DANE COUNTY DEPT. OF PUBLIC WORKS, HIGHWAY & TRANSPORTATION

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Public Works Engineering Division

ADDENDUM

FEBRUARY 13, 2020

ATTENTION ALL REQUEST FOR PROPOSAL (RFP) HOLDERS

RFP NO. 318028 - ADDENDUM NO. 1

JAIL CONSOLIDATION BUILDING COMMISSIONING CONSULTING SERVICES

PROPOSALS DUE: TUESDAY, FEBRUARY 20, 2020, 2:00 PM. DUE DATE AND TIME ARE NOT CHANGED BY THIS ADDENDUM.

This Addendum is issued to modify, explain or clarify the original Request for Proposal (RFP) and is hereby made a part of the RFP. Please attach this Addendum to the RFP.

PLEASE MAKE THE FOLLOWING CHANGES:

1. **Cover Page**
   Change: " **TUESDAY, FEBRUARY 20, 2020** ", to: " **THURSDAY, FEBRUARY 20, 2020** "

2. **Section 00 24 16**
   Page 2 - Item 1.F.3.: Delete the current paragraph & insert the following:
   " 3. Must have been responsible for the commissioning of at least three (3) projects of similar design scope and size of the Dane County Jail Consolidation project. "

   Page 2 - Item 3.A.1.:
   Change: " Signature Page, ... ", to: " Proposal Form, ... ".

   Pages 6 &7 - Tables 1 & 2: Delete the current tables & replace with new tables, issued with this Addendum.

3. **Section 00 52 98**
   Page 2 - Items 1.K.5) & 1.K.6): Delete the current paragraphs & insert the following:
   " 1.K.5. Not Used.

   1.K.6. Basis of Design / Design Concept / Schematic Design Report: a summary of the facility program, use, and functional requirements of the building with a detailed description of building design criteria, parameters, setpoints, concepts, decisions, and selections used to meet the COUNTY's goals. It serves as a basis for review, approval, and documentation of the design process used for all building systems. "

Page 3 - Item 2.A.3)a.: Delete first sentence & insert the following:

" The CPR is a summary of the basis of design, Schematic Design Report & the design concepts with facility programming written in simple, straightforward language suitable for a wide audience of facility users, Occupying Agency staff and design team members. "

Page 4 - Item 2.B.3): After this item, insert the following:

" 2.B.4) The CxP is responsible for the development and periodic updating of a Commissioning Plan throughout the project. The CxP solicits and incorporates periodic input from COUNTY, the Occupying Agency, A/E, CM and contractors in developing and updating the plan. The initial, or draft plan will be due at or before the Design Development Phase is complete, for review by COUNTY, the Occupying Agency, CM and A/E. Comments received in the review of this plan are to be incorporated into the next iteration of the plan. The plan is used to coordinate commissioning activities throughout the project. "

Page 4 - Item 2.C.1): Delete the current paragraph & insert the following:

" 2.C.1) Not Used. "

Page 4 - Item 2.C.3):

Change two references of: " A/E ", to: " CxP ".

Page 5 - Item 2.E.4)a.:

Change: " ... the submittal review the A/E edits the Functional Performance Test documents ...", to: " ... the submittal review the A/E verifies the Functional Performance Test documents ...".

Page 12 - Item 4.E.2):

Change: " ... ninety percent (80%) ... ", to: " ... ninety percent (90%) ... ".

PSA - Site Visits (Attachment A) - Second paragrapgh:

Change: " ... of two (2) times per week ... ", to: " ... of one (1) time per week ... ".

Change: " ... elements in process of being constructed must be performed. ", to: " ... elements in process of being constructed must be performed & field report issued. ".

PLEASE NOTE THE FOLLOWING CONSULTANT SUBMITTED QUESTIONS:

Q1. In the Tables 1 and 2, there are a lot of "check-boxes" that are unchecked. Should we just consider this a bullet list (with check boxes used as bullets) and assume that all the tasks / systems / equipment listed are to be included in the scope of work?

A1. Yes; all items on the list are in the scope of work. New tables are issued with this Addendum.

Q2. For 1.F.3 (*we are assuming this is the Scope of Proposals, Section 00 24 16, page 2*), what are most important to you: size, complexity, a mix of new and existing, type of work, system types, and/or facility type? I realize that ideally all would be best but it is unlikely we have projects that are exact matches in all these categories.

A2. If one was chosen it would be size, followed secondly by a mix of new and existing.

Q3. Could you point me to or share the document "Dane County Green Building Policy and LEED® design & construction techniques & guidelines" referenced in 2.B.1 (*we are assuming this is the Scope of Proposals, Section 00 24 16, page 2*)?

A3. The Policy is issued with this Addendum. There is no County-authored LEED design and construction techniques & guidelines document. It is a guideline or standard to follow.

Q4. Do you have an opinion on how often you want the construction meetings to take place?
A4. Construction phase meetings: assume weekly.

Q5. What is the security level of the current facilities and anticipated security level of future facilities?
A5. Three levels: minimum, medium & maximum.

Q6. Are any commissioning activities expected to take place within new or existing facilities that have "active" detention operations?
A6. Yes.

Q7. Estimate for the project area, systems, and / or phases in which on-site commissioning activities will require physical escort and / or coordination (e.g., scheduling) with escorts.
A7. We cannot estimate that at this time.

Q8. Construction phasing preliminary plan or goals / requirements of construction phasing.
A8. A phasing plan has not yet been developed but the existing PSB will be fully functional during construction.

Q9. In addition to typical Schematic Design documents:
a) Owner's Project Requirements (or County's plan for drafting an OPR, whether you are requesting assistance drafting; we have hosted OPR workshops in the past to accomplish this)
b) A/E Basis of Design documents
A9. The OPR is being modified by this Addendum & a BOD document is being issued with this Addendum.

Q10. Are items listed as 'requirements' and 'systems to be commissioned' part of the scope even though the check boxes aren't checked (this appears to be the public domain State of WI checklist that utilizes checkmarks that when the state uses this form they only check what they want)?
A10. Yes. Refer to A1.

Q11. Will there general lists and quantities of equipment / systems?
A11. A general list of <u>existing</u> equipment / systems is as follows. Additional quantities & details for the <u>new</u> building will not be provided.
- Chillers, cooling towers & chilled water system
- State of WI steam & condensate, heat exchangers & pumps for domestic & heating hot water systems
- Seven air handling units, multiple exhaust fans & associated ventilation systems
- Fire suppression system
- Water softening
- Domestic hot & cold water

Q12. Electronic Safety and Security goes to the granular level of prisoner retention or is it more general?
A12. More general.

Q13. Assuming energy (steam / CHW) comes from state operated CUPs?
A13. Steam: yes; CHW: no.

