke detection at each level outside the elevator, heat, smoke detection and sprinklers in the elevator room regardless if the elevator is electric or hydraulic. The elevator will also incorporate fire department recall for all elevators with a shaft over 25 feet in total length.

Elevator lobbies must include smoke guards. A recall key will be provided in a location as determined by the fire official.

2. Signage will consist of written/visual signs noting Fire Dept. elevator operation and "IN CASE OF FIRE, USE NEAREST STAIRWAY DO NOT USE ELEVATOR". The signage will be posted in a conspicuous location. Signage will not be placed near or under bulletin boards or in other areas where hanging material will obscure the signage. All fire rated doors will have the appropriate signage (provided by the manufacturer) indicating its fire rating. This signage will be in the way of a metal placard, attached to the side of the door. The placard will not be covered/painted or otherwise obscured.
3. Consider providing a vestibule for any elevator that is exposed to the outside and/or harsh environment.
4. Wherever possible, elevators shall be of the machine room-less gearless traction motor style (Kone EcoSpace variety or approved equal).
5. Elevator Sump Pump – Discuss with PPD – where feasible, gravity drains shall be used. Pits shall have a high level alarm which connects to the BAS.
6. Hydraulic elevators shall use environmentally safe, non-flammable oils.

DIVISION 21 – FIRE SUPPRESSION

21 10 00 Water-Based Fire-Suppression Systems
21 11 00 Facility Fire-Suppression Water-Service Piping

1. All fire-suppression main mechanical connections at transitions between pipe materials (e.g., Mega-Lug fittings) shall be properly restrained.

2. Fire Department Siamese connections (FDC) will be installed in a location, which will provide the quickest/easiest access to fire department vehicles. The FDC must be placed so no more than 100 ft. of fire hose is required to make connection between the FDC and the fire engine.

   FDC sizing:

   a. When the total fire-suppression system demands, including inside hose allowance, is 750 gpm or less, the FDC riser shall be minimum four (4) inches in nominal diameter and have appropriate connections as required by code unless otherwise approved in writing by UNM PPD.
   b. When the total fire-suppression system demands, including inside hose allowance, is 750 gpm or greater, the FDC riser shall be six (6) inches nominal diameter and have appropriate connections as required by code unless otherwise approved in writing by UNM PPD.

21 12 00 Fire-Suppression Standpipes

1. Per an agreement with the Albuquerque Fire Department, when required, Class I standpipe systems shall be installed in accordance with NFPA 14. The following clarification is provided regarding the design of standpipe systems.
    a. For buildings less than 75-feet, standpipe systems shall be designed as "Manual Standpipe Systems" as defined in NFPA 14. The system piping shall be hydraulically designed to provide the required flow rate at a minimum residual pressure of 65 psi at the hydraulically most remote 2½-inch hose connection. The fire department shall supplement the standpipe system via the fire department connections to provide the necessary flow and pressure. The water supply must be evaluated to ensure the available capacity will support the minimum standpipe system flow rates.
    b. Class I standpipe systems must be provided in facilities where it is not practical to reach major portions of the building with firefighting hose lines extended from the exterior of the building, regardless of building height.

21 12 16 Fire-Suppression Hose Reels.

1. Class II and Class III fire hose cabinets are not permitted on any facility on campus.

21 13 00 Fire-Suppression Sprinkler Systems

21 13 13 Wet-Pipe Sprinkler Systems

1. All fire sprinkler systems installed on campus shall be wet pipe systems unless the area being protected cannot be maintained above 40 degrees Fahrenheit, as required by NFPA 13. Such areas will require installation of a dry pipe system. Antifreeze systems will not be permitted unless otherwise approved in writing by UNM PPD.
    1. The minimum detection and protection requirements for storage, custodial and trash rooms will be smoke detection and wet pipe fire sprinkler systems connected to the fire alarm panel.
    2. Fire sprinkler system drawings (contract drawings) shall indicate the service entry, the Siamese connections, the supply manifold assembly with all alarms and switches, the vertical and horizontal distribution piping and valves and supply piping to all protected areas. Indicate test drains piped to reasonable central locations. Drains cannot simply be left to drain anywhere. Indicate head coverage as part of the specification with proper accounting for drop soffits, special conditions, etc. It is recommended that head locations, or at least head locations at special conditions be detailed. These drawings shall be submitted to CID for permit.

3. Fire sprinkler shop drawings shall be reviewed and approved by the design engineer. The drawings with professional fire protection engineer's seal shall also be transmitted to the State Fire Marshal's office for review in accordance with the State Fire Marshal's Plans Review and Submittal Requirements, the latest edition. Proof of submission is necessary so that work can commence. Due to staffing, the Fire Marshal may not be able to review the drawings on a timely basis and therefore, the Design engineer's review and approval will be sufficient to start work.
4. Conduct water flow tests, in accordance with the procedures contained in NFPA 291, to determine available water supply for the water-based fire extinguishing system. Historical water supply data will not be accepted.
5. Backflow preventer: A reduced pressure backflow prevention assembly shall be installed prior to any sprinkler or standpipe system connected to the campus water distribution system.
6. All new construction will comply with NFPA 13 and the UBC requirement that all structures will incorporate full fire sprinkler systems. Sprinklers in conjunction with full smoke/heat detection or other suppression systems will be considered on an individual basis.
7. Pipe joints may be welded, threaded or Victaulic FireLock™ Installation-Ready™ or AGS couplings. No Plain End, Pressfit or FIT type couplings permitted
8. Sprinklers: Sprinklers shall be UL listed or FM approved and shall not include O-ring seals. Any sprinkler that incurs damage, is painted, or is sprayed with any obstructive material during construction shall be replaced at no cost to the University. Quick response sprinklers are required throughout all light-hazard occupancies, and may also be installed in ordinary hazard occupancies for the quick response hydraulic design area reduction per NFPA 13 for utilizing quick response sprinklers. Extended coverage sprinklers may be used if proven by hydraulic calculations.
9. Sprinkler system design shall carefully take into account building exterior spaces (canopies, etc.) that may require fire protection. Running wet sprinkler systems through unheated space is to be avoided.

21 20 00 Fire-Extinguishing Systems

1. Special system installation will be determined on the overall protection requirements of the facility and the specific requirements for the particular use of the area in the facility.
2. If high rack, closed rack or pile storage is to be designed, consideration will be given to the requirements of specialized suppression system design

3. Areas or rooms used for storage of flammables and fuels shall have appropriate fire suppression systems. Flammables shall be in original containers or safety cans, and stored in cabinets remote from traffic.
4. The standard type fire extinguisher to be specified in all projects shall be:
    a. For business and all light/ordinary hazard areas: 2 1/2 gallon water extinguisher recommended.
    b. For Mechanical rooms and rooms with flammable liquids: 10 lb. ABC Dry Chemical extinguisher recommended.
    c. For elevator rooms: 10 lb. ABC extinguisher
    d. For computer rooms: 2A10BC Halotron (or equivalent)
    e. For Automotive and Industrial areas: 15-20 lb. ABC Dry Chemical
    f. For laboratories or other areas with high cost or sensitive equipment as determined by SRS: 2A10BC Halotron (or equivalent)
    g. For areas including laboratories which utilize flammable liquids as determined by SRS: 10-15 lb. ABC Dry Chemical
5. No extinguisher with less than a 2A-10BC rating will be accepted for UNM projects. Exception - CO_2, which does not carry an "A" rating and will be used only in specific coverage areas. The general area will still be covered by an extinguisher with a 2A-10BC rating.
6. The cabinet's style and features will be specified during plan reviews of each project. UNM does not specify a particular style, but each cabinet will have the following features
    a. Be of a size which will accommodate a 2 1/2 gallon water extinguisher, a 15 lb. Halotron or a class C water mist extinguisher if necessary
    b. Window port for visual inspection of the pressure gauge.
    c. The outside of the cabinet will have, in clear contrasting color to the cabinet, the words FIRE EXTINGUISHER regardless of the type/size of the visual panel.
    d. The door will be a straight pull-to-open type without a locking mechanism unless specified by SRS for a specific application.

21 22 00 Clean-Agent Fire-Extinguishing Systems

FM 200 or similar alternative systems will be used in computer rooms requiring such protection. Alternative systems such as water mist will be considered on a case-by-case basis.

21 23 00 Wet-Chemical Fire-Extinguishing Systems

Only Wet Chemical hood systems will be installed in cooking facilities.

21 30 00 Fire Pumps

Fire pumps shall be used only as a last resort, in accordance with the 2007 agreement between UNM and the NM State Fire Marshal.

DIVISION 22 – PLUMBING

1. Provide adequate building wall thickness to accommodate piping and fittings.
2. Provide adequate maintenance access.
3. Unless required by code (i.e. Food Service areas) or stated in the OPR as required for the location hot water shall not be distributed to the public restrooms.

22 05 19 Meters and Gages for Plumbing Piping

Provide snubbers on pressure gauges

22 05 29 Hangers and Supports for Plumbing Piping and Equipment

Cut allthread off to within ½" of the nut

22 06 00 Schedules for Plumbing

22 06 10 Schedules for Plumbing Piping and Pumps

22 06 10.13 Plumbing Pump Schedule

All pump motors over 1 hp shall be NEMA premium efficiency.

22 08 00 Commissioning of Plumbing

Pipe testing, flushing, disinfection and treatment shall be specified and witnessed by UNM PPD

22 10 00 Plumbing Piping and Pumps

22 11 00 Facility Water Distribution

1. Isolation valves at each branch take-off for CW, DHW, DHW return
2. Isolation valves at each item of equipment which are separate from balancing and control valves.
3. Sharkbite or mechanical-type, push-lock fittings are prohibited.
4. Compression fittings shall only be used in accessible locations.
5. Mechanically-formed Tee fittings ("T-Drill" fittings) are prohibited.
6. Provide accessible isolation valves at major branch take-offs, each floor and in long runs of pipe.
7. Any abandoned sewer lines, water lines, gas lines shall be capped with compatible fittings.
8. Velocity in hot and cold water lines shall not exceed 5 feet per second
9. Water lines shall not be routed over computer rooms or electrical rooms.

10. Minimum pipe size shall be ½" for 1 fixture where the flow does not exceed 2.5 gpm and ¾" for 2 or more fixtures where the flow does not exceed 5 gpm.
11. Domestic hot water shall be distributed at 120F utilizing a master mixing thermostatic valve.
12. For domestic water distribution internal to buildings, use only copper piping for pipe diameters up to 2½" and either copper or galvanized steel for pipe diameters of 2 ½" or greater. Copper joints shall be soldered, except that Pro-Press may be used for pipe joints of 3" or less in diameter. Dielectric unions shall be used for all pipe joints of dissimilar metals. PEX-a is also an approved piping material.
13. Gaskets made of natural rubber are prohibited
14. Provide separate non potable water line to soap dispensers in Area 2 janitor rooms
15. Do not place plumbing in or above IT rooms unless needed for direct support of systems in those rooms.
14. Provide freeze protected hose bibb on roof at AHU's for flushing coils.
15. A valve schedule shall be provided noting the tag #, location, size, type, system, function, normal position and manufacturer. For control valves the valve Cv will also be noted.
16. Water hammer arresters shall be included in all domestic water systems per the latest edition of the Plumbing and Drainage Institute Standard PDI-WH 201. Provide isolation valves for water hammer arrestors for the purpose of pressure testing piping. Ensure that water hammer arrestor isolation valves are open following pipe pressure testing.

22 13 00 Facility Sanitary Sewerage

1. Areas or rooms used for storage of hazardous or otherwise regulated liquids larger than 5 gallons may not have floor drains
2. All underground sanitary waste piping shall be PVC Schedule 40 solid wall pipe.
3. Specify minimum 4-band worm clamps on cast iron no-hub sanitary piping 2" and larger. This does not apply to vents.
4. Sanitary sewage sump pumps shall only be used to convey waste generated below grade and only where gravity flow is impossible.
5. All sanitary waste generated above grade shall drain via gravity.
6. Pursuant to a 2008 agreement between UNM and NM CID, sanitary waste systems within laboratory buildings shall be constructed of plastic material as appropriate for required chemical compatibility and fire/smoke ratings. Neutralizing tanks are not to be installed.
7. Polypropylene or Polyvinylidene Fluoride (PVDF) shall be used for sanitary waste systems within laboratory buildings, connections to lab sinks and similar equipment with lab waste. Joints and fittings shall be made by socket fusion. CPVC may be used with prior UNM PPD approval based on material and chemical compatibility.
8. Do not place drains in or above IT rooms unless needed for direct support of systems in those rooms.

9. Do not locate restrooms above or adjacent to IT rooms.
10. Provide ProSet Trap Guards for all drains which do not see daily water flows

22 14 00 Facility Storm Drainage

22 14 26 Facility Storm Drains

1. All facility drainage infrastructures shall be sized and routed in accordance with a drainage plan. The plan shall use the City of Albuquerque's DMP Section 22.2 method.
2. Areas where the storm drainage is inadequate must be upgraded at the project's cost to adequately convey the 100 year storm.
3. Storm drains shall be designed so that no sump pumps are needed.
4. Indicate an adequate water-harvesting plan consisting of swales, retention facilities, volume control, overflow considerations, etc. Roof drains should direct water into plantings or be used for other beneficial uses whenever possible before discharge to the storm disposal system.
5. Indicate foundation/flooring drainage if required.
6. No building entrances at bottom of grade unless such entrances are protected by an adequate swale.
7. All underground storm drain piping shall be PVC Schedule 40 solid wall pipe

22 14 26.13 Roof Drains

1. Indicate roof drain locations.
2. Indicate roof drain outfall locations.
3. All roof drain piping shall be cast iron. PVC roof drain piping is not allowed.
4. Overflow roof drains shall daylight at ground level. Avoid locations that might present slip hazards in freezing conditions.
5. Roof drains shall not daylight on the north side of buildings.
6. All horizontal roof drains piping shall be insulated above grade.
7. No more than 5000 SF of roof shall be served by a single drain.

22 30 00 Plumbing Equipment

22 35 00 Domestic Water Heat Exchangers

If steam is available an approved steam heated DWH heater shall be specified.

22 40 00 Plumbing Fixtures

22 42 00 Commercial Plumbing Fixtures

1. Specify electronic 120 volt hard-wired sensor activated toilet, urinal and lavatory fixtures. Restroom water faucets should be 0.5 gpm or less and turn off automatically after 4 seconds of non-use.
2. Urinals shall be ultra-low flow models. Specify Zurn 0.13gpf/0.5lpf models or equivalent.
3. Toilets shall be rated for 1.28 gallons per flush. Dual-flush toilets are an acceptable substitute.
4. Drinking Fountains are non-electric. NO filters on the drinking fountains. Water bottle filler stations are fine but no filters. (This is part of our campus wide water safety program.)
5. All water closets shall be wall-hung unless it is a small bathroom with no more than one such fixture.
6. All restrooms in facilities that have high intermittent usage (e.g. assembly halls, etc.) shall have at least 25% more water closets than required by code in the primary women's restroom(s).

22 45 00 Emergency Plumbing Fixtures

Chemical storage areas shall have plumbed eyewash, deluge showers

22 45 00 Emergency Showers

1. Emergency Showers shall be located such that there is adequate drainage or a collection sump to relieve a 15-minute flow of 20 gpm from the space under the shower.
2. Emergency showers, if installed, shall comply with ANSI Z358.1.

DIVISION 23 – HEATING, VENTILATING and AIR-CONDITIONING (HVAC)

23 05 00 General Requirements

1. Combustion Equipment - Provide SRS with manufacturer specifications, including air emission rates, at least 6 months before construction to allow time to obtain the required air quality permit prior to equipment installation
2. The building architectural design shall provide adequate ceiling space and equipment room area for a well-coordinated layout of ductwork, piping systems, electrical conduits, cable tray, special plumbing systems, etc. as necessary to provide accessible and maintainable components. Design documents shall include sectional views indicating accessibility requirements.

