PENNSTATE

Office of Physical Plant OPP

Design and Construction
Design Phase Deliverables

Notes:

1. **The Architect or Engineer of record shall submit this document along with the deliverables for the project at the end of each design phase for Owner review. The status of each item shall be indicated, with a check mark meaning the item has been submitted. For any item not being submitted, the Architect or Engineer shall provide justification to the Project Leader.**

2. **Each item required in the previous phase shall be further developed and submitted as part of the subsequent phases. In other words, Schematic Phase items will be re-submitted, further developed, as part of the Design Development Phase and likewise the Design Development Phase and Construction Document Phase. In most larger capital projects PSU will require a 50% Construction Document review in which case deliverables for the construction document phase shall be submitted and be at least 50% complete.**

SCHEMATIC PHASE	DESIGN DEVELOPMENT PHASE	CONSTRUCTION DOCUMENT PHASE
GENERAL DESCRIPTION		
__1. Scope of work narrative __2. Comparison of capacities i.e. ft2. Programmed space vs. Schematic Phase ft2. Including building efficiency calculations __3. List of applicable building codes __4. Building code review describing means of compliance for major code issues and building systems __5. List of anticipated variance requests __6. Anticipated building and space occupancy schedules __7. Life safety egress plans with identification of security and access points __8. LEED certification goal for the building __9. Review of OPR and delivery of Basis Design. Must include LEED checklist __10. Utility Demand Consumption Form __11. Verification statement indicating the design complies with the University goal to "balance program needs, innovation, modernization, preservation, and total cost of ownership to promote design excellence" __12. Municipal zoning and Land Development review __13. Listing of utility provider __14. Original of DEP Post Guard mailer requesting appropriate planning module for sanitary sewer connections to be submitted to DEP by PSU Eng. Services	__1. Description of Construction Phasing __2. Description of any proposed occupancy within the construction area __3. Description of water and vapor barrier characteristics of the roof and exterior wall construction __4. Schematic Phase Review Comments and Responses. Unresolved items shall be highlighted __5. Updated Utility Demand Consumption form __6. Listing of Design Criteria/Concepts which do not comply with PSU Design Guidelines __7. Initial Energy Modeling per 01 80 00 PERFORMANCE REQUIREMENTS __8. Complete Planning module submitted to Engineering Services for forwarding to municipality (Applies to buildings serviced by PSU utilities, for non-PSU service the Architect or Engineer must complete the appropriate municipal application and submit to PSU Engineering services)	__1. Documentation on drawings as required by building codes to show allowable maximum number of people in each room __2. List of all code variances on the document cover sheet __3. If multiple bid packages provide a clear indication of the scope of each release __4. Identification of construction phasing __5. Completed L& I building Permit for signature by PSU __6. Design Development Phase Design Review comments and responses __7. Updated List of Design Criteria/Concepts/Details etc. which do not comply with PSU Design Guidelines __8. Final Energy Modeling per 01 80 00 PERFORMANCE REQUIREMENTS

SCHEMATIC PHASE	DESIGN DEVELOPMENT PHASE	CONSTRUCTION DOCUMENT PHASE
SPECIFICATION		
__1. System and material narrative description __2. List of anticipated divisions and sections	__1. Outline or preliminary specifications indicating project specific features of major equipment as well as component materials, e.g. "welded Schedule 40 steel pipe, quarter sawn oak, etc. w/ same number section as the specifications __2. Preliminary List of sole source specified items __3. Track changes on the document to clarify intent	__1. Complete specification including front end documents __2. List of items which are sole-sourced or dual sourced __3. Indication of proposed sequence of operations for all electrically monitored and controlled door hardware sets. Must include schematic wiring diagram for each location
SITE		
__1. Site Plans to include the following: __a. Existing Conditions (all inclusive) __b. Demolition __c. Building outlines __d. Future Expansion __e. Site Entrance __f. Roads and Driveways __g. Parking Locations, including those required by Transportation Services, Operations Service Vehicles, special User needs, and ADA spaces as determined by Transportation Services __h. Loading Dock and Service Entrance Locations with trash compactor access route identified and all service vehicle and janitorial access shown __i. Bus Stop and Shelter if required __j. Waste and recycling collection locations __k. Walkway locations __l. Stairway locations __m. Emergency Telephone Locations __n. Site utilities __o. Emergency Vehicle Access showing turnarounds, width, code compliance verification, fire dept. connection point __p. Security during construction	__1. General Dimensions & elevations __2. Permanent Exterior Signage __3. Parking, Roadway plans and elevations __4. Vehicular and pedestrian traffic controls __5. Grading Plan(s) __6. Site Lighting plans, simulations. Specifications, equipment cut sheets, and photometrics __7. Conceptual details of site fixtures and equipment __8. Utility Plans, elevations, & details, for local governing agency approval __9. Soil erosion and sedimentation control plan for both construction and post occupancy __10. Service Vehicle Parking locations	__1. Final Limit of contract __2. Area Traffic plan if major walkways and roadways are impacted __3. Site Development phasing plan __4. Construction site access __5. Staging Area __6. Construction Signage __7. Site details including hardscape __8. Profiles for underground utilities __9. Pipe Sizes __10. Connection Details __11. Local Government review comments on site/utilities etc.