Q14. Your BAS, fire alarm contractor (whoever they might be) remain the same?
A14. Cannot say at this point.

Q15. The 70K SF of remodel on the existing PSB, is the remodel minor (moving some walls and zoning) or major (gut to the deck and all new MEP and walls)?
A15. There will be a mix of major & minor remodeling.

Q16. Can you please provide the Dane County Green Buildings Policy referenced in the RFP?
A16. See A3 above.

Q17. Scope of Work: Tables 1 and 2 on pages 6 and 7 of Section 00 24 16 of the Request for Proposals do not have any boxes checked. Can completed tables be provided in the Addendum?
A17. See A1 above. All items in the tables are to be provided in the scope of work.

Q18. Construction Phase Site Visits: Attachment A to the Sample Professional Services Agreement specifies a minimum of two site visits per week, which is more often than we typically expect. Should the proposed fee be based on two site visits per week throughout the January 2021-December 2025 estimated construction phase?
A18. No. Refer to the modification made in this Addendum.

Q19. Electronic Access Control is listed as a system to be tested.
A19. Correct; there is no question here.

Q20. Recognizing that LEED certification is <u>not</u> being perused, but that "LEED design & construction techniques & guidelines" are to be followed, which components related to commissioning are mandatory? What LEED requirements related to commissioning are we to include in the work? Will the building envelope commissioning include only the EAp1-fundamental for thermal envelope or will it also include EAc1-Option 2 Envelope Cx? If EAc1-Option 2 is required will the Cx be required to follow ASTM E2813 and/or NIBS Guideline 3-2012 or other standards? Would you specify which?
A20. There is no plan for this to be a LEED certified building. See A3 above. The remaining answers are to be determined.

Q21. Does food service equipment include the MEP system or also the food processing equipment (for example, steam tables, dishwashers, dry chemical fire suppression, etc.)?
A21. Yes.

Q22. Is the CxP to perform the Testing and Balancing or just to verify and review the TAB work?
A22. Just to verify and review the TAB work.

Q23. What, if any, selective sampling of terminal units will you permit? For example, what are the sampling rates for the following systems:
- Terminal equipment (unit heaters, cabinet heaters, VAVs, etc.),
- Plumbing systems (DHW, pumps, etc.),
- Building envelope systems (mockups, first in place, each façade, etc.),
- Emergency power systems,
- Life safety systems, and
- Each of the other systems listed

A23. We expect all major & minor equipment & systems to be commissioned, as listed in Table 2 of the Scopes of Proposals, Section 00 24 16. We are not looking to do selective sampling.

Q24. Is the CxP expected to perform NETA and or NECA testing of the electrical equipment or to confirm the testing is specified to be performed by the contractors or is this testing not required?

A24. We do not expect testing as a part of the commissioning process, but observation & verification. We may be open to adjusting the CxP scope if value can be justified & proven.

Q25. What is the scope Div. 27 & 28 commissioning? For example, what standards of testing should be followed for the electronic access control, video surveillance, and A/V systems?
A25. These details will need to be worked out with the Project Design Team.

Q26. Is there an OPR available for review? If so, would you share it? If there is currently no OPR, will there be an OPR development charrette? Will this be facilitated by the CxP or others?
A26. We are using the acronym CPR ("County" in place of "Owner"). There are attachments to this Addendum that detail the content of the CPR.

Q27. What specific Building Performance, Energy Use, or Sustainability services are you requesting from the CxP?
A27. Services are described in the Scopes of Proposals, Section 00 24 16 & the Commissioning Provider Professional Services Agreement, Section 00 52 98.

Q28. Is indoor Air Quality or Acoustical commissioning required? If so, would you specify what is required?
A28. If it is not in Table 2, it is not to be commissioned. We may be open to adjusting the CxP scope if value can be justified & proven.

Q29. Page 5, 1.B (*we are assuming this is the Scope of Proposals, Section 00 24 16, page 1, Item 1.B.*):
a) What is the anticipated scope of work (systems) for the 70,000 SF remodeling?
b) What systems will need commissioning related to that?
c) Any specific building envelope commission for the existing building?
A29.a) The existing systems were reviewed at the walk-through on Feb. 5, 2020. Please see A1 & A11 above. The total listing of new equipment & systems & existing equipment & systems to be replaced or retro-fitted is being finalized in the current Design Development Phase.
A29.b) See A29.a).
A29.c) No.

Q30. Page 6, 2.B.1 (*we are assuming this is the Scope of Proposals, Section 00 24 16, page 2, Item 2.B.1.*); please provide current "Dane County Green Building Policy and LEED design and construction techniques & guidelines" document.
A30. See A3 above.

Q31. Page 7, 3.A.4.e-g (*we are assuming this is the Scope of Proposals, Section 00 24 16, page 3, Item 3.A.4.e-g*):
a) Are we to include pricing for enclosure testing (estimated) and supply the information requested in e-g?
b) Are there preliminary specifications/drawings for a better understanding of enclosure testing requirements if yes to above?
A31.a) Yes.
A31.b) No.

If any additional information about this Addendum is needed, please call Todd Draper at 608/267-0119, draper@countyofdane.com.

Sincerely,
Todd Draper
Project Manager

Enclosures:
- Section 00 24 16 - Tables 1 & 2
- Dane County Green Building Policy
- Basis of Design Narrative - Nov 2018
- Schematic Design Report

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10. TABLE 1 - COMMISSIONING ACTIVITIES / SERVICES

The following activities correspond to Dane County's Commissioning Policy & Procedures that can be found in the *Commissioning Provider Professional Services Agreement*, which should be referenced for more detailed descriptions of the required services.