3. Areas or rooms used for chemical storage shall have appropriate ventilation.
4. Provide composite equipment room, mechanical room, etc. drawings, including all trades, to be sure all facilities fit and are accessible. Provide an overall plan with plumbing, HVAC, major electric boxes, etc. to ensure adequate space. Don't forget piping and racks.
5. Provide section cuts where necessary for clarity.
6. Provide building sections where space is limited and facilities are large, particularly above ceiling spaces, to be sure the items fit and are accessible. Indicate what work should go in what location to insure this.
7. All air handling units shall be indoor type located in a mechanical penthouse or mechanical equipment room. Rooftop mounted air handling units may be allowed on a case by case basis requiring prior approval from UNM PPD Engineering & Energy Services.
8. Generally, mechanical equipment shall be mounted on bases 4" above finished floor.
9. Contractors' installation assembly/coordination drawings are required.
10. All rooftop equipment to be located at least 10' from parapet or edge of building, unless a guard rail or parapet meeting code required height is provided.
11. Guards shall be provided for all rotating equipment.
12. Working clearance for all equipment shall be shown on drawings and maintained.
13. Utility shutoffs shall be provided convenient to equipment.
14. R-410a refrigerant piping shall be pressure tested to 400 psig, minimum.

23 05 00 Common Work Results for HVAC

23 05 19 Meters and Gages for HVAC Piping

Provide snubbers on pressure gauges

23 05 29 Hangers and Supports for HVAC Piping and Equipment

Cut all-thread rod off ½" from nut.

23 05 48 Vibration and Seismic Controls for HVAC Piping and Equipment

1. All spaces at UNM shall comply with the guidelines for acoustical performance outlined in Table 42, "Design Guidelines for HVAC-Related Background Sound in Rooms," Chapter 47 of latest ASHRAE Handbook – HVAC Applications.

2. All new installations at UNM shall comply with the sound levels required by the Albuquerque Noise Control Ordinance at a point 50' from the edge of the building.

23 05 93 Motors

1. All motors over 1 hp shall be NEMA premium efficiency.
2. All motors over 1 hp shall be inverter duty rated.
3. All fractional hp motors shall be ECM type.
4. Provide shaft grounding rings when motors are used in conjunction with VFDs.
5. Disconnect switches shall be visible from motor.

23 05 93 Testing, Adjusting and Balancing for HVAC

1. Air balance system primarily by reducing fan speed. At least one balancing damper shall remain wide-open.

2. All T&B contractors must be NEBB or ICB/TABB certified.

3. All systems shall be balanced to within 10% of design flows.

23 06 00 Schedules for HVAC

Selection of the building HVAC system must be made at the schematic design phase. The mechanical engineering design team must be actively involved in the project prior to submission of the schematic design drawings and specifications so that the HVAC system selected will fit and function within the architectural scheme (see, for example, 23.81.27 Variable Refrigerant Flow Heat Pump Systems and 23 83 00 Chilled Beams and Chilled Sails).

1. Selection shall be based on the total owning and operating costs for the system over a thirty year period, based on building occupancy. The analysis shall include but not be limited to system first costs, additional first costs associated with the system that increases or decreases building construction costs, energy consumption costs, usual and customary maintenance and replacement costs and any other costs that affect total operating cost.
2. The system selected shall be as simple in configuration and design as possible, yet durable to satisfy the building needs. It shall emphasize ease of maintenance activities and flexibility to accommodate future renovation. Evaluation and justification of alternative system designs which use less energy is encouraged.
3. The selected HVAC system shall not have multiple components attempting to control a single process variable (for example Single-zone VAV rooftop units and thermal diffusers both trying to control to space temperature).

4. The design goal is to create a facility that meets LEED Silver requirements and complies with New Mexico Executive Order 2006-001.
5. New facilities shall be designed to help UNM move towards the goals laid out in the American College & University Presidents Climate Commitment of which UNM is a signatory.
6. The design shall comply with the current edition of ASHRAE Standards 55 and 62. Where those standards conflict with UNM design criteria the more stringent requirement shall comply.
7. Design shall comply with the latest version of ASHRAE Standard 90.1 that is adopted by reference as a New Mexico energy code.
8. Heating and cooling systems shall be sized for morning warm-up/cool-down to allow transition from unoccupied to occupied setpoints within 1 hour.
9. HVAC systems shall be designed for 76F summer and 70F winter indoor temperature for occupied office and classroom spaces. Unoccupied temperatures shall be 55F for heating and 85F for cooling. Mechanical and electrical room shall be considered unoccupied spaces.
10. Vacancy sensors for lighting shall also change the state of terminal units to unoccupied mode via the DDC system.

23 07 19 HVAC Piping Insulation

1. Piping insulation to be continuous at hangers. Voids inside saddles shall be filled with insulation. Provide calcium silicate inserts on supports for pipe greater than 2".

23 08 00 Commissioning of HVAC

1. All new buildings' HVAC control systems, domestic water, lighting controls and renewable energy systems shall be commissioned either by UNM PPD's Energy Services group or by a third-party agent paid for by the project but hired and directed by UNM PPD E&ES.
2. After 10 months of operation, the design team and UNM shall meet to analyze utility consumption results and determine system modifications that may be necessary to achieve the goal.
3. Commissioning & Warranty
   a. All sensors, actuators, and end devices including sequence of operation shall be commissioned by the contractor and a report provided to UNM.
   b. Commissioning work shall use the UNM pre-functional and functional test reports unless alternates are approved by UNM prior to the work being performed.
   c. Final commissioning shall be the responsibility of the installation contractor and subject to oversight and scheduled with UNM personnel. A completed

commissioning report shall be submitted and included in the equipment manuals. Test instruments used for calibration of sensors shall be calibrated prior to testing to insure their accuracy.

d. Each new control system shall have provided a two-year manufacturer warranty for all components from date of UNM acceptance. A one-year service and maintenance warranty shall be provided from the date of UNM acceptance.
e. Each new installation shall require a minimum of two onsite training sessions provided by the equipment installer / provider. A UNM representative shall coordinate the training with the installer after final acceptance by UNM. The training shall include sequence of operation, override procedures, calibration procedures, workstation operation. Each session shall be no shorter than 2 hours and no longer than 4 hours. Class size shall be determined by UNM.
f. Upon completion of all documents and successful start-up and training of personnel a systems manual shall be prepared for each commissioned system including HVAC, lighting, domestic water and renewable energy systems. As a minimum the manual will contain piping and instrument diagrams, control diagrams, graphics, Operational and Maintenance Manuals for all equipment and instruments, spare parts, contacts with address and phone number for equipment and instrument vendors and all commissioning reports. The report will be tabbed for easy access.

23 09 00 Instrumentation and Control for HVAC

1. Direct Digital Controls shall be employed.
2. Neither Life Safety nor Process systems (e.g. O2 monitors, process gas control systems, process cooling water systems, fire alarms, etc.) shall interface with the HVAC DDC Building Automation Controls System. Life Safety systems require a dedicated, supervised SCADA system with telemetry control to automatically monitor and alarm for device failures. The Building Automation Controls System is to be used to control only HVAC systems that are installed, operated, and maintained by the Physical Plant Department. PPD does not have the responsibility or capability to control, or to respond to failure alarms for life safety or process-related systems.
3. HVAC systems shall interface with campus EMCS (Energy Management and Control System)
4. Variable volume laboratory designs shall be used.
5. Heating water temperature shall be reset based upon OA temperature and zone demand
6. Discharge air temperature shall be reset based upon reheat zone demand
7. When system is Variable Air Volume system, discharge air static setpoint shall be reset to maintain highest damper position at 90% +/- 5%.

8. Minimum OA (Outside Air) intake reset shall be based upon ASHRAE 62.1.
9. An unoccupied/occupied building schedule shall be provided when vacancy sensors are not present.
10. Building occupancy and temperature over-ride shall be provided at room temperature sensor when vacancy sensors are not present.
11. Provide utility metering of chilled water, steam, domestic water, natural gas in accordance with PPD-Utilities Metering Guidelines
12. Thermostat locations shall be specified to ensure even temperature distribution in the conditioned space.
13. Thermostat setpoints shall be established in accordance with UNM Energy Management Policy 5100.
14. Duct smoke detectors shall stop the fans directly through the VFD via hardwire connection (not through fire alarm system). An extra set of contacts shall be provided for notification to the BAS.
15. Show location of S.O.A.P. station, O.A. temp. sensor, and duct static sensors on drawings.
16. Freezestat shall be located immediately downstream of the first coil in every air handler. Set point to be 38F. The freezestat shall turn off the supply and return fan, close the outside air damper, open the return air damper 100%, open the HW coil 100% and the CHW coil 50%. Freezestat shall require manual resetting. Two sets of contacts shall be required: one directly to the VFD (if present) and one for the DDC system.
17. No capped tees on pneumatic lines.

23 09 13 Instrumentation and Control Devices for HVAC

All points included in the HVAC system shall be labeled in accordance with the UNM Point Naming Convention.

1. This applies to all components of the HVAC system that are integrated with the control system including but not limited to air handlers, heat exchangers, fans, terminal units, dampers, thermostats, pumps and valves.
2. This naming convention shall be reflected in all drawings, control sequences, programming, graphics and field labels.

23 09 13.13 Sensors & Transmitters

1. All water temperature sensors shall be installed in wells.
2. Air Duct or thermal well Temperature Sensors shall be installed within 10 feet of the controlled device.

23 09 13.43 Control Dampers

Control dampers shall be low leakage type with an AMCA Leakage Class 1A rating

23 09 23 Direct-Digital Control System for HVAC

A UNM approved building DDC system is required. This system shall seamlessly interface with the campus EMS via BACnet TCP/IP protocol. Approved systems include Delta and Automated Logic for central and north campus projects. Other systems may be considered with prior approval from PPD Engineering & Energy Services for projects in other locations.

DDC Controls Systems Specifications

1. General Logic Requirements
    a. P, PI, or PID completely selectable for each control loop.
    b. All DDC input and output points shall have trending capability.
    c. Modulating control output available for VFD control.
    d. There shall be a proofing function for all DO points to alarm if action does not take place where appropriate.
    e. All alarm levels to be set by UNM.
2. Air Side Requirements
    a. Discharge air temperatures reset on space demand.
    b. Demand Control Ventilation: CO2 shall be read from the space and be used to override and reset the zone flowrate setpoint to maintain proper levels. If a zone has reached its maximum airflow setpoint and the level is still high, then the minimum OSA shall be reset to allow more OSA. In the occupied zones over 500 SF where occupant density is routinely greater than one person /30sf provide space return air CO2 sensor to notify PPD when CO2 space levels exceed 700 ppm above the ambient level.
    c. When vacancy sensors are not installed, provide unoccupied schedules at the zone or terminal unit level.
    d. Zone occupied overrides completely adjustable.
    e. Unless otherwise noted, all air handler controllers shall be the primary network controller for VAV systems.
    f. VAV boxes shall include discharge air temperature sensors and airflow sensors.
    g. Duct Static will be reset based on max VAV box to maintain one box at 90% open.
3. Water Side Requirements
    a. Heating water temperature shall reset upon OA or space demand.
    b. Heating water pumps shall be equipped with VFDs

   c. Differential water pressure sensor shall be installed in distribution piping 2/3 of the distance from the pumps to the most remote point in the distribution system.
4. Exhaust Requirements
   a. Variable volume laboratory system & hoods
5. DDC Hardware
   a. All exposed control wiring up to 10 foot above any floor or access platform shall be in no less than ¾" conduit with compression type connectors. If control wiring is located above ceiling, then wiring shall be properly supported and identified by low voltage color (green). Control wiring shall not be support by existing electrical conduit or other system supports. All outdoor flexible conduit shall be liquid tight weatherproof type, no less than ¾" diameter and not longer than 6' in length and fittings shall be metal liquid tight. All junction boxes within air handler plenums shall be weatherproof. All electrical local and state codes shall be enforced.
   b. All CAT-5, 5e or 6 cable runs shall not exceed 300'.
   c. All transducers or converters, D/A, A/D, electronic to pneumatic shall be mounted in the DDC control cabinet with the primary controller. When connecting DDC to existing pneumatic end devices a separate transducer is required for each AO control signal. A separate panel mounted adjacent to the primary control cabinet if more space is required is acceptable.
   d. All converters, transducers, sensors, wire terminations and end devices shall be labeled according to UNM labeling standards for ease of troubleshooting. A point list and wiring table shall be installed on the inside door of each control cabinet
   e. All relays used shall have a lighted indicator as to when they are energized.
   f. All control cabinets shall be labeled on the outside as to what equipment they control.
   g. Under no circumstances shall any control cabinets contain voltages in excess of 50 volts and all control circuitry shall use voltages under 50 volts. Separate transformer or power supply enclosures shall be provided as required OR when located inside the control box the 120v terminals shall be shielded.
   h. All DC valve and damper actuators listed below shall be spring loaded and on a loss of power shall fail to the following positions:
      i. Outside air fail closed
      ii. Return air fail open
      iii. Relief fail closed
      iv. Heating water fail open, or to coil on 3-way valves
      v. Chilled water fail open, or to coil on 3-way valves
      vi. Steam preheat fail open

vii. All steam converter or generator valves fail closed

i. Limit switches shall be provided for critical control actuators.
j. 110 volt AC outlet shall be installed outside and near each control cabinets and a service switch shall be mounted inside the cabinet.
k. Capability of change of program, add sensors, and tune system shall be made available to UNM.
l. All network system wiring shall have installed manufacturer specified surge protection located in the network as recommended by the manufacturer.
m. The following standard shall be used for the local area network (LAN):
    i. Wire shall be 22 AWG twisted pair black & white, shielded, plenum rated, 300 vac insulated jacket, purple in color.
    ii. Wiring product shall conform to standards written by the controls manufacturer and follow their recommended guidelines and not to exceed maximum lengths.
    iii. Terminators, repeaters, and grounding shall be installed according to manufacturers' specifications.
    iv. All LAN wiring shall not be exposed, but shall be installed in raceway, ceiling plenum, or conduit (EMT), in accordance with NEC. LAN wiring shall be properly supported and identified by low voltage color (green). LAN wiring shall not be support by existing electrical conduit or other system supports.
    v. All LAN wiring shall not be in the same conduit as other power sources and never near panel breakers, contactors, etc.
n. No more than two wires shall terminate on a single terminal point
o. All control wiring to be copper.

6. Communications & Graphics
    a. Direct Digital Control, BACnet communication integration shall be compatible to interface with UNM campus EMCS. All necessary equipment for functional integration shall be provided.
    b. All graphics shall be linked to allow easy mobility from page to page.
    c. Each DDC building system controller will be completely stand-alone and all settings and trend data contained within a building computer with complete access by UNM maintenance personnel. Routers and servers for DDC building systems shall be installed in mechanical rooms or closets accessible by UNM Maintenance personnel and not in IT rooms. DDC routers, servers and controllers shall be installed in locked cabinets or enclosures, accessible only by UNM PPD Engineering & Energy Services personnel. The system shall not rely on a computer outside the building envelope to contain a database for its operation. A laptop/desktop computer is not required.
    d. The building controls shall have full interface with laboratory control systems.

e. The DDC systems shall be integrated with lighting vacancy sensors so that unoccupied areas go into unoccupied mode.
f. The DDC systems shall be integrated with operable windows such that when the windows are opened, the area goes into unoccupied mode.
g. All PTAC, RTUs and stand-alone HVAC equipment shall be compatible with and integrated with the DDC systems. With the exception of refrigeration and gas safeties, all control and monitoring points shall be controlled by the DDC system
h. The minimum graphics requirements shall include:
    i. Building summary page
    ii. Floor plan for each floor with animation for each room's controls
    iii. Complete graphics for each terminal unit
    iv. Complete graphics for each air handler
    v. Complete graphics for Hydronic systems
    vi. Complete graphics showing lab control systems

7. Documentation
    a. All sequence of operation submittals shall be in the logic and verbal format with a (1) = on, start, alarm, etc. All digital signals drawn with a solid line, all analog signals with a dotted line. All submittals sizes shall not exceed 11 x 17 and shall become the property of UNM
    b. All points of entry shall be defined on a system architecture logic diagram.
    c. All files and data created in the DDC installation shall be the property of UNM.
    d. If system uses function blocks, documentation of function block operation shall be provided.
    e. Three copies of all equipment manuals for controllers, end devices, sensors, and sequence of operation diagrams shall be provided to UNM at the end of each system installation, after the commissioning completion and acceptance by UNM. Each manual shall be in a standard size three ring binder labeled on the front cover and edge. Electronic file versions (CD) shall also accompany each copy submitted.