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__2. Preliminary grading plan __3. Stormwater management Plan __4. Preliminary Site Lighting Plan __5. Site Logistics Plan i.e. Contractor mobilization area, preliminary limit of contract, contractor access and site __6. Verification of need for Penn DOT Highway Occupancy Permit		
LANDSCAPING		
__1. Existing Conditions __2. Landscaping Concept __3. Existing Irrigation	__1. Planting Plan __2. Irrigation Plan	__1. Protection of existing trees and significant plantings during construction __2. Soil Preparation and Planting Specifications __3. Guying Diagrams __4. Piping Diagrams __5. Pipe Sizes __6. Landscape Irrigation Details and legends
STRUCTURAL		
__1. Structural schematic plans __2. Written description, proposed materials, foundation types, design criteria, design loads	__1. Foundation Plan __2. Typical Floor Framing Plan __3. Framing plans at unique features __4. Main member sizes __5. Structural Sections	__1. Definition of Control Joints __2. Beam Column and Slab Schedules __3. M/E housekeeping pads __4. Foundation details __5. Structural Details __6. Structural Notes __7. Structural Calculations
BUILDING EXTERIOR ENVELOPE		
__1. Typical elevations __2. Fenestration Layout (indicate % glass) __3. Material designations __4. Overall building cross sections __5. Roof layout __6. Perspectives __7. Renderings for administrative and Presidents review as directed by Campus Planning and Design	__1. All building elevations w/ dimensioned height __2. Typical Wall Sections __3. Parapet and coping details __4. Roof and drainage plan __5. Exterior Door Details __6. Typical Window Details __7. Expansion Joint Locations __8. Large Scale building cross sections	__1. Roof details __2. Exterior Details __3. Flashing Details __4. Control Joint definition and details

SCHEMATIC PHASE	DESIGN DEVELOPMENT PHASE	CONSTRUCTION DOCUMENT PHASE
__8. Exterior Building signage: note that renderings for BOT approval must reflect approved sign design and placement __9. Building Envelope Performance Compliance Report		
BUILDING INTERIOR		
__1. Building Floor Plans __2. Demolition Plans if any. __3. Proposed room numbering scheme to comply with PSU standards __4. Area use identification and area in ft2. __5. Volume analysis __6. Mechanical Rooms, electrical and other service closets and rooms to provide ample shaft and replacement pathways per 01 05 05 Space Planning __7. Flexibility for expansion & alterations __8. Preliminary layout of major spaces with fixed equipment	__1. All floor plans __2. Enlarged plans at elevation changes such as stairs __3. Enlarge toilet room plans/Janitors Closets, and Janitors Breakrooms and custodial equipment storage rooms __4. Reflected ceiling plans __5. Wall types, fire ratings, smoke control zones __6. Plan description to address existing hazardous materials __7. Fixed seating layouts __8. Defined seating, serving & kitchen facilities __9. Equipment and furniture layouts __10. Important interior elevations and start of all interior elevations __11. Details of fixed equipment __12. Preliminary finish schedule __13. Preliminary door schedule __14. Informational signage. (Refer to PSU standards for sign policies) __15. Attic Stock Storage Location	__1. Dimensioned floor plans __2. Enlarge plans __3. Partition details __4. Interior Details __5. Interior elevations __6. Finish schedules __7. Door & hardware schedules __8. Room signage __9. Schedule of proposed moveable equipment not indicated on the contract documents __10. Schedule of lab fixtures if applicable
ELEVATORS		
__1. Elevator Location __2. Equipment room location __3. Basis of Design Description __4. Emergency Power Determination	__1. Elevator shaft location __2. Equipment description __3. Elevator Phone Installation Design	__1. Dimensioned plans __2. Description of shaft sump pits __3. Car and equipment support details __4. Description of controls and fixtures __5. Door and Frame details __6. Interior details including lighting (cab and lobby)