	REQUIREMENTS
Design Phase	
	Review Basis of Design documents to evaluate if construction documents meet Owner's Project Requirements and guidelines.
	Provide input to A/E for inclusion in the Construction Verification Checklists and Functional Performance Test forms into the Project Manual.
	Review preliminary design documents (Schematic Design & Design Development) to evaluate and comment on the design meeting the Owner's Project Requirements and project goals.
	Develop a Commissioning Plan identifying the commissioning team, procedures, system tests, test sampling, milestones and responsibilities.
	Review final design documents (Construction Documents) to ensure incorporation of review comments, elimination of construction ambiguities and completeness of the Construction Verification Checklists and Functional Performance Test Forms.
	Review Construction Documents for inclusion of Dane County & CxP comments.
Construction Phase	
	Attend and participate in the Construction Progress Meetings and lead the commissioning team of contractors and consultants. Provide Commissioning Plan overview at the Pre-Construction Meeting.
	Review Contractor's Quality Control Plan, comment to Public Works & incorporate into Commissioning Plan.
	Conduct regularly scheduled commissioning meetings and regularly update the Commissioning Plan tracking status and responsibilities.
	Enter construction, functional performance, design discrepancies, etc. into a CxP Issues List for Public Works, A/E & CM. Track the issues to help move the issue to correction. When Contractor, A/E, CM or Public Works indicates an issue is corrected, verify and close the issue within Issues List.
	Perform field checks of the Contractor completed Construction Verification Checklists. Enter non-conformance items into the CxP Issues List. If there is more than a 10% deficiency, Contractor to correct and CxP to recheck.
	Establish sampling protocol for Functional Performance Testing. Witness, record and document the testing and report any deficiencies on the CxP Issues List.
	Review HVAC testing, adjusting and balancing report, field verify with contractor, report deficiencies on the CxP Issues List, track issues to resolution, verify corrections and close the issues.
	Review Operations and Maintenance Manuals and provide comments to the A/E so they can include with all other review comments.
	Attend DCSO training sessions, provide and collect attendee evaluation forms and evaluate training to ensure DCSO training is adequate.
	Complete draft Commissioning Report and distribute to Public Works, A/E, CM, Contractors and DCSO Contact.
Post-Construction Phase	
	Witness the Seasonal Functional Performance Testing, document the results and enter deficiencies into the CxP Issues List and provide follow-up through closure.
	Complete final Commissioning Report and distribute to Public Works, A/E, CM and DCSO Contact.
Optional Commissioning Activities / Services	
	N/A

11. TABLE 2 - SYSTEMS TO BE COMMISIONED

Divisions 3 thru 8 - General Construction
- Concrete
- Masonry
- Waterproofing
- Thermal Protection
- Building Envelope Sealing & Infiltration
- Roofing
- Doors & Windows
- Div. 11 - Equipment
- Div. 13 - Special Construction
- Div. 14 - Conveying Equipment

Division 21 - Fire Suppression
- Sprinkler & Standpipe Systems
- Fire Pumps & Controls

Division 22 - Plumbing
- Domestic Water Systems
- Domestic Hot Water Systems
- Plumbing Equipment
- Plumbing Fixtures
- Fuel Piping Systems
- Food Service Equipment

Division 23 - Heating, Ventilating & Air Conditioning (HVAC)
- Temp. Control & Building Automation Systems
- Testing & Balancing
- Variable Frequency Drives
- Piping Systems, Valves & Specialties
- Pumps
- Ductwork, Duct Accessories & Casing Systems
- Filtration
- Coils & Heat Exchangers
- Fans & Air Handlers
- Compressors & Condensing Units
- Chillers & Cooling Towers
- Computer Room Air Conditioning Equipment
- Boilers & Fuel Fired Equipment
- Terminal Units
- Fan Coils, Unit Ventilators, Unit Heaters
- Energy Recovery Systems
- Smoke Control Systems

Division 26 - Electrical
- Lighting & Daylighting Controls
- Lighting Fixtures & Contactors
- Exterior Site Lighting & Controls
- Conductors, Conduit, Raceway & Cable Tray
- Grounding & Bonding
- Switchboards & Panelboards
- Motor Starters & Motor Control Centers
- Disconnect Switches & Circuit Breakers
- Wiring Devices, Switches, Receptacles, Etc.
- Generators & Transfer Switches
- Metering / Submetering
- Surge Protective Devices
- Transformers
- Medium Voltage Switchgear

Division 27 - Communications
- Communication Cabling, Outlets & Equipment
- Audio / Visual Systems

Division 28 - Electronic Safety and Security
- Fire Alarm Systems
- Access Control Systems
- Video Surveillance Systems

Divisions 32 & 33 - Exterior Improvements & Utilities
- Bioretention Systems (“Blue Roof”)
- Water Distribution Systems
- Sanitary Sewer & Storm Drainage Systems
- Fuel Storage & Distribution Systems

Other
- N/A

END OF SECTION

Resolution 299, 1999-2000
The Dane County Green Building Policy

Nationally, buildings have a major impact on the environment. They consume 36% of all primary energy used, and 66% of all electricity. In the US, buildings use 17% of all fresh water consumed and 55% of the wood cut for non-fuel use is used in buildings. Nationally, the waste from building construction and demolition amounts to a third of all non-industrial waste, while in Dane County, it amounts to 40-45% of what is landfilled.

Both nationally and internationally, the building industry is working to reduce both the environmental and economic costs of building construction, operation, maintenance and removal, developing programs known as Green Building. In Dane County, the Madison Area Builders Association developed a Green Building program for the Madison Area Parade of Homes in 1999 and is expanding this in 2000.

Across the US, federal and local governmental bodies are developing Green Building programs for their own buildings, both to reduce the environmental impacts of the buildings and to take a leadership role in their community. Dane County owns approximately 250 buildings, worth an estimated $280 million, and is engaged in several significant building projects.

NOW, THEREFORE, BE IT RESOLVED that the Dane County Board of Supervisors adopts the following as the Green Building policy for the buildings owned by Dane County:

> The overall goal of sustainable building by Dane County is to protect human health, be environmentally responsible and fiscally prudent over the life of the building in the delivery of all new and renovated facilities. To meet this goal, construction planners, engineers and contractors for Dane County shall:
>
> - Strive to exceed all local, state and federal environmental standards;
> - Use resources efficiently and minimize the consumption of raw materials and resources (energy, water, land, and materials) during the construction and life of the facility;
> - Maximize the reuse of resources;
> - Minimize or eliminate the use of toxic materials;
> - Seek out renewable energy sources as opposed to using fossil fuels;
> - Create a healthy environment for workers, visitors, and neighbors;
> - Design facilities for long term durability, flexibility, and eventual reuse; and
> - Protect and restore the natural environment.
>
> It is recognized that for many environmental topics (such as erosion control or indoor air quality), it is not possible to calculate a strict financial payback. In applying the green building policy, the County will be guided by the following principles:
>
> - Precautionary principle - it is best to err on the side of adding more environmental and human health protection rather than have too little
> - Life cycle analysis - we will take a long term look at alternatives, not just the initial costs
> - Pollution prevention - it is best to not produce a waste product or emission, rather than work to manage it later
> - Leadership and education - we will provide leadership to others for the adoption and implementation of green building practices
> - Continual improvement - we will work for continual improvement, including an annual self-evaluation of our policies and practices

BE IT FURTHER RESOLVED that all departments are to work to implement this policy and the County encourages the private sector and municipalities within the County to also adopt Green Building policies.

BE IT FINALLY RESOLVED that the Department of Administration report back to the County Board in two years regarding implementation of county green building efforts.