23 10 00 Facility Fuel Systems

23 11 00 Facility Fuel Piping

23 11 23 Facility Natural-Gas Piping

1.Provide a shut-off valve at each connected item of equipment with a dirt leg immediately upstream from the valve

2. Consideration should be given to installation of a master emergency gas shut off valve to specific areas such as laboratories, classrooms and other similar spaces that can be accessed by the occupants in an emergency. The valve would be in a conspicuous location and be in a break-glass box to provide security from malicious actions.
3. All gas piping must be labeled as to the contents of the piping.
4. Gas piping shall not be run through HVAC duct work or have pressure relief valves, inspection ports or any other part of the system which could produce a leak, near any air intake or ventilation vent/port.
5. Unless required by the OPR, gas piping shall not be run inside buildings where the gas pressure exceeds 2 psi.
6. Underground gas piping must have a brass cap, on the surface, over the line indicating the direction of the line. A brass cap is required at every tee and elbow.

23 20 00 HVAC Piping and Pumps

23 21 00 Hydronic Piping and Pumps

1. Process cooling shall be provided as necessary through the use of plate & frame heat exchanger interface with the campus chilled water system. Pumps are only required on the process side of the heat exchanger. Return water to the campus system shall be no less than 58°F. Double-wall plate & frame heat exchangers shall be used to isolate process cooling water (or potable water) from the campus chilled water system.
2. Provide startup strainers at pumps; Remove startup strainers after flushing.
3. All hydronic piping shall be flushed , passivated and chemically treated, with strainers removed, cleaned and replaced following flushing. Bypass heat exchangers and coils during piping flushing.
4. Provide chemical water treatment for all closed loop hydronic systems. Initial chemical water treatment will be verified by third party. Provide 5 gallon minimum pot feeder with integral filter arranged for side stream filtration. Initial cartridge filter shall be rated at 50 microns for startup. Provide future 20 micron and 1 micron cartridges.
5. Backflow preventers shall be installed to isolate all hydronic systems from domestic water supplies. Soft-seated resilient check valves shall be installed upstream and downstream of backflow preventers.
6. Provide high point vents with shutoff valves and low point drains on hydronic piping systems. Include ¾" hose bibs at drains.
7. All hydronic piping 2" and less shall be soldered copper. The use of Pro Press fittings is an accepted joining method. PEX-a is also an approved piping material.

8. Dielectric couplings shall be provided between all changes in hydronic pipe materials.
9. Mechanically-formed Tee fittings ("T-Drill" fittings) are prohibited

23 21 13.23 Aboveground Hydronic Piping

1. Utility meter location with dimensioned straight pipe upstream and downstream
2. Isolation valves on each branch take-off
3. Isolation valves at each item of equipment, coil, reheat VAV box, etc, which are separate from balancing and control valves.
4. Drains at low points
5. Vents at piping high points and at equipment
6. Reheat and air handling coil piping shall be rigid, unless unit is supported by springs, in which case stainless steel braided flexible pipe connections shall be provided.
7. Where used (primarily at pumps), use braided flexible stainless steel connectors (no rubber connectors)
8. Heating system loops shall have reverse return piping, unless PICC valves are utilized throughout the system.
9. Reverse return coil bank piping. Pressure drop in and out of coils must be identical for multiple coils.
10. Piping shall be copper or steel. PEX-a is also an approved piping material. Victaulic couplings are not allowed.
11. Hot taps permitted only with prior approval of UNM PPD Engineering.
12. Metal insulation jackets in exposed areas
13. Lace-up insulation or pre-formed plastic jacketing around all hot piping appurtenances such as steam pressure reducing valves, check valves, flanges, valves, etc.
14. Hydronic piping shall not be installed in or above IT rooms.
15. The use of combination valves such as Y-strainer, ball valve, PT port, and union device and/or ball valve, PT port, union device is prohibited. Strainers, valves and PT ports shall be provided individually with unions on both sides of the device.

23 21 23 Hydronic Pumps

1. Dual heating water pumps shall be provided at 100% capacity each and shall be provided with VFDs.
2. Pumps equipped with VFDs shall be selected with full-size impellers.
3. Chilled water pumps are not to be used within buildings that are connected to the campus chilled water system.

1. If surplus steam capacity permits, steam-driven condensate pumps are preferred to electrically-driven condensate pumps. Make selection based on steam capacity verification with PPD Utilities group.
2. Electrically-driven condensate Pumps to have electric alternators and be fed by one power circuit. Power circuit to have separate overload fuses for each pump at the control panel. Controls to include runtime meter for each pump.
3. Use cast iron receiver. Volume to be sufficient for 10 minutes storage of condensate at maximum flow. Pumps to be lead lag, not lead standby.

23 25 00 HVAC Water Treatment

1. Specify pipe testing, flushing and treatment.
2. Equipment must be included to allow addition of water treatment chemicals to all closed hydronic systems. – see Division 23 general requirements for type.

23 30 00 HVAC Air Distribution

1. Base system design for typical variable air systems for classroom spaces, administrative spaces, and common spaces shall be single duct VAV system with hot water re-heat coils in terminal units. Electric reheat is not allowed.
2. Alternative systems shall be studied where constant volume airflow is required such as in laboratory spaces. Economic evaluation shall be made of constant volume reheat and dual duct constant volume with separate fans on each deck.
3. Laboratory spaces shall be designed and equipped with variable airflow control valves for each fume hood exhaust, room exhaust, and room makeup air. Acceptable manufacturers shall be approved by PPD Engineering on a case-by-case basis. Laboratory VAV flow controls shall be capable of interfacing with the building BAS to allow BAS control of room airflows and pressures.
4. Laboratory spaces shall be designed and operated to be at a lower pressure than adjacent spaces. The target differential pressure will vary depending on the laboratory use and biosafety level of the lab and of adjacent spaces, but in no case shall the differential pressure be less than 0.03”wc negative relative to non-laboratory spaces. Walls, floors, and ceilings which enclose and define a laboratory space shall be continuous, without openings between the lab space and adjacent spaces. Penetrations between lab spaces and adjacent spaces shall be sealed to prevent contaminant migration and pressure equalization between spaces.
5. Variable airflow control valves (SAV/EAV) may be used to control laboratory pressurization, but should only be used in laboratories with fume hoods. Ordinary Variable Air Volume (VAV) terminal units shall be used to control pressurization in laboratories having no fume hoods.
6. Return air duct/path design shall insure that the free open area required is not restricted. Return air design velocity through ceiling grilles shall not exceed 300

fpm of free open area. Return air design velocity through wall transfer openings shall not exceed 450 fpm of free open area

7. All exhaust ducts shall be under negative pressure inside buildings.
8. Design velocity for general exhaust ducts shall not exceed 1500 fpm except as required for special systems. Special exhaust systems shall be designed in accordance with Industrial Ventilation guidelines.
9. Air velocity in diffuser necks shall not be greater than 1000 fpm.
10. Variable flow systems with variable frequency drives shall be used wherever possible.
11. Fans connected into a common duct, stack, or fan wall shall have backdraft dampers on each fan.

23 30 02 Filters

1. Filters shall be moisture resistant, rated per ASHRAE Std 52.2, and Class 1 or 2 per UL Std 900
2. Prefilters shall be 2" MERV 8
3. Manufacturers include AAF, Camfil Farr or pre-approved equal
4. Filters shall be factory labeled and show direction of flow, manufacturers name and model number, and MERV rating
5. Initial resistance shall be less than .25" wc at 400 fpm

23 31 00 HVAC Ducts and Casings

1. The maximum velocity for medium pressure supply duct shall not exceed 2500 fpm
2. The maximum pressure drop for low pressure supply duct shall not exceed 0.07"w.c./100 ft.
3. Ductwork shall be leak tested per AHSRAE 90.1 to leakage class 3/SMACNA Seal Class C. Advise PPD E&ES when systems will be ready for testing.
4. Ductwork shall not be installed in or above IT rooms unless specifically supplying equipment within those rooms.
5. Ductwork shall not be installed above electrical switchgear
6. Duct mains and primary floor branches shall be pressure tested for leaks and witnessed by UNM PPD
7. When extending ductwork, vacuum the existing ducts before working on the new system.

23 31 13 Metal Ducts

No spin-in duct take-offs. Use conical or 45° flare fitting

23 32 00 Air Plenums and Chases

1. Vertical duct shafts shall be accessible from each floor, and be provided with enough extra space, perhaps 20% to 25%, to accommodate the installation of future ductwork, pipes, conduits, etc. within the shaft construction
2. Return air paths and grille sizes adequate from spaces to air handling units

23 33 00 Air Duct Accessories

23 33 33 Dampers

23 33 13.13 Volume-Control Dampers

1. Identify dampers with streamers of 1" width, 1 ft. minimum below ductwork. Damper streamers shall be bright pink during construction, and shall be replaced with green streamers after balancing.

23 33 13.16 Fire Dampers

Fire/Smoke Dampers (FSD)

1. FSDs will be operated by a duct type smoke detector/tube device. Fusible links will NOT be acceptable for any UNM project.
2. All FSDs will be tied into the building fire alarm system as addressable nodes.
3. Ducts entering or leaving electrical & IT equipment rooms will require a FSD.
4. Provide a duct pressure sensor on both sides of each air handling unit FSD. Use the upstream sensor for high pressure shutdown and the downstream sensor for duct pressure measurement.
5. All FSD will incorporate access doors for inspection. The access doors will:
    a. be of fire rated construction when penetrating a fire rated wall.
    b. be rated for smoke seal when penetrating a fire/smoke rated wall.
    c. have ceiling access doors measuring a minimum of 24"x 24" for inspection access.
    d. be labeled "fire/smoke damper" on the outside of the access door and/or the access tile or ceiling area as appropriate and determined by SRS.
    e. incorporate smoke detection activation on both sides of the damper.
    f. duct access panels which are tightly sealed with a mechanical latching mechanism
6. Duct smoke detectors shall be accessible for testing using a step ladder unless specifically approved by UNM PPD

23 33 46 Flexible Ducts

1. Flexible ductwork shall be limited to 90°of bends and a length of 6 feet.
2. Use rigid ductwork elbows at diffusers, or a product such as Thermaflex® Flexflow to maintain an unobstructed flow path.
3. No flexible ductwork on high pressure side of terminal boxes or above hard ceilings.
4. Special flexible ductwork installation arrangements may be used where noise is a concern and shall be specifically reviewed and approved by UNM

23 33 53 Duct Liners

No internal fibrous acoustical duct lining shall be used in any supply air system. Elastomeric acoustical duct lining is acceptable.

23 34 00 HVAC Fans

1. Fan speed shall be much less than 1750 rpm and at least 15% below the first critical speed
2. Air Handler external static pressure shall be less than 3”w.c. for units with return air and less than 2”w.c. for 100% outside air systems.
3. Exhaust fan static pressure shall be adequate for hood and fan discharge requirements
4. Fans shall be selected for the best possible performance and lowest cost as measured by 10-year net present cost considering unit size, unit cost and energy performance.
5. Fans shall be selected to minimize noise. A room coefficient value of 35 shall be the design maximum unless specified by the OPR
6. Strobic type fans to have sound attenuation shroud (and deficit damper sound attenuation if required).

23 36 00 Air Terminal Units

1. Balancing damper at branch take-off on low pressure side of terminal box
2. Ensure proper access to terminal boxes
3. Ensure that electrical, computer & telecom rooms have proper ventilation and cooling.
4. Zoning of terminal units shall be laid out such that interior and exterior zones are supplied separately.
5. Mark location of terminal unit with ¾” red adhesive dot on ceiling grid or label identifying the equipment tag designation.
6. Mark terminal unit number on the bottom of the unit with minimum 3” letters visible from the floor.
7. Provide either fiber-free foam liner or ¾” 1.5# fiberglass acoustical material with metal liner.

23 36 16 Variable-Air-Volume Units

8. Three duct diameters straight length of rigid ductwork shall be installed on the supply to VAV boxes
9. Provide minimum 6x6 access door upstream of reheat coils for cleaning. Access door shall be insulated to match VAV box, without exposed insulation.
10. Provide either fiber free foam liner or perforated metal liner with fiberglass insulation.
11. Appropriate VAV minimum airflow settings shall be provided to minimize energy consumption.
12. At design static pressure, the VAV damper shall be less than 80% open for maximum flow and greater than 20% open for minimum flow. Factory installed plastic test tee shall be removed and replaced with brass barbed coupling.
13. High voltage equipment to be separated from low voltage equipment in the control box with separate access panels.
14. For VAV control retrofits, transformers shall be mounted outside of boxes.
15. Provide local service disconnect switch. Mount on side of control box in highly visible and accessible location.
16. Install label on control box reading “Do not obstruct access. Provide 3’ clearance”

23 38 00 Ventilation Hoods

1. No return air from laboratory spaces
2. No positive exhaust ductwork inside building
3. Avoid filters in exhaust ductwork
4. Fume exhaust fan upblast discharge velocity 3,000 fpm
5. Exhaust fans shall be selected to minimize noise and energy consumption. It is expected that all exhaust fans, even those on the UNM campus and away from neighboring properties will meet the requirements of the Albuquerque noise ordinance.
6. Fume hood airflows shall be controlled to provide appropriate air velocity at face opening (regardless of sash position), based on specific gravity/molecular weight of fumes or particles to be captured and exhausted per SRS requirements. In no case shall a fume hood face velocity be less than 75 fpm or greater than 125 fpm.

23 52 00 Heating Boilers

23 52 16 Condensing Boilers

1. Condensing boilers shall be specified wherever boilers are required. Ensure that HW supply and return temperatures are selected for the best overall performance with boiler, pump, coils and fans all taken into account. Condensing boilers economic feasibility must be evaluated for retrofit applications.

23 57 00 Heat Exchangers for HVAC

23 57 16 Steam-to-Water Heat Exchangers

2. Steam-to-water heat exchangers shall be designed to have two units, each with a capacity of 100% of the maximum building heating requirement (unless vertical flooded shell type exchanger is used – see below).
3. All steam-to-water heat exchangers shall be either tube-and-shell steam converter or high-efficiency vertical flooded vessel type. Acceptable manufacturers of high-efficiency vertical flooded vessel heat exchangers include Maxitherm; other manufacturers may be approved by PPD Engineering on a case-by-case basis.
4. Steam to water heat exchangers shall include a high-limit cutoff.
5. Steam-to-hot-water converters for building heat shall be designed to generate no less than 180ºF when outside air is below 30ºF.
6. Control of converters shall be reset-able through the DDC system and each converter shall be supplied with 1/3rd and 2/3rd DDC control valves on the steam supply.
7. Steam PRVs shall be of a 1/3rd and 2/3rd arrangement.
8. Steam traps shall not be required to have a bypass line.
9. Each converter shall be supplied with a vacuum breaker on the steam lines downstream of the control valves.
10. Pressure relief valve discharge piping shall be routed to ensure the protection of personnel in the mechanical room (e.g., no discharge to a sump in a small mechanical room).
11. If tube and shell heat exchanger is used, a pressure powered pump trap at the heat exchanger shall be utilized in lieu of a F&T trap to prevent stall at low load conditions.