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ACCESSIBILITY REQUIREMENTS		
__1. Accessible entrance locations __2. PO door locations __3. Areas of Refuge	__1. Description of POD Devices per the PSU manual __2. Updated verification design is in compliance with ADAAG and PSU requirements	
HVAC		
__1. Mechanical Legend. Must use OPP Acronym List __2. Basis of Design for all systems including but not limited to strategies to meet HVAC portion of Basis of Design document in accordance with 23 00 01 Owner General Requirements and Design Intent __3. Initial "Shoebox" Building Envelope Energy Calculations, for Envelope Performance Compliance Report __4. Initial ASHRAE 55 Thermal Comfort Analysis – documenting integrated thermal envelope and HVAC design __5. One line diagrams for each air, hydronic, steam, condensate, and all other materials required to describe the fundamental concept for all mechanical systems __6. Indication of the amount of redundancy for all major pieces of mechanical equipment __7. Schematic plans, sections, elevations showing major equipment locations, and air intake and discharge locations __8. Gross HVAC zoning and typical individual space zoning and operating schedules of the zoned areas. Special occupancy zones such as College server rooms and Telecommunications and Networking Server rooms. Refer to 23 00 01 Owner General Requirements and Design Intent	__1. Preliminary calculations and load summaries with breakdowns for major areas, subsystems and equipment loads __2. Systems design verification using Life Cycle costing analysis methods __3. Overall building airflow diagram showing interrelationships of air handlers exhaust fans, duct risers, and duct mains and primary dampers __4. Overall building hydronic and steam system diagrams showing interrelationship of main heating/cooling plant equipment or central utility source, heat exchangers, pumps, pipe risers and mains and primary isolation and control valves __5. Locations of air control devices i.e. damper locations along with shaft access requirements __6. Duct layout for typical spaces. Pay particular attention to Classroom design requirements and for air distribution and noise levels __7. Equipment schedules for major pieces of equipment __8. Equipment locations with enlarged mechanical room plans, sections, and elevations. Documents shall show required maintenance and service requirements __9. Indication of typical locations of fire dampers, smoke dampers, combination F/S dampers, and air control devices with access provisions __10. Control diagrams for all mechanical and plumbing systems	__1. Floor plans with all components and required service access areas drawn to actual scale. Indicate duct sizes and air flow quantities relative to each room including CFM in and out of all doors __2. Detailed piping and duct design with all sizes shown, and expansion compensation and structural support requirements coordinated __3. Location of control panels, transformers, lab air valves, volume control boxes, thermostats, and control valves __4. Detailed floor plans of mechanical rooms with all components and required service access areas __5. Enlarged plans and sections showing coordination of systems in constricted areas __6. Equipment details with structural support details and vibrations isolation methods __7. Penetration and sleeve details __8. Space zoning diagram by system __9. Connection to fire alarm and campus control and security systems __10. Installation details __11. Final equipment schedules __12. Duct construction schedule and material pressure class __13. Detailed control drawings, including clear differentiation of trade responsibility for control power, fire and control power wiring