Adopted April 6, 2000

DANE COUNTY JAIL
BASIS OF DESIGN NARRATIVE

STRUCTURAL SYSTEMS BASIS OF DESIGN

A. Preliminary details of the proposed waffle slab structural system
   1. 30" X 30" voids with 6" ribs @36"
   2. 14" rib depth + 4 ½" slab depth = 18 ½" total depth

B. Approximately 25'-0" column spacing
   1. 2.1 PSF Grade 60 reinforcement
   2. 1.20 CF/SF concrete volume @4000 PSI concrete
   3. Upper level columns: 24" X 24" + 12-#14 @ 6000 PSI
   4. Lower level columns: 30" X 30" + 12-#14 @ 6000 PSI
   5. 4'-0" thick X 14'-0" square spread footings with 15-#11 each way

C. Approximately 30'-0" column spacing
   1. 2.7 PSF Grade 60 reinforcement
   2. 1.20 CF/SF concrete volume @4000 PSI concrete
   3. Upper level columns: 26" X 26" with 16-#14 @ 6000 PSI
   4. Lower level columns: 36" X 36" with 16-#14 @ 6000 PSI
   5. 5'-6" thick X 17'-0" square spread footings with 20-#11 each way

D. Approximately 35'-0" column spacing
   1. 3.6 PSF Grade 60 reinforcement
   2. 1.20 CF/SF 4000 PSI concrete
   3. Upper level columns: 30" X 30" + 16-#14 @ 6000 PSI
   4. Lower level columns: 40" X 40" + 16-#14 @ 8000 PSI
   5. 6'-6" thick X 19'-0" square spread footings with 23-#11 each way

E. Estimated reinforced concrete shear walls on mat foundation: (lateral analysis not conducted at this early stage)
   1. Lower level: 24" thick with #7 bars @ 12" on center each way at each face
   2. Upper levels:12" thick with #5 bars @ 12" on center each way at each face
   3. 7'-0" thick mat foundation reinforced with #11 bars at 12" on center each way top and bottom

See Appendix A: *Structural Framing System Summary* for further information

ARCHITECTURAL SYSTEMS BASIS OF DESIGN

The addition to the Dane County Public Safety Building (PSB) will be designed under the Wisconsin Commercial Building Code, amended in April 2018 which references the 2015 International Building Code (IBC).

The existing PSB was designed as a Type 1 Fire Resistive A Class of Construction with an unlimited allowable area. The new addition would also be designed as a Type 1 Class of Construction (IBC 602.2). This will eliminate the requirement for a fire wall between different Class of Construction. The fire-resistive ratings for the building elements would be as follows: 3-hour for primary structural

frame, 2-hour for exterior and interior bearing walls, 1-hour for non-bearing exterior partitions, floor and roof construction (reduced per IBC 403.2.1.1), and 0-hour for non-bearing interior partitions.

The occupancy for the building will be Institutional Group I-3, Condition 4 (Jail), Business Group B (Sheriff's Office), and Low-Hazard Storage Group S-2 (Parking Garage).

The existing and new construction will be provided with an automatic sprinkler system per IBC 903.2.6 and NFPA 13.

Allowable area and height for the building would be unlimited per IBC Table 504.3 and 504.4. The Madison Zoning Code has a limit of 10-story per 28.071(2) and height of 187.2-feet city datum per 28.134(3).

Exiting requirements will be developed as the floor plans are developed.

MECHANICAL SYSTEMS BASIS OF DESIGN

A. Overview

The mechanical scope of work consists of providing an HVAC system for the facility, including temperature controls and utilities services.

B. Design References

The following applicable Codes, Standards, Guidelines, and Criteria are intended to be used to determine acceptable design criteria, standard of performance, workmanship, etc. Based on industry best practice and owner's experience, system design criteria that exceed the minimum standards will be applied as appropriate.

1. Applicable Codes

IMC	International Mechanical Code – 2015
IEEC	International Energy Conservation Code – 2015

2. Guidelines, Standards, and Criteria

a. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)

ASHRAE 55-1010	Thermal Environmental Conditions for Human Occupancy
ASHRAE 62.1-2010	Ventilation for Acceptable Indoor Air Quality
ASHRAE 90.1-2010	Energy Standard for Buildings Except Low-Rise Residential Buildings

b. National Fire Protection Association (NFPA)

NFPA 90A	Standard for the Installation of Air Conditioning and Ventilating Systems, 2015 Edition
NFPA 101	Life Safety Code

c. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)

d. Occupational Safety and Health Administration (OSHA)

C. Design Conditions

1. Project Location: Madison, WI
2. Elevation: 625 feet above mean sea level
3. Outdoor Design Conditions

a. Summer: 87º F DB / 75º F WB

b. Winter: -15º F DB

4. Indoor Design Conditions

a. Housing/Medical/Program/Offices

Heating:	70ºF ± 2ºF
Cooling:	75ºF ± 2ºF

b. Outdoor Recreation

Heating:	65ºF ± 2ºF
Cooling:	None

c. Maintenance Areas

Heating:	68ºF ± 2ºF
Cooling:	None

d. Unoccupied Spaces/Garage

Heating:	65ºF ± 2ºF
Cooling:	None

5. Heating and Cooling Loads

a. Electrical

1) Housing/Medical/Program/Offices

Lighting:	0.5 watts per sq ft
Equipment:	1.0 watts per sq ft

2) Outdoor Recreation

Lighting:	1.0 watts per sq ft
Equipment:	None

3) Storage/Maintenance Areas

Lighting:	0.5 watts per sq ft
Equipment:	1.0 watts per sq ft

b. Occupancy

1) The number of occupants in each space will be based on the actual occupant density listed in the project program documents when available or will be based on occupancy densities as specified in the International Mechanical Code and ASHRAE 62.1. The typical occupancy heat rejection will be as follows:

2) All Spaces

Sensible	250 Btu/h/person
Latent:	250 Btuh/person

3) Occupancy Schedule – 24 hours / 7 days

c. Infiltration

1) The building heat loss calculations will include an infiltration load based on 1.5 cfm of infiltration air per lineal foot of exterior wall with windows, per floor level, and 1.0 cfm of infiltration air per lineal foot of exterior wall without windows, per floor level.

2) Infiltration rates of 200 cfm per door will be used for exterior main entrance, high use service doors. Infiltration rates of 100 cfm will be used for secondary exterior entrances and exits. Infiltration rates of 10 cfm/sf will be used for exterior overhead doors.

d. Building Envelope

Wall (below ceiling)	U value = TBD Btuh/sf/ºF
Wall (above ceiling)	U value = TBD Btuh/sf/ºF
Wall (below grade)	U value = TBD Btuh/sf/ºF
Partition Wall	U value = 0.11 Btuh/sf/ºF
Roof (New Replacement)	U value = 0.03 Btuh/sf/ºF
Glass	U value = TBD Btuh/sf/ºF Shading Coeff. = 0.90)
Service Door	U value = TBD Btuh/sf/ºF
Overhead Door	U value = TBD Btuh/sf/ºF
Slab-on-Grade perimeter	F factor = TBD

e. Pressure Relationships

Garage	Negative to adjacent space
Housing cells	Negative to adjacent space
Maintenance Areas	Positive to Garage and Negative to Administration areas.
Building as a whole	Positive to exterior

f. Ventilation Rates

1) Outdoor
   a) Building ventilation (outdoor air) will comply with the International Mechanical Code. Code minimum rates will be increased as necessary to account for building exhaust rates and maintain pressure relationships.