23 70 00 Central HVAC Equipment

1. O.A. (Outside Air) intakes shall be located so they are not within 40’ of streets, loading docks, parking structures, generators, or other internal-combustion exhaust sources. Maintain minimum separation distance between OA intake and other sources of airborne contaminants per the latest published ASHRAE Standard 62.1. Evaluate OA intake location for physical security.
2. O.A. duct shall be long enough to pre-heat outside air to assist in avoiding freezing temperatures being introduced over coils and shall incorporate at least 2 elbows.
3. If CO2 sensors are not used within occupied areas then O.A. quantity shall be measured with a device accurate at the minimum O.A. flow.
4. LED lights shall be provided inside all large AHUs. Hubbell Vaporite or approved equal.
5. Access panels shall be provided for all AHU sections.
6. Sound elbows shall be provided at all open DX unit return air intakes.

7. Provide AHU's with heavy duty, lasting latches on hinged panels (to prevent injuries). Air handler door handles shall be operable from outside and inside the unit casing to avoid the existence of a confined space.

23 72 00 Air-to-Air Energy Recovery Equipment

Heat recovery systems may only be considered for systems requiring considerable amounts of outside air and when economically justified. Energy balance calculations shall be provided to PPD Engineering & Energy Services for justification. When an air-to-air recovery system is used, bypass dampers shall be required in order to utilize economizer cycle without the pressure drop of the heat exchanger.

23 73 00 Indoor Central-Station Air-Handling Units

1. Air Handling Units (AHUs) must be enclosed in an equipment room with enough clearance to allow for coil removal and filter removal.
2. AHUs with fan motors in excess of 15 hp shall utilize fan arrays in order to minimize individual motor horsepower size to 15 hp or less. A single fan failure shall be able to be alarmed. The method by which the fan failure is detected shall be approved by UNM PPD Engineering and Energy Services. Multiple VFDs shall be utilized in a configuration approved by UNM PPD Engineering & Energy Services.
3. Air handling unit chilled water coils shall be selected for 55°F discharge air temperature at airflow velocities which minimize moisture carryover. Coils shall be selected at 20°F water temperature rise.
4. Cooling coils shall utilize Belimo energy valves.
5. Chilled water coils shall be 6 rows maximum. If conditions require greater coil capacity, two coils in series shall be used to achieve required duty, and shall be placed a minimum of 18 inches apart (with access between) to allow coil cleaning.
6. AHUs shall be selected to require no more than 10 bhp per 10,000 CFM inclusive of both return and supply fans. This power requirement shall be at mid-life filter pressure drops.
7. AHUs shall be selected using 400 FPM across the face of the coil
8. AHUs shall be selected to not require sound attenuators.
9. UV coil lamps, when installed, shall be wired to a dedicated circuit and provided with a local disconnect.
10. Filters shall be equipped with analog differential pressure sensors on each filter bank. Binary switches are not allowed.
11. Any units that have a minimum OSA damper or is a 100% OSA unit, the pre-heat or heating coil shall have a re-circulating pump for freeze protection.
12. When the outside air damper and return air damper are not physically linked such that one or the other is always open, provision shall be made to prevent the supply

fan from running when both dampers are closed to avoid excessive negative pressures within the fan casing and compartments.

13. A single outside air damper that functions as both a minimum ventilation air damper and economizer damper is preferred to having separate dampers for the two functions..
14. AHU shall be provided with drain pans at the heating coil section to facilitate cleaning. Provide with threaded drain connection, capped.

23 76 00 Evaporative Air-Cooling Equipment

Evaporative cooling can be considered for use only for spaces requiring considerable amounts of outside air (e.g. laboratory system application) upon UNM approval.

23 80 00 Decentralized HVAC Equipment

1. Equipment AHRI ratings shall, at a minimum, meet the PNM qualifying efficiency for a prescriptive rebate.

23 81 00 Decentralized Unitary HVAC Equipment

1. Equipment AHRI ratings shall, at a minimum, meet the PNM qualifying efficiency for a prescriptive rebate.

23 81 23 Computer-Room-Air-Conditioners

1. Computer rooms, electrical rooms, telecom rooms and similar spaces (e.g., IT rooms) shall be properly conditioned. Refer to the UNM IT Design Guidelines.
2. All IT rooms with the exception of small Telecom closets shall be equipped with humidifiers to maintain a minimum of 30% relative humidity in the space.
    a. The upper limit is 50% relative humidity. In the NM climate, dehumidification beyond the amount already obtained from a DX or CHW cooling coil is not necessary unless the room is in a building that is evaporative cooled. In those cases, supplemental dehumidification shall be provided.
    b. Water quality (hardness, conductivity, etc.) supplied to the humidifier shall be in full accordance with the humidifier manufacturer's requirements.
    c. Humidifiers shall be placed outside of the IT room (with the exception of dedicated CRAC per section 4 below).
    d. Humidifiers shall be selected to minimize maintenance requirements and total cost of ownership.
    e. Humidifiers shall be located where they can be easily accessed for maintenance.

3. IT rooms shall be equipped with standalone dedicated cooling systems that are independent of the central air handler(s). Such systems shall provide continuous service.
    a. In all cases, an in-room thermostat shall be used to control the system and the system shall be integrated with the building DDC system if such a system is present.
    b. If there is no DDC system in the building, the IT room shall be controlled by a local programmable control system.
    c. A DX split system shall be installed.
        i. These systems shall be variable load to run reliably and efficiently at all load levels from 20% to 100% of the ITS room's full-build-out capacity.
        ii. These systems shall be the most efficient units available.
        iii. If the IT-room is small enough that ductless units are used, they shall be mounted immediately below the ceiling.
        iv. If ducted units are to be used, supply air shall be distributed within the IT room to the back of the telecom equipment racks.
        v. UNM PPD Engineering and UNM IT must both approve the layout at each stage of design.
        vi. Gravity-drained drip & condensate pans shall be provided.
        vii. A makeup duct from the main HVAC system shall be provided to allow for room pressurization.
4. Large server rooms shall be equipped with standalone dedicated cooling systems that are independent of the central air handler(s).
    a. Floor-mount Liebert units (or equivalent) shall be provided.
    b. Where CHW is available, a CHW coil shall be used as the primary cooling, with a DX coil for emergency backup.
    c. UNM PPD Engineering and UNM IT must both approve the layout at each stage of design.
    d. Supply air shall be distributed within the IT room to the equipment racks and a cold/hot aisle concept shall be used.
    e. Monitoring & alarms with a shutdown interface shall be provided to avoid saturation of the space in the event of a coil leak or failure. It is recommended that this be accomplished via a duct humidistat with user adjustable setpoint.
    f. Gravity-drained drip & condensate pans/berms shall be provided.
    g. All piping must be routed to minimize exposure within the server room and must be entirely within the berm/drip pan.
    h. An in-room thermostat shall be used to control the system and the system shall be integrated with the building DDC system.
    i. A makeup duct from the main HVAC system shall be provided to allow for room pressurization.

5. In no case shall humidifiers or stand-alone air conditioning equipment be installed above IT equipment.

23 81 26 Split-System-Air-Conditioners

1. Provide hail guards for condensers
2. Space temperature shall be monitored and alarmed to FMS.

23.81.27 Variable Refrigerant Flow Heat Pump Systems

1. VRF heat pumps systems can be considered as an energy efficient alternative HVAC system in new and existing building applications where central chilled water and steam plant system connections are not economically feasible.
2. Energy recovery type heat pump systems shall be utilized when the HVAC system zones are such that simultaneous heating and cooling may occur within the building, otherwise standard heat pump type units are recommended for installation.
3. Heat Pump size selection shall allow up to 30% load diversity for applicable heat recovery system applications, and based on loads determined by utilizing ASHRAE design weather guidelines for Albuquerque, NM. Heat Pump specification shall include design features that assure heat pump performance near maximum heating capacity while operating at ambient temperatures as low as 0ºF.
4. Warranty requirements – VRF systems shall be designed by qualified (manufacturer trained) engineers, installed by qualified (manufacturer factory trained) contractors and commissioned by qualified (manufacturer certified) personnel, so that the Installation Contractor can provide UNM the manufacturer's equipment warranty for 5 years on all parts and components of the installed system.
5. VRF system controls shall provide hard wired thermostat/controller devices, communications wiring from each device controller to the central heat pump controller, and BACnet interface to allow viewing of system by UNM Building Automation Systems.
6. UNM PPD Energy Service personnel shall be provided with required training and system interface devices for equipment operational programming options including time-of-day schedules, space temperature set point adjustments, fan speed adjustments, and equipment alarm signals, etc.
7. Designated UNM PPD personnel shall be provided with manufacturer approved service training for proper maintenance, operation and service of VRF heat pump systems equipment. The Installation Contractor shall provide UNM PPD required

service access equipment (devices and software) for communication to interface with heat pump system controllers and monitor or download information regarding the system operation and performance.

8. Refrigerant piping systems shall be Type L copper silver soldered piping from heat pumps to controller boxes with Type M copper silver soldered piping being allowed from controller box to fan coil units. Also Reflok Aluminum piping systems are acceptable for VRF refrigerant piping system installations.
9. Dedicated outside Air Systems (DOAS) are required for ventilation air with VRF type HVAC systems, and shall be energy recovery type equipment.
10. Individual fan coils units shall have either gravity drain condensate lines, or factory installed or field mounted condensate return pumps piped to condensate drain system. Equipment controls shall shut off fan coil unit and provide service technician alarm upon the failure of the condensate pump to properly function.
11. Approved equipment manufacturers systems for UNM campus installations shall be made in conjunction with UNM PPD Engineering and Energy Service group based on their knowledge, experience of past performance by available products.

23 82 16 Air Coils

1. Fan coils shall be controlled by the FMS and status shall be monitored.

23 83 00 Chilled Beams and Chilled Sails

1. Avoid the use of Chilled Beam and Chilled Sail systems unless justified and accepted by PPD Engineering based on architectural limitations, cost analysis, and energy savings analysis.
2. Chilled beam systems, if employed, shall have controls in place to maintain chilled beam chilled water temperature above the dewpoint temperature of the space to prevent interior condensation.

23 84 00 Humidity Control Equipment

23 84 13 Humidifiers

3. Avoid the use of humidifiers except where essential for programming requirements.
4. Straight length of stainless steel ductwork shall be provided at humidifier location
5. Humidifiers shall incorporate airflow sensing instruments to shutoff the unit in the case airflow loss or reduction below 80% of design.

6. Humidifiers must be accessible for frequent inspection and removal and replacement of generators and tanks
7. Provide softened water for supply

23 84 13 Dehumidifiers

1. Avoid the use of dehumidifiers except where essential for programming requirements.
2. Dehumidification may be accomplished with chilled water or DX condensation coils, or dessicant-type adsorption wheels.

DIVISION 26 –ELECTRICAL

1. Electrical closets and rooms and MDRs/TRs will be constructed of at least a one-hour fire barrier, regardless of the construction requirements of the rest of the building. The closet door will be solid core (or fire rated metal) and be labeled for at least 20 minutes unless a higher requirement is called for by Code, with a self-closing device. Doorstops will not be installed on the door. NOTE- magnetic hold open devices may be installed per NFPA 101 and 80 and connected to the fire alarm system.
2. Remove completely all abandoned or unused electrical equipment and wire/cable.
3. Load summary schedule shall be provided.
4. Main equipment shall be properly sized to take into account planned future additions.

26 05 00 Common Work results for Electrical

1. Comply with UNM PPD E&ES “Electrical Specifications for Contractors and Personnel Doing Work at the University of New Mexico (latest edition).
2. Comply with the New Mexico Night Sky Protection Act.
3. Comply with UNM PPD Utilities Div’s “Electrical Upgrade Guidelines.”
4. Comply with UNM PPD Utilities Div’s “UNM Utilities Guidelines for Construction.”

26 05 19 Low-Voltage Electrical Power Conductors and Cable

1. Conductors shall be copper. However, 600V feeder conductors in sizes #1/0 AWG to 750 kcmil may be copper or aluminum alloy. Aluminum alloy conductors shall be compact stranded conductors of a recognized Aluminum Association 8000 Series aluminum alloy conductor material (AA-8000 series alloy), with Type XHHW-2, temperature rating 90º C insulation.
2. Metal-clad and non-metallic cables (including types: MI,AC, NM, MC, NMC, SNM, SE, USE, UF, or BX) should NOT be used on UNM property without the

expressed consent of the Physical Plant Department Engineering and Energy Services Division (PPD-E&ES).

3. Where multiple 20 amp branch circuits serve areas of non-linear loads such as discharge lighting, computer equipment, etc; separate No. 12 neutrals shall be run for each circuit. Shared neutrals are not acceptable.
4. Conductor splices/taps in gutters or large j-boxes shall be made using insulated, multi-cable connector blocks. Taped split-bolt connections are not acceptable.
5. The splicing (or joining) together of wires, sizes #10 and smaller should be accomplished with industry standard twist-on wirenuts, butt-splices, or other NEC-acceptable methods. The use of "push-in connectors" is prohibited for "pigtailing" wires in junction and device boxes, as well as in lighting fixtures, or virtually any other application. Individual luminaire disconnects (as required by the NEC) are specifically exempt from this requirement.
6. All bolted pressure connections shall be torqued to manufacturer specifications.
7. In general and where practical, all conductors should be continuous (no splices) from their point of origin to their point of termination. In NO case shall "Service Conductors" be spliced.

26 05 26 Grounding and Bonding for Electrical Systems

1. Grounding requirements shall be clearly defined and conductor sizes specified.
2. Grounding and bonding requirements for IT equipment shall be verified with the UNM IT Design Guidelines.

26 05 29 Hangers and Supports for Electrical Systems

All conduits should be run parallel and perpendicular to the structure. No unsuitable angles, bends or suspended conduit will be allowed. Exposed conduit shall be run parallel and perpendicular to the structure and generally tight to structure.

26 05 33 Raceway and Boxes for Electrical Systems

1. Under no circumstances will non-metallic "Wiremold" (surface raceway) contain any conductors which carry more than 50 volts. In all cases where "self-adhesive" surface raceway is used, in addition to the raceway adhesive, at least 2 mechanical fasteners per ten foot length shall also be used (straps, screws, etc.).
2. PVC conduit shall not be used above grade except in special applications that have been pre-approved or are required for a special installation.
3. PVC conduit may be used underground. But, underground elbows and vertical risers up through slabs must be metallic conduit.
4. All EMT fittings shall be of the compression type (gland & ring). Set-screw fittings will NOT be acceptable. All fittings shall be steel, not pot metal.

5. The ends of all conduits containing wires of any type shall be bushed.
6. Conduits through concrete slabs or walls and fire-rated walls shall be sleeved.
7. Conduit penetrations of exterior below-grade walls shall be made with watertight Link-Seal fittings. No exceptions.

26 05 53 Identification for Electrical Systems

1. Labels shall be installed on all panels, disconnects, hardwired equipment, etc., identifying its use and where it is fed from. Labels shall be installed on all switches and receptacles, identifying its circuit. Arc flash hazard labels shall be provided on all major electrical equipment.
2. The phasing of all conductors (#8 and larger) shall be identified by color coding tape. Conductors sizes #10 and smaller shall have colored insulation. The grounded (neutral) conductor sizes #6 and smaller shall be white or light gray, or have 3 continuous white stripes on other than green insulation. Grounded (neutral) conductors larger than size #6 shall be color coded white with coding tape. Grounding conductors sizes #6 and smaller shall have green insulation or be bare the entire length. Grounding conductors larger that size #6 shall be color coded green with coding tape. (Ref: NEC # 210.4, 200.6, 250.119.)