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__9. Analysis of existing utilities and or HVAC infrastructure with summary listing of required upgrades to support new work __10. Initial Ashrae 55 Thermal Comfort Review __11. Estimated Utility Demand Consumption Data Sheet __12. Initial Draft of PSU "Environmental Systems Criteria Matrix"	__11. Outline of major control sequences of operation __12. ME smoke control schemes __13. Preliminary large scale mech. Room plans with required service access areas show to scale __14. Meter locations __15. Sound and vibration control analysis, attenuation requirements, and methods for control	__14. Detailed sequence of operations including specific setpoints for all control loops including connection to fire alarm, campus control and security systems __15. Duct construction schedule and material pressure class __16. Design Calculations __17. Final Energy modeling __18. Final HVAC component of Energy Performance Compliance Report __19. Final HVAC Sound and Vibrations provisions with calculations documenting compliance with the design criteria __20. Final Utility Demand and Consumption report
PLUMBING & PIPING		
__1. Plumbing legend in accordance with PSU Equipment Acronym List __2. Define water use efficiency measures that comply with 01 80 00 PERFORMANCE REQUIREMENTS __3. Listing of recommended redundancy requirements __4. One line riser diagram for every plumbing system, i.e. domestic, sanitary, storm, gas, RO/DI, vacuum, processed water and other materials to describe the fundamental concept for all plumbing systems __5. Main water supply, storm and sanitary leads __6. Major equipment locations __7. Restroom locations __8. Listing of any special sanitary waste products	__1. Updated design criteria for each plumbing system including set points water quality levels etc. __2. Preliminary floor plans of mechanical rooms with all components and service access shown to scale __3. Preliminary piping plans with indication of required service access areas __4. Meter locations. (PSU will provide all meters. Submit size requirements to the Project Manager __5. Backflow prevention locations __6. Fixture schedules __7. Equipment schedules (major equipment) __8. Determine need for pretreatment of sanitary waste	__1. Floor plans with all components and required service access __2. Detailed piping design with all pipe sizes indicated __3. Foundation drain layout __4. Typical plumbing details including structural support requirements __5. Equipment piping details __6. Penetration and sleeve details __7. Water riser diagram, including assumed fixture counts per floor connection __8. Waste and vent riser diagrams including assumed fixture counts per floor connection __9. Design calculations

SCHEMATIC PHASE	DESIGN DEVELOPMENT PHASE	CONSTRUCTION DOCUMENT PHASE
FIRE PROTECTION (MECHANICAL)		
__1. Fire Protection Legend in accordance with the OPP Equipment Acronym List __2. One line diagrams for each fire protection system and other materials as required to describe the fundamental design concept for all fire protection systems __3. Report documenting adequacy of serving utility. Contact the Project Manager to obtain flow measurements __4. Location of main utility connection __5. Fire pump need assessment, coordinated with OPP/Environmental Health and Safety, Fire Protection and & Prevention __6. Location of entrance and sprinkler piping layout __7. Proposed locations of fire department connections and test headers	__1. Preliminary piping plans __2. Preliminary floor plans of mechanical rooms with all components and required service access drawn to scale	__1. Fire protection plans with header and riser layout with indication of required services access area __2. Detailed piping design with major pipe sizes indicated __3. Location of all sprinkler zone valves, drains, and hose connection points __4. Critical zone calculation area __5. Fire protection service entrance details __6. Typical sprinkler installation details including structural support details __7. Penetration details __8. Design calculations
ELECTRICAL POWER DISTRIBUTION		
__1. Electrical demolition __2. One line diagrams with equipment ratings __3. Manhole duct bank and building entry locations __4. Exterior equipment locations __5. Substation, generator, and electric room locations __6. Substation generator and ATS descriptions __7. Preliminary substation and generator room plans __8. Panel numbering schemes __9. Lightning protection analysis __10. Special systems and equipment listings	__1. Manhole, ductbank, and building entry plans and details __2. Normal power riser diagram with circuit breaker, fuse, conduit, and wire sizes and updated one line diagram __3. Emergency power riser diagram with circuit breaker, fuse, conduit, and wire sizes __4. Grounding riser diagram __5. Preliminary fault current and coordination studies __6. Substation standard details __7. List of equipment proposed to be on emergency or standby power __8. Electrical Load calculations __9. Preliminary panel schedules __10. Typical Panel arc flash and color code labels	__1. Details of Power Service to building __2. Power plans, including primary cable, raceways, feeder conduits, electrical loads, duplex and special receptacles and branch circuitry design __3. Emergency Power system plans. Controls, and details __4. Connections to other building systems including fire alarm systems and HVAC; systems, BAS systems and utility LAN __5. Details of non-standard electrical installations __6. Conduit and wire sizes for services, feeders, and special branch circuits __7. Notes identifying locations of separate and shared neutrals __8. Switchgear and MCC elevations