2) Exhaust
   a) Individual room exhaust rates will comply with the International Mechanical Code.

g. Diversity / Redundancy Requirements: Dual redundant steam to hot water heat exchangers and hot water pumps.

h. Noise Criteria

1) Sound attenuation equipment will be provided based on standard design practice. Results are not guaranteed due to many items not under control of the design team and actual building usage.

6. Heating Hot Water System

a. System Description

1) A new high-pressure steam service will be provided from a main in Wilson St.
2) The steam will be reduced to 10 psi via a 1/3, 2/3 pressure reducing station in the sub-basement.
3) Steam will be converted to hot water for the facility's heating hot water service for air handling units and terminal heating devices, etc.
4) Heating hot water will be distributed at a supply water temperature of approximately 180ºF.
5) The heating hot water distribution system will be a variable volume primary system utilizing a modulating 2-way control valve at each heating device.

b. Design Criteria

1) Heating hot water piping will be sized as follows:
   a) Maximum pressure drop of 4 ft. of water/100 ft.
   b) Maximum velocity of 8 fps.

c. Equipment and Materials

1) The heating hot water system will also include the following components:
   a) Unit heaters.

b) Appropriate valving and piping specialties.

d. Distribution

1) Heating hot water piping 2" and under will be Type L copper with soldered fittings or carbon steel with threaded fittings.
2) Heating hot water piping over 2" will be carbon steel with welded fittings.
3) Unions will not be provided at terminal heating devices in copper piping.
4) Heating hot water piping system will be insulated with rigid glass fiber type insulation with appropriate insulation jacket.

7. Cooling Chilled Water System:

a. System Description

1) The existing chilled water plant in the existing PSB 5th floor penthouse will provide chilled water service for the new facility's chilled water service for air handling units.
2) Additional modular water-cooled chillers will be added to replace the aging 300 ton centrifugal chiller and supplement the existing modular chillers installed years ago.
3) The existing cooling tower located in the penthouse will be removed and two new nominal 300 ton cooling towers will be installed on the existing PSB 4th floor roof.

8. Humidification System – Humidification will not be provided.

9. Air Handling Unit System – General Population Housing

a. System Description

1) Indoor air handing units located at the mezzanine level will serve the General Population Housing floors (one for each floor). They will be 100% outdoor units with energy recovery wheels for ventilation of the space.
2) This system will be single duct, variable air volume with hot water heat and chilled water cooling.
3) The system airflow capacity is approximately 12,000 CFM each.
4) Unit's construction shall be a double insulated panels system similar to manufacturer's Daikin, CES (Nortek) Group, Trane, or York.
5) Conditioned air will be supplied to all spaces and exhausted through the cells and showers.
6) A fully ducted supply and exhaust system will be utilized.
7) Unit's supply and exhaust systems will operate 24/7/365.
8) Supply air ductwork will not be lined.

b. Design Criteria

1) Air Handling Unit Component Sizing

a) Maximum allowable nominal face velocities:

Filters:	400 fpm
Heating Coils:	650 fpm
Cooling Coils:	450 fpm

2) Duct System Sizing

a) 0.10 in.wg. per 100 feet.

c. Equipment and Materials

1) The unit will be of galvanized steel double wall construction. The unit will consist of the following components:

a) Outside air intake and exhaust dampers.

b) 30% (MERV 7) - 4 inch pre-filters.
c) 65% 9MERV 130 – 6 inch filters.
d) Hot water heating coil
e) Chilled water cooling coil.
f) Supply and exhaust fans with variable frequency drives (VFD).
g) Smoke detector at supply air discharge ductwork.

2) Supply and exhaust fans will be direct drive, plenum centrifugal type with airfoil blades in fan array configuration. Fan speed and air volume will be modulated by VFD through the building automation system (BAS).
3) An energy recovery wheel or heat pipe will recover approximately 50-60% of the energy exhausted.

d. Distribution

1) Ductwork will be constructed in accordance with SMACNA Standards for the appropriate pressure class. Ductwork will be sealed to meet SMACNA Seal Class A as a minimum and to limit ductwork leakage not to exceed 2% for low pressure ductwork.
2) Low pressure (2" wc) galvanized ductwork.
3) Supply air ductwork will be externally insulated with fiberglass insulation.

10. Air Handling Unit Systems – Medical/Psychiatric Housing

a. System Description

1) Indoor air handing units located in the 5th floor mechanical space will serve the various Medical/Psychiatric Housing areas on floors 1-4 based on compatibility of spaces (TBD). They will contain energy recovery wheels.
2) These systems will be single duct, variable air volume with hot water heat and chilled water cooling.
3) Unit's construction shall be a double insulated panel system similar to manufacturer's Daikin, CES (Nortek) Group, Trane, or York.
4) Air will be supplied to all appropriate spaces and a portion of this air will be returned to the air handling unit. The remaining portion of the air not returned to the air handling unit will be exhausted through the cells and showers.
5) A fully ducted supply and exhaust system will be utilized.
6) Unit's supply and exhaust systems will operate 24/7/365.
7) Supply air ductwork will not be lined.

b. Design Criteria

1) Air Handling Unit Component Sizing

a) Maximum allowable nominal face velocities:

Filters:	400 fpm
Heating Coils:	650 fpm
Cooling Coils:	450 fpm

2) Duct System Sizing

a) 0.10 in.wg. per 100 feet.

c. Equipment and Materials

1) The unit will be of galvanized steel double wall construction. The unit will consist of the following components:

a) Outside air intake and exhaust dampers.
b) 30% (MERV 7) - 4 inch pre-filters.

c) Hot water heating coil
d) Chilled water cooling coil.
e) Supply and exhaust fans with variable frequency drives (VFD).
f) Smoke detector at supply air discharge ductwork.

2) Supply and exhaust fans will be direct drive, plenum centrifugal type with airfoil blades in fan array configuration. Fan speed and air volume will be modulated by VFD through the building automation system (BAS).
3) An energy recovery wheel or heat pipe will recover approximately 50-60% of the energy exhausted.

d. Distribution

1) Ductwork will be constructed in accordance with SMACNA Standards for the appropriate pressure class. Ductwork will be sealed to meet SMACNA Seal Class A as a minimum and to limit ductwork leakage not to exceed 2% for low pressure ductwork.
2) Low pressure (2" wc) galvanized ductwork.
3) Supply air ductwork will be externally insulated with fiberglass insulation.