26 05 73 Overcurrent Protective Device Coordination Study

1. Indicate short circuit calculation values on drawings.
2. Equipment AIC ratings shall be appropriate for the calculated available fault values.
3. Arc flash incident energy calculations shall be done, and printed labels for the major electrical equipment included in the study/report.
4. Short circuit, protective device coordination and arc flash incident energy studies shall be done by either Emerson Electrical Reliability Services (ERS), Eaton Electrical Services, Electric Power Systems or GE Engineering Services (GE) as a subcontractor to the electrical contractor. No exceptions. Protective device settings for instantaneous, long time, short time and ground fault (where applicable) shall be made by the subcontractor that prepared the coordination study.

26 06 00 Schedules for Electrical

26 06 20 Schedules for Low-Voltage Electrical Distribution

1. All switchboards, panels, Motor Control Centers (MCC), etc. shall be shown on the appropriate plans and on the riser diagram.
2. Equipment designations shall be coordinated on the various plans and make logical sense.
3. HVAC equipment locations and designations on electric drawings shall match those on the Mechanical Drawings.

4. The following shall be specified at least once but not twice (mech & elect sections): electrical disconnects, equipment starters, VFDs, etc.
5. Power feeder/branch circuit sizing (conductor size and overcurrent protection devices) shall be coordinated with MECH equipment schedules.
6. Power shall be provided to sensor-activated lavatories, urinals, and toilets.
7. Power circuits shall be shown for elevator cab fan and lights and power shown for elevator(s).
8. Verify requirements for IT power in the UNM IT Design Guidelines.

26 06 50

26 06 50.13 Lighting Panelboard Schedule

1. All lighting circuits shall be supplied via dedicated panels.
2. Where appropriate, lighting panels shall be of the GE Smartbreaker or Square-D Powerlink type and shall be provided with Internet connection to allow remote programming from the UNM PPD E&ES DDC Command Center.

26 08 00 Commissioning of Electrical Systems

1. Include an itemized description of equipment to be inspected and tested (describe required test(s), setting of OCPDs, etc., and reports required):
    a. Pad-mount switches
    b. Pad-mount transformers
    c. Medium voltage cables
    d. Dry-type transformers
    e. Low-voltage feeders (to panels, etc.)
    f. Circuit breakers, low-voltage, 225AF and larger
    g. Grounding systems
    h. Switchboards
    i. Photovoltaic systems
2. 0-600V testing shall be done by Emerson Electrical Reliability Services (ERS), Electric Power Systems or Eaton Electrical Services as a subcontractor to the electrical contractor. 15kV-115kV testing shall be done by Emerson Electrical Reliability Services (ERS) as a subcontractor to the electrical contractor. No exceptions.
3. Resolve early on in the project what electrical equipment and/or systems should receive Enhanced Commissioning, for example:
    a. Lighting Controls
    b. Photovoltaic System
    c. Life Safety Systems
    d. Etc.

26 09 20 Instrumentation and Control for Electrical Systems

26 09 23 Lighting Control Devices

1. Occupancy sensing, continuous dimming, daylight harvesting and switching of small areas to reduce energy usage shall be considered.
2. Wireless switches, occupancy/vacancy sensors and control modules with dry contact shall be strongly considered over wired control solutions. Contact PPD E&ES for exact products to be specified and programming/sequence of operations requirements.
3. Vacancy sensors shall be used to control lighting in appropriate rooms. Occupancy sensors shall be used to control lighting in restrooms (or ceiling mounted sensors, as appropriate) Room lighting shall be controlled by motion sensors and should turn off 5 minutes after the last occupant leaves. Occupancy/vacancy sensors shall not be used in electrical, mechanical or IT rooms/closets.
4. Vacancy sensors shall be of the dual-technology (DT) type incorporating both infrared and ultrasonic sensing technology (or infrared and sound sensing technology), only where appropriate, i.e., restrooms. Otherwise, passive infrared (PIR) type only.
5. Wherever feasible, both lighting and HVAC shall be controlled based upon occupancy (vacancy control for lighting and occupancy control for HVAC), daylight sensors shall be used to control lighting in appropriate rooms (near windows or rooms with skylights). These may be combined with vacancy sensors where appropriate.

26 20 00 Low-Voltage Electrical Distribution

1. Provide NMEC/NEC required working clearances for switchboards, panels, etc. in adequately sized electrical rooms.
2. Switchboard, panel and MCC physical sizes shall be shown correctly.
3. Switchboards, panels and MCCs shall be shown in appropriate locations (i.e., a Code compliant layout).
4. Provide an all-inclusive plan that shows all equipment to ensure access.

26 22 00 Low-Voltage Transformers

26 22 13 Low-Voltage Distribution Transformers

1. Transformer secondary disconnects shall be provided in NEC required locations.
2. Windings shall be copper.

3. Belleville washers (in lieu of lock washers) shall be provided for all bus connections.
4. All connections must be properly torqued, using a calibrated torque wrench in accordance with manufacturer's recommended values.

26 24 00 Switchboards and Panelboards

1. Main breakers shall be provided in appropriate locations and NEC required locations.
2. Panels and switchboards:
    a. Will be "Bolt-in" circuit breaker type.
    b. Will have copper busses.
    c. Will be provided with neutral and equipment ground lugs (bars).
    d. Will have a permanent label affixed to the front cover, showing the designation, voltage, and where it is fed from.
    e. Will have an arc flash hazard label affixed to the outside of the panel cover.
    f. Will provide 30% unused (spare) capacity for future use.
    g. NEMA 1 panels will be "Door in Door' construction.
    h. Any recessed panel installed, in addition to the circuits for which it is being installed, will have 4 (ea) spare conduits (minimum ¾ trade size) stubbed from the panel into ceiling space above for future.
    i. Bonding (grounding) bushings will be provided on all feeders.
    j. The "AIC" rating of all panels/switchboards and associated overcurrent protective devices shall be adequate to meet short circuit calculated values.
    k. Panel/switchboard schedules and labeling must be completed (updated). This applies to both new and modified existing panels/switchboards.
    l. All electrical equipment: panels, disconnects, etc. must meet the code clearance requirements.
3. No conductors shall be spliced within panelboards. Under no circumstances will "wire nuts" be accepted within any panelboard. Conductors may not be installed within any panel or device raceway unless those conductors terminate within that specific panel or device.
4. At no time will a contractor leave any electrical switchgear, panels, or energized devices open or exposed in a public area without having qualified electrical personnel working on or guarding the exposed electrical components.
5. All panels shall have door-in-door fronts.
6. All panels/switchboards shall have copper busses.
7. All panels/switchboards shall utilize bolt-on circuit breaker devices in lieu of fuses.
8. Belleville washers (in lieu of lock washers) shall be provided for all bus connections in switchgear, busduct or standalone (e.g., ground bar).
9. All connections must be properly torqued, using a calibrated torque wrench in accordance with manufacturer's recommended values.
10. A TVSS shall be provided at the main electrical service panel/switchboard.

26 24 19 Motor-Control Centers

1. Motor-operated equipment (i.e. fan coil units) must be supplied by a minimum of a local manual motor starter with thermal overloads. It should be mounted on the side of the control enclosure, or within 3 feet maximum of the unit.
2. MCCs shall utilize motor circuit protectors in lieu of fused switches.
3. Bussing shall be copper.
4. Belleville washers (in lieu of lock washers) shall be provided for all bus connections.
5. All connections must be properly torqued, using a calibrated torque wrench in accordance with manufacturer's recommended values.

26 27 00 Low-Voltage Distribution Equipment

26 27 19 Multi-Outlet Assemblies

Standard tumbler switches and duplex receptacles shall be commercial specification grade, 20 amp. All terminations must be made using the screw terminals, not the "stab-in" provisions. Receptacles in restrooms, in kitchens, in labs, on building exteriors, or within six feet of any water source shall be of the GFCI type.

26 28 00 Low-Voltage Circuit Protective Devices

1. Surge protection devices shall be provided in appropriate locations.
2. Shunt trip requirements shall be provided where required.

26 28 16 Enclosed Switches and Circuit Breakers

1. Where feasible, all protective devices shall be circuit breaker type. An enclosed circuit breaker is to be used in preference to a fused safety switch.
2. Non-fused safety switches may be acceptable for local equipment maintenance disconnection.

26 29 00 Low-Voltage Controllers

26 29 13 Enclosed Controllers

Provide local service disconnect switch. Mount on side of control box in highly visible and accessible location.

26 29 23 Variable Frequency Motor Controllers

1. Provide VFDs for all motors greater than 1hp.
2. All VFD's to be manufactured by ABB. No exceptions.

3. Provide by-passes or dual VFDs for critical operations only.

26 31 00 Solar Photovoltaic System

1. Roof structures shall be designed to support photovoltaic (P-V) systems in future, including roof mounts, structural landings, and space for inverters and future P-V panels.
2. Photovoltaic (P-V) systems installed on the UNM campus will be designed to conform to the regulations in the New Mexico Interconnection Manual, as applicable.
3. UNM PPD Utilities Div. will obtain an interconnect agreement with PNM for each PV system. A P-V system cannot be placed in continuous service until this agreement is obtained. (However, the system can be installed, tested and commissioned without the agreement.)
4. P-V systems installed on the UNM campus will be interconnected to the associated building's electric system either at the main electrical service entrance equipment (preferred) or to the nearest existing electrical panel approved by PPD Engineering (much less desirable).
5. The P-V inverter(s) shall be utility interactive type, and automatically disconnect from the building's electric system upon loss of normal (PNM/UNM Turbine Generator) power to the building, and shall automatically reconnect when normal building power returns. (Inverters shall be connected into the building's normal power system, not the building's emergency power system so that they will NOT reconnect if the building's emergency/standby engine-generator starts and transfers load.)
6. UNM intends to apply for or retire renewable energy credits (RECs) from PNM for all installed P-V systems. The P-V system vendor shall provide any drawings required by PNM. The P-V system will need to have a PNM-approved meter socket for the installation of a REC meter to be owned and installed by PNM. The meter socket shall be located electrically between the inverter(s) and the connection point at the electrical service equipment. An electrical panel may be required to combine the output of all inverters for making the connection to the REC meter. PNM will need to approve the REC meter location, which typically requires unescorted access during regular working hours. The REC meter shall also have local disconnects on both sides of the meter, for isolation purposes. No additional disconnects are required beyond those in the electrical distribution system if they are in the same general area as the meter.
7. Inverter(s) shall include local metering for determination of P-V system output. Additionally, the inverter(s) shall have an RS-485 interface and be connected

to the building BUMP for remote data gathering. (If no BUMP exists, then an Ethernet interface is needed for remote monitoring by UNM.)

8. All PV systems installed at any UNM site MUST be provided with and connected to an Egauge energy monitor along with an Ethernet port for remote reading of the energy monitor.
9. The system shall receive enhanced commissioning, as defined in the USGBC's LEED system.
10. P-V modules and P-V inverters are critical components of the P-V system. Recognizing that equipment design is rapidly changing and companies come and go, it is important to specify current state-of-the-art equipment and from manufacturers that are likely to be around through the warranty period. Early in the design phase, the A/E shall review and obtain approval from PPD Engineering personnel on possible equipment options (manufacturers/models), including mounting hardware/methods.
11. P-V modules shall be warranted for 25 years. P-V inverters shall be warranted for 10 years. These warranties shall be provided to UNM by the contractor/manufacturer, regardless of whether these lengths of warranty exceed the manufacturer's standard warranty.
12. P-V modules are to be bonded to aluminum support racks with stainless steel hardware (nuts, lockwashers and threaded bolts). Bonding points shall be abraded immediately prior to a lug being fastened in place.
13. P-V inverters shall be installed in an interior, conditioned space (quite possibly the main electrical room).
14. The p-v system should be designed with safety in mind. This would include having appropriate disconnects and signage. Both maintenance and emergency (firefighting) personnel need signage to be made aware of the possible hazards and locations for disconnecting the photovoltaic power source(s). It is likely that needed signage and disconnects will exceed the requirements given in Article 690 of the National Electrical Code. See NFPA 70E 450.6(C)(2) for a sign example. Signage shall be placed on the primary switch serving the building transformer, and the dc and ac disconnects on the P-V inverter indicating "an open switch may have power on both sides."

    The p-v inverter(s) shall be approved utility grade and have the ability to manually disconnect from the grid and the P-V modules. The P-V modules shall also have the ability to be individually isolated. Provisions shall be made to safely remove individual modules from service for maintenance or replacement.
15. Individual strings of P-V modules shall be protected by circuit breakers (rather than fuses).
16. P-V systems shall be provided with solar radiation/insolation sensor and solar cell temperature sensor and connected to the associated building BUMP or

appropriate data gathering device (for continuous data collection to be compared to the P-V system output). Discuss with PPD Engineering.

17. Keeping the P-V modules clean is a maintenance concern. A water source (hose bibs) shall be provided within 50' of all modules. Water systems must be frost proof and design must have adequate drainage so there is no standing water on roofs. Hot water may be required for effective cleaning. Additionally, weatherproof, GFCI receptacles should be provided should cleaning require use of a power washer. Discuss with the associated PPD Maintenance area.
18. Assure adequate access to all system components for future maintenance (including p-v module cleaning) and troubleshooting. Catwalks may be necessary, if the modules are located up in the air (e.g., if located on top floor canopies on a parking structure).
19. P-V systems at UNM shall not include battery storage systems, except under special conditions (e.g., systems that are for research or systems that are not grid-connected).
20. Pest control must be considered as part of the design. A rooftop system will attract birds. Provide a deterrence plan that is effective for both day and night, and complies with Federal animal protection guidelines.
21. P-V system modules shall be connected to the building lightning protection system (if one exists). If no lightning protection system for the building exists, it shall be provided, as part of a rooftop P-V system installation. P-V modules and inverters shall be provided with surge protection.
22. All of the system's PV panel racks must be grounded and bonded. Furthermore, if a grounding electrode is the only means of grounding, a supplemental grounding electrode shall be installed.
23. A minimum of 2 "Weeb" washers are to be installed at each PV module at opposing corners.
24. The technical specifications for the P-V system shall indicate that the contractor must have NABCEP™ Solar PV Installer Certification.
25. Consult the UNM Master Plan and UNM Planning & Campus Development to assure that the proposed P-V system array location has and is designated to have future solar access.
26. Refer to the PPD Utilities Division's Guidelines for Construction for additional UNM requirements.

26 32 00 Packaged Generator Assemblies

26 32 13 Engine Generators

1. Provide SRS with manufacturer specifications, including air emission rates, at least 4 months before construction to allow time to obtain the required air quality permit prior to equipment installation.

2. Generator shall be shown in proper scale and location, location suitable for maintenance and appearance.
3. Bollards shall be provided where required for physical protection.
4. Diesel shall be the fuel source, if generator serves life safety loads. Otherwise, a natural gas generator may be used.
5. Provide diesel Tier III (Tier IV, if available) unit.
6. Power and alarm conduit and wiring to generator, jacket water heater, battery charger, GFCI maintenance outlet, etc.
7. Quietest standard muffler, along with oxidizing catalyst/particular filter shall be specified. Additionally, depending upon location, provide sound-attenuated enclosure.
8. Remote generator derangement panel may be desirable depending upon the specific project.
9. Breakglass emergency stop station shall be provided. Coordinate location with PPD E&ES
10. Transfer switch(es) shall be properly located and power conduit and wiring indicated.
11. Generator loads should include IT loads in MDR/TRs.