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	__11. Electrical equipment location plans __12. Typical electrical outlet location plans __13. Plan for temporary power during construction	__9. Grounding details __10. Roof and penetration details __11. Settings for Contractor furnished equipment
LIGHTING		
__1. Electrical Symbols Legend __2. General Drawing Notes __3. Proposed light levels __4. Fixture, Lamp and controls description __5. Preliminary interior lighting plans __6. Preliminary Outdoor Lighting Plans	__1. Typical interior lighting and control plans __2. Outdoor lighting and control plans __3. Fixture types and schedules __4. Control systems and control device descriptions __5. Typical photometric calculations __6. Dimming, daylighting with calculations and low voltage control zones documentation __7. Proposed lighting fixture catalog cuts for review by Engineering Services __8. Energy **Code Calculations**	__1. Interior and exterior lighting plans including control systems and devices, lighting panels, switching and circuiting __2. Lighting control systems detailed sequences of operations __3. Lighting control systems schematics and wiring diagrams __4. Installation details including structural support details __5. Normal lighting photometric calculations __6. Emergency lighting photometrics __7. General notes on conduit and wire sizes for lighting branch circuits
FIRE ALARM		
__1. System Description. (PSU has a proprietary specification as outlined in the Design Guidelines.) __2. FA panel locations __3. Preliminary FA device and appliance location plans	__1. Riser Diagram __2. FA panel, device, and appliance location plans	__1. Detailed FA panel, device and appliance location plans including duct detectors, fire smoke dampers, sprinkler flow and tamper switches, monitor and control modules, door hold opens, door lock releases __2. Strobe light candela ratings __3. General notes on conduit and wire sizes __4. Details of connections to HVAC, fire pump, fire suppression, door hold open and door lock systems __5. Detailed sequences of operations
COMMUNICATIONS (INCLUDING VOICE, DATA, AND VIDEO SYSTEMS)		
__1. Manhole ductbank and building entry locations __2. Entry locations and TNS space location plan __3. Riser diagram __4. Preliminary cable tray plans	__1. Backboard locations in TNS spaces __2. Raceway and grounding riser diagrams __3. Conduit and Cable tray layout and sizes __4. Material cut sheets	__1. Detailed voice data and outlet locations __2. Details of service to the building __3. Floor box schedule __4. Conduit, outlet box, and floor box installation details

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__5. Summary of Access and security needs	__5. List of equipment and preliminary layout of telecomm spaces __6. Typical voice data and video outlet locations __7. Emergency phone locations and type __8. Courtesy phone locations	__5. Power outlet locations in the TNS spaces __6. Final Equipment rack location in the TNS spaces
SECURITY (Access Controls Surveillance and Security Alarms)		
__1. System descriptions. Access Controls, Surveillance and Security Alarms __2. Panel Locations, rack and wall space requirements __3. Preliminary Device Location Plans __4. Narrative of Security Systems needs	__1. Riser Diagrams __2. Equipment location Plans __3. Electronic Security Equipment Closet Layout __4. Emergency Phone Locations and type	__1. Detailed equipment location plans __2. Equipment schedules (including all device specifications and electronic security system specifications) __3. Concealed and exposed raceways __4. Wiring Diagrams (Show quantity, typed, and splice and termination locations) __5. Installation Details (Must include field device installation details) __6. Detailed Sequences of Operations __7. Trade coordination diagrams showing clearly the responsibility of each trade contractor responsible for security system installation
A/V AND SPECIAL SYSTEMS		
__1. System Descriptions __2. Panel locations __3. Preliminary Device Locations	__1. Riser Diagrams __2. Equipment Locations __3. A/V Equipment location Plans	__1. Detailed equipment location plans __2. Equipment schedules __3. Wiring Diagrams __4. Installation details, including cabinets, hangers, and connection boxes __5. Detailed sequences of operations
COST		
__1. Cost Estimate, for CM projects a comparison between the Architects estimate and the CM's estimate	__1. Updated cost estimate	__1. Updated Cost Estimate

SCHEMATIC PHASE	DESIGN DEVELOPMENT PHASE	CONSTRUCTION DOCUMENT PHASE
NOTES		