11. Air Handling Unit Systems – Program/Administration Spaces

a. System Description

Indoor air handing units located in the 5th floor mechanical space will serve the various Program/Administration Spaces on floors 1-4 based on compatibility of spaces (TBD). They will contain energy recovery wheels if required per the IEEC.

1) These systems will be single duct, variable air volume with hot water heat and chilled water cooling.
2) Unit's construction shall be a double insulated panel system similar to manufacturer's Daikin, CES (Nortek) Group, Trane, or York.
3) Air will be supplied to all spaces and a portion of this air will be returned to the air handling unit. The remaining portion of the air not returned to the air handling unit will be exhausted through toilet rooms, janitor's closets, etc.
4) A fully ducted supply and exhaust system will be utilized.
5) Unit's supply and exhaust systems will operate based on a programed occupancy schedule.
6) Supply air ductwork will not be lined.

b. Design Criteria

1) Air Handling Unit Component Sizing

a) Maximum allowable nominal face velocities:

Filters:	400 fpm
Heating Coils:	650 fpm
Cooling Coils:	450 fpm

2) Duct System Sizing

a) 0.10 in.wg. per 100 feet.

c. Equipment and Materials

1) The unit will be of galvanized steel double wall construction. The unit will consist of the following components:

a) Outside air intake and exhaust dampers.
b) 30% (MERV 7) - 4 inch pre-filters.

c) Hot water heating coil
d) Chilled water cooling coil.
e) Supply and exhaust fans with variable frequency drives (VFD).
f) Smoke detector at supply air discharge ductwork.

2) Supply and exhaust fans will be direct drive, plenum centrifugal type with airfoil blades in fan array configuration. Fan speed and air volume will be modulated by VFD through the building automation system (BAS).
3) An energy recovery wheel or heat pipe (if required) will recover approximately 50-60% of the energy exhausted if appropriate or required (TBD).

d. Distribution

1) Ductwork will be constructed in accordance with SMACNA Standards for the appropriate pressure class. Ductwork will be sealed to meet SMACNA Seal Class A as a minimum and to limit ductwork leakage not to exceed 2% for low pressure ductwork.
2) Low pressure (2" wc) galvanized ductwork.
3) Supply air ductwork will be externally insulated with fiberglass insulation.

12. Air Handling Unit System – Existing Building Outdoor Rec Infill

a. System Description

Indoor air handing unit located in the existing 5th floor mechanical penthouse space will serve new spaces infilled into the outdoor recreation space. It will contain energy recovery wheels if required per IEEC.

1) These systems will be single duct, variable air volume with hot water heat and chilled water cooling.
2) Unit's construction shall be a double insulated panel system similar to manufacturer's Daikin, CES (Nortek) Group, Trane, or York.
3) The system airflow capacity is approximately 8,000 CFM.
4) Air will be supplied to all spaces and a portion of this air will be returned to the air handling unit. The remaining portion of the air not returned to the air handling unit will be exhausted through toilet rooms, janitor's closets, etc.
5) A fully ducted supply and exhaust system will be utilized.
6) Unit's supply and exhaust systems will operate based on a programed occupancy schedule.
7) Supply air ductwork will not be lined.

b. Design Criteria

1) Air Handling Unit Component Sizing

a) Maximum allowable nominal face velocities:

Filters:	400 fpm
Heating Coils:	650 fpm
Cooling Coils:	450 fpm

2) Duct System Sizing

a) 0.10 in.wg. per 100 feet.

c. Equipment and Materials

1) The unit will be of galvanized steel double wall construction. The unit will consist of the following components:

a) Outside air intake and exhaust dampers.
b) 30% (MERV 7) - 4 inch pre-filters.
c) Hot water heating coil
d) Chilled water cooling coil.

e) Supply and exhaust fans with variable frequency drives (VFD).
f) Smoke detector at supply air discharge ductwork.

2) Supply and exhaust fans will be direct drive, plenum centrifugal type with airfoil blades in fan array configuration. Fan speed and air volume will be modulated by VFD through the building automation system (BAS).
3) An energy recovery wheel or heat pipe (if required) will recover approximately 50-60% of the energy exhausted if appropriate or required (TBD).

d. Distribution

1) Ductwork will be constructed in accordance with SMACNA Standards for the appropriate pressure class. Ductwork will be sealed to meet SMACNA Seal Class A as a minimum and to limit ductwork leakage not to exceed 2% for low pressure ductwork.
2) Low pressure (2" wc) galvanized ductwork.
3) Supply air ductwork will be externally insulated with fiberglass insulation.

13. Air Handling Unit System – Existing Building Fourth Floor Replacement Units

a. System Description

The two existing indoor air handing units located in the existing 5th floor mechanical penthouse space will be replaced to serve the repurposed spaces on the fourth floor and the existing Huber dormitory housing on the third floor. They will contain energy recovery wheels as required per the IEEC.

1) These systems will be single duct, variable air volume with hot water heat and chilled water cooling.
2) Unit's construction shall be a double insulated panel system similar to manufacturer's Daikin, CES (Nortek) Group, Trane, or York.
3) Each systems airflow capacity will be approximately 24,000 CFM.
4) Air will be supplied to all spaces and a portion of this air will be returned to the air handling unit. The remaining portion of the air not returned to the air handling unit will be exhausted through toilet rooms, janitor's closets, etc.
5) A fully ducted supply and exhaust system will be utilized.
6) Unit's supply and exhaust systems will operate based on a programed occupancy schedule.
7) Supply air ductwork will not be lined.

b. Design Criteria

1) Air Handling Unit Component Sizing

a) Maximum allowable nominal face velocities:

Filters:	400 fpm
Heating Coils:	650 fpm
Cooling Coils:	450 fpm

2) Duct System Sizing

a) 0.10 in.wg. per 100 feet.

c. Equipment and Materials

1) The unit will be of galvanized steel double wall construction. The unit will consist of the following components:

a) Outside air intake and exhaust dampers.
b) 30% (MERV 7) - 4 inch pre-filters.
c) Hot water heating coil
d) Chilled water cooling coil.

e) Supply and exhaust fans with variable frequency drives (VFD).
f) Smoke detector at supply air discharge ductwork.

2) Supply and exhaust fans will be direct drive, plenum centrifugal type with airfoil blades in fan array configuration. Fan speed and air volume will be modulated by VFD through the building automation system (BAS).
3) An energy recovery wheel or heat pipe (if required) will recover approximately 50-60% of the energy exhausted if appropriate or required (TBD).

d. Distribution

1) Ductwork will be constructed in accordance with SMACNA Standards for the appropriate pressure class. Ductwork will be sealed to meet SMACNA Seal Class A as a minimum and to limit ductwork leakage not to exceed 2% for low pressure ductwork.
2) Low pressure (2" wc) galvanized ductwork.
3) Supply air ductwork will be externally insulated with fiberglass insulation.
4) Ductwork extending down to the third floor will connect to the existing duct mains such that no new ductwork will be required on the third floor.