26 50 00 Lighting

26 51 00 Interior Lighting

26 51 13 Interior Luminaires, Lamps and Ballasts

1. LED luminaires shall be provided for all new construction and retrofits.
2. LED lumens per watt (LPW) must be sufficient to earn ENERGY STAR ratings and must be on PNM's list of acceptable fixtures for rebate program.
3. Interior LED Lighting must have a correlated color temperature (CCT) of 4000K.
4. LED luminaires must have a color rendering index (CRI) of at least 82. 90+ CRI fixtures shall be strongly considered.
5. LED luminaires must come with 0-10v control standard if not being controlled as part of proprietary lighting control system.
6. Where fluorescent lamps will be frequently switched or controlled by occupancy/daylight sensors, replacement ballasts shall be high frequency, programmed start type. All other existing fluorescent luminaires shall be provided with high frequency, instant start, high p.f., low THD, replacement

electronic ballasts. Each ballast shall have appropriate ballast factor (B.F.) and applicable (i.e. T-8 or compact fluorescent) lamps.

7. All replacement multi-lamp ballasts must be of the "Parallel circuit" type. Replacement fluorescent lamp correlated color temperature (CCT) shall be as approved by UNM (typically 4100 K).
8. All existing open lamp strip fluorescent luminaires light fixtures must be provided with a full coverage lens, or clear "tube protectors". Replacement fluorescent lamps shall be of the highest CRI available (SPX / 800 series) for the lamp type.
9. 4' replacement fluorescent lamps shall typically be 28W, T-8. 25W, 4' lamps should not be used, due to UNM night setback operational procedures.
10. "U-lamp" lamps shall NOT be installed, due to cost of replacement lamps.
11. TLED (LED tubes) shall NOT be used.
12. Special areas (conference rooms, etc.) shall have suitable lighting for presentations.
13. CRI and CCT for LEDs (or replacement fluorescent lamps, and ballast factor (B.F.) for ballasts shall be specified/scheduled for each luminaire type.
14. Ceiling types, grid layout and luminaire layout shall be coordinated with Architectural drawings. Base sheet shall match.
15. 24 x 7 "night" lighting shall be minimized for energy conservation. Use GTDs (generator transfer devices) where appropriate.
16. Lighting shall comply with the most recent recommendations of the Illuminating Engineering Society of North America (IESNA). Typically the low end of recommended ranges is totally adequate. Discuss proposed levels with PPD E&ES.

26 53 00 Exit Signs

1. All exit lighting shall be standardized. The standardization shall apply to the EXIT sign housing, lettering and color. All EXIT signs shall meet the size criteria of NFPA 101. Exit signs shall be LED type.
2. Exit signs and egress lighting shall be shown in appropriate locations.
3. All exit lighting shall be internally lit with battery backup power or shall be connected to an emergency source of power, which will provide not less than 1-1/2hrs of continuous power in the event of main building power failure.
4. Exit signs with attached emergency lighting heads will not be acceptable unless specifically approved.
5. Battery packs shall be provided with self-diagnostics feature.
6. No radioluminescent EXIT signs shall be installed.

26 56 00 Exterior Lighting

1. Exterior luminaires shall comply with the UNM lighting master plan. Latest technology sources (LED) shall be used for all exterior lighting. Discuss with PPD E&ES.
    a. 25' major roadway fixture = LED versions of the Cooper INVUE ICON or Cooper/Lumark Navion, depending upon location and existing streetlighting in the area .
    b. 20' parking lot fixture = LED versions of the Cooper INVUE ICON
    c. 12’ internal campus walkway fixture = LED versions of the Cooper INVUE Mesa (alternate AAL Largent)
2. The NM Night Sky Protection Act shall be complied with (i.e., fully shielded luminaires). Additional “house-side” shielding shall be provided for luminaires near residential/housing and Astronomy Observatory.
3. Electric signs shall be indicated where required and power shall be shown for electric signs.
4. Time clocks shall be of the remotely (via Internet) programmable electronic astronomic type and shall be capable of being interfaced with the HVAC DDC system. Utilize the time clock feature in the DDC system (in lieu of a standalone time clock) to control relays/contactors where a DDC system exists.

26 56 13 Lighting Poles and Standards

Light poles shall have raised bases if potentially subject to vehicular damage. Light pole base detail(s) shall be shown. In ground base depth shall be at least 1/4 length of pole.

26 56 16 Parking Lighting

1. Parking lot lighting shall be provided if required. The lighting control method shall be indicated and appropriate. Luminaires shall be compatible (source, finish, appearance) with adjacent existing lighting where so directed by PPD E&ES. Otherwise, comply with the campus lighting master plan.

2. Additional “house-side” shielding shall be provided for luminaires near residential/housing and Astronomy Observatory.

DIVISION 27 – COMMUNICATIONS

Please refer to the UNM IT Design Guidelines and Guide Specifications available at http://it.unm.edu/communications/designguidelines/ for complete specifications pursuant to this division. The items included herein are only intended as a partial summary and shall not be considered to supersede anything in the IT Design Guidelines.

27 10 00 Structured Cabling

Project requirements shall be coordinated with UNM IT to ensure that it is understood how cabling, jacks, plates, equipment racks, etc., are included and funded for the project.

27 11 00 Communications Equipment Room Fittings

1. IT closets and rooms shall be constructed of at least a one-hour fire barrier, regardless of the construction requirements of the rest of the building. The closet door will be solid core (or fire rated metal) and be labeled for at least 20 minutes unless a higher requirement is called for by code, with a self-closing device. Doorstops will not be installed on the door. NOTE- magnetic hold open devices may be installed per NFPA 101 and 80 and connected to the fire alarm system.
2. The electrical installation for IT rooms shall comply with NFPA 75 or may also comply with NEC 645. One may have an advantage over the other.
3. It is recommended that the main IT/ service entry room (at least), be equipped with a single room electrical shut off button for all equipment (dedicated room subpanel is suggested. A second shut-off is required for dedicated HVAC equipment. The on-floor generally smaller rooms need not have this feature so long as compliance with other applicable code requirements are met.
4. Ensure that telecommunications rooms are appropriately sized & located.
5. Adequate cooling (24/7) shall be provided for telecommunications rooms, typically using split systems. (Note that the campus chilled water system is taken down a couple of times each year for maintenance.)
6. Pathways shall be provided for cabling runs back to telecommunications rooms.

27 15 00 Communications Horizontal Cabling

1. Pathways shall be provided for cabling runs through hard ceiling areas.
2. Typically provide cable trays in building main corridors for the cabling runs.
3. Provide 12” clearance on top of cable tray (away from duct, piping, etc.)
4. Provide conduit stubups into the ceiling space from voice/data outlets. Where close to corridor walls and cable tray, stub conduit to the cable tray. Otherwise, stub conduit into ceiling space and use j-hooks for support over to the cable tray. Provide conduit sleeves through corridor walls and fire seal.

27 30 00 Voice Communications

27 32 00 Voice Communications Telephone Sets, Facsimiles and Modems

1. Telephones shall be installed in elevator cabs.
2. Adequate handicap telephones shall be indicated.

3. Code Blue phones shall be indicated. Telephone and power service shall be shown to Code Blue stations.

27 50 00 Distributed Communications and Monitoring

27 53 00 Distributed Systems

27 53 13 Clock System

Clocks are to be Power over Ethernet (PoE), IP type. Coordinate required clock locations with the building users. Coordinate clock types (analog vs digital) and display type (6 digit vs 4 digit) with building users and their needs. Clocks shall be Primex Wireless, or approved equal.

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

28 20 00 Electronic Surveillance

1. The UNM Lockshop operates and controls all access control both mechanical and electronic. See their specifications for specific details.

28 23 00 Video Surveillance

Exterior CCTV cameras shall be shown if required.

28 30 00 Electronic Detection and Alarm

28 31 00 Fire Detection and Alarm

1. The work covered by this section of the Specification shall include all labor, equipment, materials and services to furnish and install a complete fire alarm system of the “addressable” type. It shall be complete with all-necessary hardware, software and memory specifically tailored for this installation. It shall be possible to permanently modify the software on site by using a plug-in programmer/computer. The system shall consist of, but not be limited to, the following:

    a. Fire Alarm Control Panel
    b. Remote annunciator(s)
    c. Addressable manual fire alarm stations
    d. Addressable area smoke detectors, with sensitivity/maintenance alert
    e. Beam detectors
    f. Addressable duct smoke detectors, with sensitivity/maintain alert
    g. Addressable heat detectors

h. Sprinkler waterflow alarm switches
i. Audible notification appliances
j. Visual notification appliances
k. Air handling systems shutdown control
l. Smoke exhaust systems startup control
m. Magnetic door holder release
n. Sprinkler supervisory switches and tamper switch supervision
o. Fire pump supervision

2. Fire alarm shop drawings shall be reviewed and approved by the design engineer.

3. The final shop drawings shall also be transmitted to the State Fire Marshal's office for review in accordance with the State Fire Marshal's Plans Review and Submittal Requirements, latest edition. Proof of submission is necessary so that work can commence. Due to staffing, the Fire Marshal may not be able to review the drawings on a timely basis and therefore, the Design engineer's review and approval will be sufficient to start work.
4. The contractor will coordinate with IT Alarms prior to start of work on any new or existing fire alarm system in order to alert SRS and UNM agencies.

5. Contractor shall advise building occupants that a fire alarm system may be out of service.

6. The Architect/Engineer must consider the location of future furnishings when locating fire alarm/notification devices. Consideration must be given to furnishings obstructing the devices.

7. All fire protection systems will receive a 100% device/operational test, performed by the installing contractor and witnessed by a UNM representative. The test will include activation of each pull station, smoke detector, flow/tamper switch, alarm notification device and connection through the fire alarm panel to Campus Police dispatch.

8. Be sure to require that the "alarm" contractor coordinate work in this section with all related trades. Work and/or equipment provided in other sections and related to the fire alarm system shall include, but not be limited to:

a. Sprinkler waterflow and supervisory switches shall be furnished and installed by the plumbing contractor or fire alarm contractor, and wired by the fire alarm contractor.
b. Duct smoke detectors shall be furnished, wired and connected by the fire alarm contractor.

c. HVAC contractor shall furnish necessary duct opening and installation of the duct smoke detectors. Air handling and smoke exhaust system fan control circuits and status contacts to be furnished by the HVAC control equipment contractor or as shown on the contract drawings specifically for this project.
d. Elevator recall control circuits to be provided by the elevator control equipment.
e. The sprinkler system control equipment contractor shall provide wet pipe flow and tamper switches, dry pipe/deluge sprinkler system release valve control circuits and supervision contacts.
f. Emergency generator supervision contacts to be provided by the emergency generator control equipment.
g. Fire Pump supervision contact to be provided by the fire pump control equipment.
h. Wiring, cabling and conduit shall conform to the specifications set forth in Division 26.

9. Warranty. Manufacturer shall guarantee the system equipment for a period of one (1) year from the date of final acceptance of the system. The contractor shall guarantee all wiring and raceways to be free from inherent mechanical or electrical defects for one (1) year from date of acceptance of the system. Upon completion of the installation of fire alarm system equipment, the electrical contractor shall provide to the architect a signed written statement substantially in form as follows: "The undersigned, having engaged as the Electrical Contractor on the (name of project) confirms that the fire alarm system equipment was installed in accordance with the wiring diagrams, instructions and directions provided to us by the manufacturer."

   Circuiting Guidelines. Each circuit shall complete as shown on drawings, but device loading is not to exceed 80% of loop capacity, in order to leave for space for future devices.

10. Manufacturers. Notifier, EST, Siemens or Simplex . No exceptions.

28 31 13 Fire Detection and Alarm Control, GUI and Logic Systems

1. Main fire alarm panel location shall be indicated and appropriate. Consideration should be given to providing a location that would eliminate the need for a remote annunciator.

2. All FA systems will be the addressable type. Each device will report in as a separate address. The contractor will be responsible for programming the address according to the needs of UNM IT Alarms.

3. This theory of operation is provided for the designer's information:
   a. Actuation of any manual fire alarm station or automatic detector will sound all audio/visual alarms and trip the master fire alarm panel.
   b. Actuation of automatic detectors in the elevator lobbies, shaft, or equipment room will sound all audio/visual alarms, trip the master fire alarm panel, and activate the elevator controls as directed by the elevator installer.
   c. Activation of a HVAC unit smoke detector will sound all audio/visual alarms, trip the master fire alarm panel and shut down the HVAC unit directly, not through the temperature control system.
   d. Actuation of a sprinkler flow switch will sound all audio/visual alarms and trip the master fire alarm panel.
   e. Closure of any sprinkler system valve or the PIV valve will report as a supervisory signal.
   f. Closure of HVAC "dampers" will report as a supervisory signal.

28 31 23 Fire Detection and Alarm Annunciation Panels and Fire Stations

1. Remote annunciator(s) shall be shown.
2. The manufacturer must have received prior approval of their fire alarm system before their system will be considered for use. Prior approval submittal shall include system operation description, equipment cut sheets, and wiring diagrams.
3. Applicable Codes and Standards. All equipment shall be UL listed for its intended use. Installation of equipment and operation of, shall comply with NFPA 72, the National Electric Code, all other local codes and authorities having jurisdiction.
4. Circuit Identification Nameplates. All circuit breakers related to the fire alarm system shall have a red marking, be identified as "Fire Alarm Circuit Control".
5. Include in the technical requirements that a $$ allowance for additional contractor furnished fire alarm signals beyond those required by the documents or approved shop drawings. The installation shall occur after initial testing and in areas where signals cannot be heard properly.
6. The system's capacity and battery system shall be sized to accommodate the extra (20%) devices.
7. Specify spare parts for the system. The spare parts shall directly interchange with the corresponding components as furnished in the installed systems. Spare parts and accessories shall be suitably packaged and identified by nameplate, stamping or tagging. Provide the following spare parts and accessories.
   a. 1 spare pull station
   b. 1 spare horn/strobe
   c. 1 spare "module" of each type
   d. 1 spare of each type of smoke detector installed (ion, photo)

e. 1 heat detector

8. The contractor shall furnish a list of all other spare parts and accessories which the manufacturer recommends to be stocked for maintenance of the system.

28 31 33.13 Fire Detection and Annunciation Interfaces to Remote Monitoring

Central Station Dialer. Furnish and install digital alarm dialer, which is compatible with the UNM central station alarm reporting system, (911Notifier or approved equal).

Tests.

a. The entire fire alarm system shall be tested and adjusted under the supervision of a factory-trained representative of the manufacturer. Any defects shall be corrected at once and the test re-conducted.
b. After the completion of the installation and supplier's testing, the entire system, devices, wiring, and equipment shall be completely tested in the presence of the architect's representative, State Fire Marshal, and owner. If the system fails to pass this inspection, the contractor shall be liable for all additional re-inspection and re-testing expenses. The Fire Marshal must approve the entire Fire Alarm System before it will be accepted.

28 31 43 Fire Detection Sensors

1. Smoke/fire duct detectors shall be shown and coordinated with mechanical and not double specified (i.e., by both MECH and ELECT).

2. Regardless of Code requirements, provide smoke detection in lounges, break areas, electrical & IT rooms, mechanical rooms, custodial/janitor's closets, storage rooms, records rooms, trash/recycling rooms, and other normally unoccupied rooms, etc. Those rooms which are subject to false alarms caused by dirt or vapors (e.g., mechanical rooms, custodial closets, break areas with microwaves, etc.) shall be equipped with heat detection, in lieu of smoke detection.

3. Storage, custodial and trash rooms shall be connected to a wet pipe fire sprinkler system.

28 31 53 Fire Alarm Initiating Devices

Fire sprinkler system monitoring shall be shown.

DIVISION 31 – EARTHWORK

31 01 00 Maintenance of Earthwork

1. Protect excavation from surface water

31 05 00 Boundary Markers and Survey Monuments

1. All work must align and correspond to existing campus surveys.
2. Vertical Accuracy: 3rd order
3. Horizontal Accuracy:
    a. 1:10,000 minimum for urban areas
    b. 1:20,000 minimum for metropolitan areas.
4. Vertical control datum use Mean Sea Level datum adjusted by United States Coast and Geodetic Survey for the location of survey
5. Identify all benchmarks and monuments found, set, reset or replaced; describe kind, size and location.
6. UNM uses the geocentric datum of The North American Datum of 1983 (NAD 83), North American Vertical Datum of 1988 (NAVD 88)as the reference datum.
7. All work to be approved and signed by a registered Professional Land Surveyor in the State of New Mexico.

31 06 00 Schedules for Earthwork

1. Over excavation, placement of engineered fill, and compaction to 95% shall be clearly specified.

31 06 20 Schedules for Earth Moving

31 06 20.16 Backfill Material Schedule

1. Backfill material and lift depths shall be specified (8-inches minimum)
2. The geotechnical engineer's written approval is required for use of spoils as backfill. If written approval is not received, acceptable imported fill material is required.
3. The following references must be included in all fill specifications;

a ASTM C 136, ASTM D 1883, ASTM D 2487, ASTM D 3282, ASTM D 3740.

31 06 40 Schedules for Shoring and Underpinning

In any excavation, shoring is required at any depth determined by an appointed Competent Person and if shoring is used it will be designed and approved by a Professional Engineer registered in the State of New Mexico.

31 30 00 Earthwork Methods

31 35 00 Slope Protection

Avoid steeply sloped site development. Refer to OSHA regulations and guidelines.

31 60 00 Special Foundations and Load-Bearing Elements

All slabs and sidewalks adjacent to buildings – especially at door openings – are to be supported by the building foundation to avoid differential settling

DIVISION 32 – EXTERIOR IMPROVEMENTS

32 00 00 EXTERIOR IMPROVEMENTS

32 01 00 General requirements and owner intent

.01 Inspection and Testing

A. Continuous inspection and testing by a testing laboratory with a Soils Engineer shall be provided during filling and compaction. All footing excavations shall be inspected by a qualified inspector to ascertain that all excavations have penetrated topsoil, soil with organic matter, or fill to undisturbed soil; that the bottom of the excavation is on suitable bearing material; and that all loose material, water and water-softened material has been removed just prior to placing concrete. Copies of reports from the testing laboratory shall be forwarded to the Contractor, the University, and the Professional.

B. Compaction Tests (if required)

1. The Owner shall employ a recognized testing laboratory to perform verification testing of compaction.
2. The Professional and the University reserve the right to direct where tests shall be taken.
3. Certification of compliance from testing laboratory shall be provided to the Professional, which shall state that the earth compaction conforms to the

requirements of the specifications. Certificates shall be received and approved by the Professional prior to concreting operations.

32 10 00 BASES, BALLASTS, AND PAVING

.01 Curbs and Gutters

A. Portland cement concrete curbs and gutters. The following specifications and standards of the issues listed are to be utilized.

1. American Society for Testing Materials (ASTM).

B. All Portland cement concrete curb and gutter work shall be constructed in conformance with the latest edition Standard Specifications for Highway and Bridge Construction NMDOT:

1. Curb and/or curb and gutter shall be a monolithic pour with form or saw contraction joint 3/16" wide and 2" deep.
2. Concrete curb may be placed with an acceptable, self-propelled machine as approved by the University Comply with all curb and/or curb and gutter profiles and dimensions.
3. Wood or metal forms may be used at all locations.
4. Match curb and gutter profiles where new work is an extension or revision of existing.

C. The following specifications and standards listed are to be utilized:

1. Standard Specifications for Highway and Bridge Construction New Mexico State Department of Transportation 2014 edition.
2. American Society for Testing Materials (ASTM).
3. American Concrete Institute (ACI).
4. American Association of State Highway and Transportation Officials (AASHTO).
5. Portland Cement Association (PCA).

D. Before placing aggregate bed for cement concrete paving, check the subgrade and do all necessary grading, rolling, and compacting required to attain a true, even, firm surface. Fill and consolidate any traces of dented or depressed areas. Remove all spongy material, replace with suitable earthfill, and compact solidly with roller or mechanical compactors; moisten if required.

E. Provide a crushed aggregate bed fully choked and rolled to the compacted thickness indicated on the drawings. Stone aggregate for base course shall comply with NMDOT 303.2.2.

B. Cement Concrete:

1. Furnish Class A cement concrete mixture of Portland Cement, Type IA air-entraining cement, fine aggregate, course aggregate, and water as specified Cement to be air-entrained from an approved manufacturer. Use cement for each project from the same manufacturer.
2. Cement content shall be a minimum of six (6) 94-lb. bags per cubic yard and a maximum of eight (8) bags per cubic yard.
3. Fine aggregate (sand) to be Type A. Do not use fine aggregate produced from limestone in concrete wearing surfaces.
4. Course aggregate to be Type A,
5. Water for mixing or curing shall be clean and free of all impurities detrimental to the cement concrete.
6. Cement concrete shall be designed with an entrained air content of 6% in the plastic state with a tolerance of +1.5 percent during the work. The specification for entrained air is met, if the entrained air in the hardened concrete is not less than 3.5 percent nor greater than 7.5 percent. Testing for air-entrained cement concrete shall be in accordance with ASTM C231
7. Cement concrete shall be mixed and transported in accordance with
8. Slump range at point of delivery shall be 1 inch to 3 inches. Test concrete for slump in accordance with ASTM C143
9. Compressive strength at 28 days shall be a minimum 3300 psi.

10. Proportions of ingredients shall be determined, and tests shall be conducted, in accordance with basic relationships and procedures outlined in ASTM C172, C31

C. Expansion Joints:

1. Use ¼" thick premolded expansion joint material the specified depth of the concrete slabs along all foundations and walls where slabs abut other fixed structures; longitudinally where sidewalk slab is to be constructed in contact with curb, and adjacent to existing structures as directed. Expansion joint material may be Isolation-Joint-Filler Strips – ASTM D 1751, asphalt saturated cellulosic fiber, or ASTM D 1752, cork, or self-expanding cork.
2. Sidewalks shall be constructed with expansion joints placed every 20' to 35' to accommodate scoring joint patterns. Expansion joint material shall be recessed ¼ inch from top of slab to allow for edging and sealants if specified or indicated. See also plan for scoring joint designs and expansion joint placement.
3. Where existing and/or new light standards, poles, fire hydrants, access frames and covers to underground utilities, manhole frames and covers, and similar structures are within the limits of the sidewalk areas, the concrete around such structure shall be scored, by edging and/or grooving, in a block 8" wider than the maximum dimensions of the structure at the sidewalk elevation. Prior to placing the concrete around such structures, premolded expansion joint material shall be placed around the structure to the full depth of the slab.
4. Unless otherwise directed by the University, a metal edger having a ¼" radius shall be used for edging all joints. Transverse and longitudinal scoring shall be done in accordance with the drawings and/or directed. Scoring and control joints shall extend to a depth of at least ¼ of the thickness of the concrete slab.

D. Forms:

1. Forms may be metal or wood, securely staked and braced, and constructed to true lines and shapes indicated and extending the full depth of concrete.
2. Forms shall be oiled if metal or wetted or oiled if wood. Form oil shall be an approved form coating. Care shall be taken to prevent reinforcement from becoming coated with form oil.
3. Forms once used shall be thoroughly cleaned before being reused.
4. Side forms shall not be removed within 12 hours after the concrete has been placed. After the removal of forms, minor honeycomb at formed areas shall be filled with mortar composed of 1 part of cement and 2 parts of fine aggregate. Major honeycomb areas will be considered as defective work, and shall be removed and replaced at no additional cost to the University.

E. Placing Concrete:

1. All concrete work shall conform to referenced and applicable standards and the latest American Concrete Institute Manual of Concrete Practice.
2. Sidewalk slabs shall be one-course construction of thickness indicated on the drawings - in no case less than a full five (5) inches, unless otherwise specified on the drawings.
3. Do not increase the quantity of water in the concrete beyond the recommended design limit.

F. Weather Requirements:

1. Placement of concrete under extreme weather conditions shall take place only after approval from a University Project Manager.

G. Curing Requirements:

1. To insure adequate curing, forms for vertical surfaces shall not be removed sooner than 12 hours after casting concrete, unless other approved means are taken to prevent premature drying of the concrete.
2. All other unformed surfaces shall be protected from premature drying with liquid membrane-forming curing compound clear or white and also with white polyethylene sheeting:

a. The clear and translucent shall contain a red fugitive dye and conform to AASHTO-M148, Type 1-D. The white pigmented compounds shall be Type 1-D and Type 2

- Do not use white membrane-forming curing compounds after September 1 where deicing chemicals will be used the following winter.

b. White polyethylene sheets shall conform to AASHTO

3. Liquid membrane-forming curing compounds and polyethylene sheeting shall remain in place for a period of at least 96 hours after casting and finishing operations.

4. Temperature of the air in contact with concrete surfaces during this curing period shall be maintained at temperatures not lower than 50°F and not higher than 90°F.

H. Protection and Cleaning:

1. All finished concrete work shall be protected from damage due to subsequent construction operations. All concrete work from which traffic cannot be restricted shall be protected by use of approved covering, temporary ramps or walkways.

2. New construction adjacent to concrete work areas shall be protected from splashing and damage, by protective coverings of waterproof paper, plastic, and/or wood members as required.

I. Finishing of Concrete Sidewalks:

1. All cement concrete sidewalk slabs shall be placed to full thickness in one operation without change in proportions, rammed, spaded or vibrated, and screeded to proper grade, wood floated and lightly troweled with a steel trowel. When the concrete has set sufficiently, the slabs shall be given a coarse stiff bristle broom finish perpendicular to the line of traffic to produce a non-slip surface. See plan for other finishes.

J. Concrete Stairs

1. Steps should be built into the slopes and have a foundation below frost level. Risers shall have a backslope and treads shall have a 1/4" wash.
2. A general design formula for establishing size of risers and treads shall be twice the riser plus the tread = 26". Preferred riser dimensions are 5" minimum and 6" maximum.
3. Foundation wall at top and bottom of steps shall have a projecting ledge to support pavements.
4. Where feasible there shall be no fewer than 3 steps and no more than 10 steps per set.
5. Maintain 3" minimum clearance from edge of steps to outside of drilled hole for handrail installation where required.
6. Handrails, tread, and riser design shall meet all local and national codes and ADA requirements.
7. Treads shall have a non-slip finish.
8. Nosing bars shall not be used in step construction.

32 11 00 Base Courses

32 11 13 Subgrade Modifications

Subgrade under sidewalks shall be scarified to a depth of eight (8”) inches and recompacted to minimum of 95% maximum density as determined by ASTM D 1557. Any soft or ‘spongy’ areas shall be removed and replaced with structural fill as described herein.

SECTION 32 12 16 – ASPHALT PAVING

PART 1 – GENERAL

A. Mixing, spreading, compacting and finishing of bituminous pavements for base, leveling and surface courses on roads, parking lots, and other areas.

QUALITY ASSURANCE

A. Perform work in accordance with the State of New Mexico Department of Transportation-Bureau of Highways-Standard Specifications for Road and Bridge Construction, latest Edition, hereinafter referred to as "State Highway Specifications." Measurements and payments portions of those State Specifications do no apply to work performed under this contract.
B. Mixing Plant: Comply with requirements of State Highway Specifications.
C. Qualifications of Asphaltic Concrete Producer: Use only materials which are furnished by a bulk asphaltic concrete producer regularly engaged in production of hot-mix, hot-laid asphaltic concrete.

PAVING QUALITY REQUIREMENTS

A. General: In addition to other specified conditions, comply with the following minimum requirements.
    1. Test in-place asphaltic concrete courses for compliance with requirements for density, thickness and surface smoothness.
    2. Provide final surfaces or uniform texture, complying with required grades and cross-sections.
    3. Take not less than 4 inches diameter pavement specimens for each completed course, from locations as directed by the testing agency.
    4. Repair holes from test specimens as specified for patching defective work.
B. Density
    1. Compare density of in-place material against laboratory specimens of same hammer on each side of specimen.
    2. Minimum acceptable density of in-place course material is 97% of the recorded laboratory specimen density.

REGULATORY REQUIREMENTS

A. Comply with applicable local standards, codes and ordinances for paving work on public property.

TESTS

A. Testing and analysis of asphaltic mix will be performed under provisions of Division 1 of the Specifications.

SUBMITTALS

A. Samples: Provide samples of materials for laboratory testing and job-mix design as required by Owner's Representative.
B. Certificates:
    1. Provide certificates, in lieu of laboratory test reports.
    2. Certify that materials comply with specification requirements.
    3. Signed by asphaltic concrete producer and Contractor.

ENVIRONMENTAL REQUIREMENTS

A. Do not place asphalt when the base surface temperature is less than 40°F.
B. Do not apply materials when substrate is wet or contains sufficient moisture to prevent uniform distribution and proper penetration.

PART 2 – PRODUCTS

MATERIALS

A. Tack Coat: Emulsified asphalt SS-1, diluted with equal parts of water.
B. Asphalt Cement: ASTM D946, 60-70 penetration grade.
C. Stone Base: Grading D pug mill mix in accordance with NMDOT.
    1. Coarse aggregate: ASTM D692.
    2. Fine aggregate: ASTM D1073.
D. Mineral Filler: Shall meet the requirements of AASHTO M17 finely ground particles of limestone, hydrated lime, Portland cement, or other approved mineral dust, free from foreign matter.

ASPHALT PAVING MIX

A. Use dry materials to avoid foaming. Mix uniformly.
B. Mix designation: State Highway Specification Sections as follows:
    1. Asphaltic Concrete Surface Course: Section 404
    2. Binder Course: Section 404
C. The pavement shall be constructed in accordance with Sections 407 and 303 of the State Highway Specifications.

PART 3 – EXECUTION

INSPECTION

A. Verify compacted sub-grade is dry and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct. Beginning of installation means acceptance of substrate.

PREPARATION

A. Prepare mix materials and place of deposit in accordance with referenced state highway specifications.
B. Tack Coat:
   1. Apply to contact surfaces of concrete items which abut pavement.
   2. Apply to contact surfaces of existing asphalt or concrete pavement at the rate of .05 gal/sq. yd. of surface.
C. Frames of subsurface structures:
   1. Coat surfaces of new and existing frames with oil to prevent bond with asphalt paving.

   2. Set to be flush with finish surface and surround with a ring of compacted asphaltic concrete to one inch below top of frame. Adjust as required to meet paving.
   3. Provide temporary covers over openings until completion of rolling operations.

PLACING ASPHALT PAVEMENT

A. Place materials in accordance with referenced State Highway Specifications.
B. Place, spread, and strike-off to compacted thickness indicated with paving machine, except that inaccessible and small areas may be placed by hand.
C. Place topping course within 2 hours of placing and compacting binder course.
D. Compact pavement by rolling. Do not displace or extrude pavement from position. Hand compact area inaccessible to rolling equipment. 1. Average relative density: Minimum of 97%.
   2. Individual relative density: Minimum of 94%.
E. Develop rolling with consecutive passes to achieve even and smooth finish of uniform texture, without roller marks.
F. Make joints between successive days work, or between old and new pavements in accordance with referenced State Highway Specifications. Ensure a continuous bond is attained.

TOLERANCES

A. Flatness: ± ¼ inch measured with a 10 ft. straight edge.
B. Compacted scheduled thickness: ± ¼ inch of design thickness. Variation from true elevation: 0.05 feet.

PATCHING

A. Remove defective or deficient areas for full depth of course.

1. Cut sides parallel and perpendicular to direction of traffic with edges vertical.
2. Apply tack coat to exposed surfaces and place asphalt on prepared surfaces as specified above.