14. Temperature Controls

a. Mechanical systems will be controlled and monitored through a DDC based BAS with distributed processing at the local level. All valves and dampers shall have electric actuation.
b. DDC controllers will utilize distributed architecture and will not rely on "front-end" or higher level controller to perform required control sequence.
c. Each DDC controller will have a minimum of 10% spare points of each type (DI, DO, AI and AO) at each panel. For universal joints, the spares will be divided evenly between the analog and digital types of points.
d. All DDC system primary LAN controllers, PCs and communications equipment that monitors life safety and critical points (fire alarm, CNG alarms, etc.).
e. System will monitor temperature, pressure, status, alarms, runtime, positions, occupancy, etc., as required to provide Owner operators adequate feedback to diagnose system operation.

15. Gas Detection

a. The exhaust fans serving the Garage be controlled by CO/NO2 gas detectors with manual override.
b. When the gas detection system is activated, both exhaust fan and associated make-up air unit shall start. System shall continue to run at maximum fan speed setpoint until automatically reset by the gas detection system controller.
c. Gas detection: The concentration of a detected gas is above the set point. Signal alarm through DDC with automatic reset.

1) Carbon Monoxide (CO) Set Point: 35 ppm. (Adj.)
2) Nitrogen Dioxide (NO2) Set Point: 1 ppm. (Adj.)

d. Exhaust system shall automatically operate for at least 5 hours in each 24-hour period.
e. Provide a battery backup to power the gas detection system in the event of a power failure. Minimum backup of 12 hours.

16. Miscellaneous Mechanical Requirements

a. Exhausts presently exiting the south face of the existing building will need to be relocated as necessary due to the new addition.
b. Sub-basement and Basement utility/mechanical/electrical spaces will have dedicated air handling and exhaust systems, appropriate for the function of the space.
c. Air supply and exhaust will be provided for a new emergency generator located on the Basement level.
d. Repurposed spaces on basement, first, and second floors will need supply ductwork, exhaust ductwork and zoning revisions to accommodate new functions and spaces.

ELECTRICAL SYSTEMS BASIS OF DESIGN

A. Overview

1. The electrical scope of work consists of providing lighting and controls, power distribution and a fire alarm system for the new high-rise facility.
2. Electrical scope also consists of providing lighting and controls, power distribution and fire alarm systems for renovated areas in the existing building. These electrical distribution modifications include the utility (normal) and generator sourced systems. The distribution systems will be upgraded or replaced where required to serve renovated areas.

B. Design References

1. The following applicable Codes, Standards, and Guidelines are intended to be used to determine acceptable design criteria, standard of performance, workmanship, etc. Based on industry best practice and Owner's experience, system design criteria that exceed the minimum standards will be applied as appropriate.
2. Applicable Codes, Standards and Guidelines

SPS 316	WI Commercial Building Electrical Code
NFPA 70	National Electrical Code
NFPA 72	National Fire Alarm and Signaling Code
SPS 363	WI Commercial Building Energy Conservation Code
IBC	International Building Code
IEBC	International Existing Building Code
SPS	WI Commercial Building Code

C. Design Criteria

1. Overall normal building power is calculated based on the following load density values. Where VA/sq. ft values are given, these values are taken over the entire building area or, in the case of exterior lighting, over the entire illuminated area.

Item	**Load Density**	**Unit**
General Purpose Receptacles	2.00	VA/sq. ft
Lighting	1.00	VA/sq. ft
Exterior Lighting	.25	VA/sq. ft
Low Voltage Systems	2.00	VA/sq. ft
Mechanical Equipment	As Scheduled	
Plumbing Equipment	As Scheduled	
Other Equipment	As Scheduled	

2. Lighting levels will be in accordance with recommendations of the Illuminating Engineering Society (IES) and as indicated below. Areas designed by the lighting designer will have maintained levels as selected by that designer.

Area	**Maintained Footcandles**
General Circulation	5-15
Offices	30-40
Hold Rooms	20-25
Individual Cells	20-30
Secure Circulation	10-20
Activity Room	30-40
Toilet/Locker Rooms	10-20
Mechanical and Electrical Rooms	20-30
Telecommunication Rooms	30-40
Medical Care	30-50

3. Branch Circuit Load Calculations

Lighting	Actual installed VA
Receptacles	180 VA per outlet
Multi-Outlet Assemblies	180 VA per 2'-0"
Special-Purpose Outlets	Actual installed VA of equipment served
Motors	125% of motor VA

4. Demand Factors

Lighting	100% of connected VA
Receptacles	100% of first 10 kVA installed plus 50% of balance
Special-Purpose Outlets	Actual installed VA of equipment served
Motors	125% of VA of largest motor plus 100% of VA of all
Fixed Equipment	100% of connected VA

5. Electrical Quality Level
   a. Equipment selections will be from manufacturers whose products comply with current industry accepted design and testing standards.
   b. Equipment selection, specification, and installation practices will reflect a commitment to long-term longevity of the system, ease of maintenance, and energy efficiency.
   c. The intended level of quality of all wiring devices will be heavy-duty, specification and detention grade.
   d. The intended level of quality of all lighting fixtures will be specification and detention grade.

6. Proposed manufacturers of major equipment will be as indicated:

Equipment	**Manufacturer(s)**
Power Distribution Equipment	Square D, Eaton, GE
Generators	Caterpillar, Cummins, Kohler, MTU
Automatic Transfer Switches	Caterpillar, Cummins, ABB, Kohler, MTU, ASCO
Wiring Devices	Hubbell, Leviton, Legrand
Fire Alarm System and Devices	Edwards, Notifier, Siemens, Simplex, Honeywell

7. Energy Conservation
   a. Electrical building systems shall be designed using sustainable energy efficiency goals.
   b. Design to meet the requirements of WI Building Code SPS 363 and ASHRAE 90.1.

D. Systems Descriptions

1. Building Demolition

   a. System Description
      1) Removal of electrical distribution equipment, lighting, electrical devices, and fire alarm components serving renovated spaces. Removal of all fire alarm devices and equipment for entire building.

   b. Design Criteria
      1) Disconnection of electrical power to utilization equipment and circuits removed or affected by demolition work.
      2) Electrical services reconfigured and refed from new addition.
      3) Survey and record condition of existing facilities to remain in place that may be affected by demolition operations.
      4) Provide temporary wiring and connections to maintain existing systems in service during construction. Assume all equipment and systems must remain operational unless specifically noted otherwise on drawings.