FIELD QUALITY CONTROL

A. Field inspection and testing will be performed as defined in Division 1 of the specifications.

PROTECTION

A. Immediately after placement, protect pavement from mechanical injury for 7 days.

B. Cover openings of substrate structures in paved area until permanent coverings are placed.

SCHEDULE OF PAVEMENT SECTIONS

A. Place and compact materials to the thickness called for on the Drawings.

32 01 90.16 Amending Soils

1. All soils must be amended per the Soil Preparation specifications maintained by UNM PPD Grounds & Landscaping. Copies may be obtained by contacting that division at (505) 277-2421.

DIVISION 33 – UTILITIES

33 01 00 Operation and Maintenance of Utilities

1. If utility shutdowns are required, the contractor shall obtain approval not less than 10 days prior.
2. Indicate that existing utilities must be disconnected and capped at locations identified on the drawings or removed. Record actual disconnection locations and abandoned lines on as-built drawings.
3. Spotting and locating existing utilities and underground installations shall comply with the NMSA 1978 (New Mexico Excavation Law) and the requirements of the UNM General Conditions. In addition to New Mexico One-Call compliance, add noting that utility locating is also the responsibility of contractor and is delegated by the documents. Also, utility locating by other parties does not relieve the contractor of this responsibility. Be sure these requirements are clearly indicated.

(These requirements are specifically addressed in UNM's General Conditions for the Contract for the Construction.) Verify with UNM that the Project Manual and drawings are clear and do not issue conflicting requirements.

4. Buildings shall be sited to minimize disruption to UNM-owned utilities and especially to avoid compromising the utility tunnels.

33 06 00 Schedules for Utilities

1. Proper pipe-bedding material shall be specified. Bed pipe continuously along entire length, scoop out for bells & fittings. Proper depth of backfill around pipe shall be specified. Backfill to be compacted beneath pipe haunches before additional backfill is added
2. Check to make sure that new utility lines are in compliance with UNM Utility Master Plans.
3. Clearly indicate the utility point of connection to the building, including size, routing and shutoff valves where appropriate for steam and condensate, chilled water, domestic water, fire sprinkler service, fire department siamese connections, sanitary sewer, storm sewer, etc.
4. Specify that an approved warning tape shall be installed above utilities, twelve (12") inches beneath finished grade. Specify that a magnetic traceable tracer wire shall be provided with appropriate test connection points for all wet lines.
5. All new underground utilities shall have a brass cap placed above all bends and tees and for long runs will be placed every 100 feet. The brass cap shall note the utility and have arrows showing where the utilities lines are going.

33 09 00 Instrumentation and Control for Utilities

1. Building boundary metering of all utility demand and consumption is required. Monitoring of both instantaneous and cumulative consumption shall be available through the building DDC system. In selected cases, metering and monitoring of individual HVAC units may be required, as well as electrical loads by type of load (HVAC, lighting, plug loads, etc.). LEED M&V credit requirements may apply, depending upon the project.
2. Refer to the UNM-PPD Utilities Division Metering Equipment Guideline for detailed metering specifications. Copies may be obtained by contacting that division at (505) 277-1142.

33 10 00 Water Utilities

All design calculations excluding fire suppression systems shall be based on a system static pressure of 65 psi. The designer must review the most current UNM Utility Map for the appropriate connection points and necessary extensions to provide service to their project.

33 11 00 Water Utility Distribution Piping

1. Specify lined ductile iron pipe (DIP) for domestic supply piping.
2. Pipe to be delivered with factory-installed end caps, which remain in place until pipe is installed and until necessary to remove to install next piece of pipe. No damaged components are to be installed. Pipe lining to be intact.
3. Plastic piping is to be protected from sunlight
4. Only mechanical joint restraint fittings and valves are acceptable. No joint restraint gaskets accepted
5. Corrosion protective encasement for direct-buried piping (PE film) is required
6. Specify non-rising stem, resilient seat, mechanical joint gate valves, 250 psig
7. Specify tees, not tapping sleeves. Note: Hot taps permitted only with prior approval of UNM PPD Engineering.
8. Bury valves four (4') feet below grade so that valve stem extensions are avoided.
9. Valves and stems must be in a City of Albuquerque specified valve box.
10. Conduct piping pressure tests before joints are covered. Pressure test piping at not less than 1 ½ times working pressure for 2 hours. Piping pressure tests to be witnessed and signed off on by the designated construction observer. This data must be included in the project close-out documents.

33 11 19 Fire Suppression Utility Water Distribution Piping

1. All design calculations shall be based on a system static pressure up stream of the backflow preventer of 65 psi.
2. Specify lined ductile iron pipe (DIP) for fire supply piping Corrosion protective encasement for direct-buried piping (PE film) is required.
3. Specify non-rising stem, resilient seat, mechanical joint gate valves, 250 psig.
4. Specify tees, not tapping sleeves. Note: Hot taps permitted only with prior approval of UNM PPD Engineering.
5. All normally unoccupied spaces will be protected with a smoke detector and sprinkler head regardless of the protection requirements of the rest of the building. Both systems will be connected to the buildings fire alarm system. A heat detector (no higher than 135^{o}) may be substituted where appropriate and with approval, i.e. steam production from the custodial sink, areas with blowing dust, etc.

6. Drains and test connections shall be grouped in a reasonable fashion for ease of testing and control of discharged water. Hose connections will be provided.

33 12 00 Water Utility Distribution Equipment

33 12 13 Water Service Connections

Coordinate connection to the existing water main with the PPD Utilities Division or City of Albuquerque, as appropriate.

33 12 13.13 Water Supply Backflow Preventer Assemblies

1. Backflow preventers shall be installed where needed. Provide required hot box backflow protection for domestic, fire and irrigation water as required.

2. Provide parallel building backflow preventers sized for ½ design flow to facilitate maintenance.

33 12 16 Water Utility Distribution Valves

1. All connections to the UNM domestic water distribution system shall be equipped with 3 AWWA (American Water Works Association) valves: one on the branch and two on the distribution pipeline, one either side of the branch.

2. All intersections on the UNM domestic water distribution system shall be equipped with an AWWA valve on each branch.

33 12 33 Water Utility Metering

Indicate a building water meter and location. Be sure it is coordinated with the building EMS and PPD Utility Division specifications. Refer to the UNM-PPD Utilities Division Metering Equipment Guideline for detailed metering specifications.

33 12 19 Water Utility Distribution Fire Hydrants

1. Specify fire hydrant location and verify adequate access.
2. Ensure that Fire Department Siamese connections are properly located and accessible.

33 13 00 Disinfecting of Water Utility Distribution

NMED Certified Technicians must supervise the sanitizing of new connections to UNM's drinking water utility system. Use AWWA C651 procedure or alternate for purging & disinfection BAC-T tests by independent labs.

33 30 00 Sanitary Sewerage Utilities

Provide manholes at all direction changes.

33 31 00 Sanitary Utility Sewerage Piping

33 40 00 Storm Drainage Utilities

1. All projects must include a drawing indicating existing conditions. Contour lines must be included with flow areas and locate and call-out all drainage infrastructures.
2. On a separate drawing the proposed improvements must be shown with revised contour lines and flow arrows. The drawing should show all new infrastructure and indicate how that infrastructure will connect to existing infrastructure.
3. All drainage calculations shall be in accordance with the City of Albuquerque's DPM Section 22.2
4. All projects shall have a table on the proposed improvements must have a table illustrating the existing condition and the 20 and 100 year drainage calculations for the current situation and the proposed project.
5. Include all site surface drainage structures, inlets, etc. in the project.
6. Indicate the site surface drainage course(s). Provide adequate drainage away from the building: including but not limited to roof drains, landscaped areas, drive pads, sidewalks
7. Indicate required subsurface drainage: drop inlets, drain inlets, manholes, storm sewers, etc. Subsurface drainage should be outside the building structures foundations area of influence.
8. Indicate finished floor elevations relative to grade at building. Avoid setting elevations too low.
9. Indicate an adequate water-harvesting plan consisting of swales, retention facilities, volume control, overflow considerations, etc. Roof drains should direct water into plantings or be used for other beneficial uses whenever possible before discharge to the storm disposal system.
10. Indicate new and existing inverts and grades
11. Avoid situations requiring a sump pump
12. Provide manholes at all direction changes
13. Use of sump pump should be the alternative of last resort. In order to use this approach a life cycle cost estimate of a sump pump and any other alternative

must be completed. If the sump pump life cycle cost is not the lowest cost to UNM they may not be used.

33 50 00 Fuel Distribution Utilities

33 51 00 Natural-Gas Distribution

1. Connect to UNM system if at all possible
2. Avoid installing new gas piping in the utility tunnel.
3. Piping and shut-offs to comply with code.

33 51 33 Natural-Gas Metering

Refer to the UNM-PPD Utilities Division Metering Equipment Guideline for detailed metering specifications.

33 60 00 Hydronic and Steam Energy Utilities

33 61 00 Hydronic Energy Distribution

1. Chilled water shall be supplied at 42°F. and shall return at not less than 58°F.
2. System chilled water pressure is adequate to satisfy most building circulation requirements (no building chilled water pumps are required).
3. Winter months' cooling requirements must be able to be met with 50°F chilled water supply as the central plant hydronic economizer cycle is used.
4. All connections to the UNM chilled water distribution system shall be equipped with 3 valves for both supply and return: one on the branch and two on the distribution pipeline, one either side of the branch.
5. Specify Tees, not tapping sleeves. Note: Hot taps permitted only with prior approval of UNM PPD Engineering.
5. All intersections on the UNM chilled water distribution system shall be equipped with an AWWA valve on each branch.

33 61 33 Hydronic Energy Distribution Metering

Refer to the UNM-PPD Utilities Division Metering Equipment Guideline for detailed metering specifications.

33 63 00 Steam Energy Distribution

Steam shall be supplied to buildings at a pressure of 45 psig. However, the pressure reducing station shall accommodate (with adjustment) future supply pressures up to 110 psig. Higher pressure steam for autoclaves (125psig) is no longer available.

33 63 33 Steam Energy Distribution Metering

Refer to the UNM-PPD Utilities Division Metering Equipment Guideline for detailed metering specifications.

33 70 00 Electrical Utilities

1. Identify the location of primary pad-mount switch and pad-mount transformer.
2. Ensure that the locations are suitable for maintenance and minimizes impact on appearance.
3. Provide adequate working clearances, access and drainage.
4. An enclosure shall typically not be provided, except where desired for aesthetic reasons.
5. Pad-mount transformer(s) shall have 12.47 kV delta-wye connection. Wye-Wye connections shall not be permitted. Transformers will be OFCI, and paid for by the project.
6. Pad-mount primary switches shall be 12.47kV, OFCI, and paid for by the project.
7. Specify that contractors are to provide feed-thru bushing inserts, elbow connections and elbow surge arresters for OFCI transformers.
8. Spare conduit stubout(s) shall be indicated.
9. Primary equipment designation(s) shall be obtained from UNM PPD Engineering and shown correctly
10. Power connection points shall be identified, both at manholes and building.
11. UNM has a underground dual-radial 12.47kV primary electrical distribution system. Two 500kcmil, primary circuits and 5” conduits shall be specified to new switches from the nearest existing manholes. Additionally, a 2” empty conduit system shall be provided throughout the B circuit manholes and to primary switches for future SCADA. Manholes shall be provided where needed.
12. A #2 primary circuit in 4” conduit shall be provided from a switch to each transformer.
13. Bollards shall be provided where required to protect switches and transformers.
14. A single perimeter ground counterpoise shall be detailed for transformer and switch.
15. If appropriate, a perimeter ground counterpoise shall be detailed for building and properly interconnected.
16. Power and alarm conduit and wiring to sprinkler controls, hot boxes and backflow preventers shall be indicated.

17. Paint color of exterior equipment and devices shall be suitable for environment, (i.e., match building colors for exposed devices). Factory "Desert Tan" finish will be provided on OFCI transformers and primary switches.
18. PIV and supervisory tamper switch locations shown shall be along with tie to fire alarm system.

33 71 00 Electrical Utility Transmission and Distribution

33 71 19 Electrical Underground Ducts and Manholes

1. In all PVC conduit/ductbank runs, all bends over 30 degrees and all stub-ups shall be in wrapped rigid conduit and properly grounded. 90 degree bends shall be sweep (large radius) elbows.
2. PVC conduit/ductbank runs shall transition to wrapped rigid conduit at entries into manholes and buildings. Associated ductbanks shall be doweled into manholes and basement building walls. Link-Seals shall be used to seal conduit entries into building basements.
3. A 4/0 bare copper ground conductor shall be provided in all electrical and telecommunications ductbanks, and shall ring the perimeter of each manhole and pullbox, and terminate at primary switches.
4. A 2" empty conduit shall be provided from the existing B circuit manhole to the new primary switch (for future SCADA).
5. Removal of abandoned conduit that is underground must be indicated.
6. Coordinate with UNM-PPD to determine the extent of removal work.

33 71 73 Electrical Utility Services

33 71 73.33 Electric Meters

1. An electrical meter shall be provided at the main electrical service equipment. The meter shall be an EI/G Shark 200 v5, with Ethernet card.
2. More than one electric meter may be required, depending upon the number of electrical services to the building, and possibly for tenant metering. Exact requirements shall be reviewed and approved by UNM PPD.
3. Meter(s) must be able to be read remotely by UNM personnel. The meter shall be connected to the Building Utilities Monitoring Panel (BUMP), if one is required to be provided for the building. Otherwise, the meter shall be furnished with an Ethernet communications card and connected to a LAN outlet.
4. Refer to the UNM-PPD Utilities Division Metering Equipment Guideline for further metering specifications.

33 73 00 Utility Transformers

If the transformer contains a secondary CB, appropriate modifications to neutrals and grounds shall be specified.

33 73 13 Liquid-Filled Utility Transformers

New OFCI pad-mount transformers will be supplied filled with natural ester less flammable liquid (LFL). The associated project will need to fund this equipment cost.

33 77 00 Medium-Voltage Utility Switchgear and Protection Devices

Pad-mount primary electric switches will be OFCI, and typically 4-way (2-in, 2-out). If a different configuration is anticipated to be required, discuss with PPD Engineering. The associated project will need to fund this equipment cost.

33 79 00 Site Grounding

Only approved exothermic or compression type ground connections shall be specified. UNM prefers compression type connections for all connections except those made to ground rods.

33 79 93 Site Lightning Protection

1. If system is desired by UNM, based upon importance of the building and/or hazard, it must be shown.
2. If system is provided, then certification is required. Specify whether UL or LPI certification is required.

33 80 00 Communications Utilities

Please refer to the UNM IT Design Guidelines and Guide Specifications available at http://it.unm.edu/communications/designguidelines/ for complete specifications pursuant to this section. The items included herein are only intended as a partial summary and shall not be considered to supersede anything in the IT Design Guidelines.

33 81 00 Communications Structures

33 81 26 Communication Underground Ducts, Manholes and Handholes

1. Telecom ductbank and manholes/pullboxes shall be indicated.

2. PVC conduit/ductbank runs shall transition to wrapped rigid conduit at entries into manholes/pullboxes and buildings. Associates ductbanks shall be doweled into manholes and basement building walls. Link-Seals shall be used to seal conduit entries into building basements.
3. A 4/0 bare copper ground conductor shall be provided in all telecommunications ductbanks, and shall ring the perimeter of each manhole and pullbox.
4. Fiberglass manholes/handleholes are not permitted. All manholes shall have a 36" round steel lid with chimney. See UNM IT Design Guidelines for further details.

33 82 00 Communications Distribution

1. Telephone service tie-in point shall be shown and the location coordinated with UNM IT.
2. Data service tie-in point shall be shown and the location coordinated with UNM IT.
3. Conduit stubouts into building shall be shown.
4. Cable TV service tie-in point shall be shown, if desired or required.

DIVISION 40 – PROCESS INTEGRATION

Combustion Equipment - Provide SRS with manufacturer specifications, including air emission rates, at least 4 months before construction to allow time to obtain the required air quality permit prior to equipment installation.