5) Existing Fire Alarm System: Maintain existing system in service. Disable system only to make switchovers and connections. Obtain permission no fewer than 72 hours in advance of proposed interruption of fire alarm system before partially or completely disabling systems. Minimize outage duration. If required, make temporary connections to maintain service in areas adjacent to work area. Do not proceed with interruption without Owner's written permission.

2. Power Distribution System

a. System Description

1) The power distribution system is comprised of utility (normal) source, and generator source consisting of emergency, legally required standby, and optional standby systems. Major system components include switchboards, distribution and appliance panelboards, transformers, generator, and automatic transfer switches.
2) Emergency systems are those essential for human safety if the normal power fails, such as egress lighting, fire alarm systems, fire pumps, public safety communications systems and automatic doors.
3) Legally required standby systems are typically installed to provide electric power to aid in firefighting, rescue operations, control of health hazards, and similar operations. These loads include heating systems, ventilation and smoke removal systems, elevators, lighting, and communication systems
4) Optional standby systems are typically those that life safety does not depend on for the performance of the system but are provided when Owner would like to have on back-up power.
5) The building is served from a main multi-distribution switchboard (MDS). The switchboard consists of three sections: main disconnect, current transformer cabinet/power metering, and two distribution sections. The switchboard is rated at 1000 amperes at 480/277 volts, three-phase, 4-wire with a GFI protected main fusible switch fused at 1000A. No work will be done on the MDS for this phase.
6) Normal power will be distributed at 480Y/277V and transformed to 208Y/120V for utilization equipment. Maximum single 480V:208Y/120V transformer size in any electrical room shall be 150kVA. All 480V and 208V power will be distributed throughout the facility from electrical rooms.
7) In general, lighting and appliance panelboards will be located in electrical rooms. Exceptions to this include panelboards serving telecommunications equipment remote from electrical rooms. In these cases, panelboards will be located within the respective spaces they serve.

b. Design Criteria

1) Panelboards
   a) Power panelboards comparable to Square D I-Line style; Lighting and appliance panelboards comparable to Square D NF (480V) and NQOD (208V) style; rated for 3 phase, 4 wire, 60 Hz service.
   b) Enclosures will be NEMA Type 1 for indoor dry locations; NEMA Type 3R for outdoor locations; NEMA Type 4 for other wet or damp indoor locations; and NEMA Type 12 for indoor locations subject to dust, falling dirt and dripping non-corrosive liquids.
   c) Main devices to be fixed, individually mounted. Branch devices to be bolt-on.
   d) Phase, neutral and ground buses will be hard-drawn copper, tin-plated.
   e) Conductor connectors will be compression type.

2) Transformers
   a) Enclosure will be ventilated, NEMA Type 2 for indoor transformers.
   b) Primary shall be 480V delta connected; secondary shall be 208Y/120V wye connected; rated for 60 Hz service.
   c) Transformers 15kVA and higher will comply with 10 CFR 431 (DOE 2016) efficiency levels.
   d) Taps shall be provided as indicated below.

Transformer Size	**Taps**
15 - 24 kVA	(2) 5% taps below rated voltage
25 kVA and >	(2) 2.5% taps above and (4) 2.5% taps below rated voltage

   e) Insulation class will be 220-degree C, UL component recognized system with a maximum of 150-degree C rise above 40-degree C ambient temperature.

f) All transformers will be capable of being floor- or wall-mounted. All floor-mounted transformers will be mounted on a housekeeping pad. Only transformers 75 kVA or smaller will be allowed to be wall mounted.

3) Circuit Breakers
   a) All circuit breakers will be provided with AL/CU listed connector lugs and will be bolt on type.
   b) All circuit breakers will be fully rated for the available fault current.
   c) Thermal magnetic circuit breakers will be provided with an inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits in each pole. Adjustable magnetic trip setting for circuit breaker sizes 150A and larger will be provided.
   d) Adjustable, instantaneous-trip circuit breakers will be provided with a front-mounted, field-adjustable trip setting magnetic trip element.
   e) Electronic trip circuit breakers will be provided with field-replaceable rating plug, rms sensing and with the following field-adjustable settings: instantaneous trip, long- and short-time pickup levels, long- and short-time adjustments, ground-fault pickup level, time delay and I2t response.
   f) GFCI circuit breakers will be provided with Class A ground-fault protection (6 mA trip) for personnel protection.
   g) GFP circuit breakers will be provided with Class B ground-fault protection (30 mA trip) for equipment protection.
   h) Provide solid-state circuit breakers with fully adjustable trip functions where required to achieve selective coordination with all supply side overcurrent devices

4) Fuses
   a) Fuses will be nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

5) Surge Protection Device
   a) Surge suppression equipment shall be connected via a circuit breaker to allow for ease of maintenance.

3. Raceway and Wiring System

a. System Description
   1) The raceway and wiring system is comprised of conduit, boxes, conductors, and support equipment.

b. Design Criteria
   1) Conduit
      a) Conduit type will be as indicated below.

Location	**Conduit Type**
Exterior Exposed	RGS
Exterior Concealed	RGS
Underground (outside building foundation)	PVC Sch 40 (normal)
Underground (below slab)	PVC Sch 40
Interior Dry (not exposed to physical damage)	EMT
Interior Dry (exposed to physical damage)	RGS (below switch height) EMT (above switch height)
Interior Dry (concealed)	EMT
Interior Damp/Wet	RGS (below 96” AFF) EMT (above 96” AFF)
Interior Corrosive	PVC Sch 40
Connection to Vibrating Equipment	FMC (dry) LFNC (damp/wet/corrosive)

b) Minimum conduit size shall be ¾"".
c) (1) 1" spare conduit from panelboard to above accessible ceiling will be provided for each (3) spaces or spare breakers in panelboards. All spare conduits will be provided with a pull string and will be labeled at each end with the terminus of opposite end.
d) Conduit in areas exposed to the public will be run parallel or perpendicular to structure and will be painted to match surrounding finish.

2) Boxes
a) Box type will be as indicated below.

Location	**Box Type**
Exterior	Ferrous Alloy
In Concrete	Ferrous Alloy
Interior Dry	Galvanized Steel
Interior Damp/Wet	Ferrous Alloy
Interior Corrosive	PVC

b) Minimum box size shall be 4" square.

3) Support Equipment
a) Hangers and supports will be as indicated below.

Location	**Box Type**
Exterior	Hot-Dip Galvanized Steel
Interior Dry	Hot-Dip Galvanized Steel
Interior Damp/Wet	Non-Metallic
Interior Corrosive	Non-Metallic

4) Conductors and Cables
a) All branch circuits will be copper. All feeders will be copper.
b) Conductor insulation shall be type THHN/THWN.
c) Conductors to first device on a branch circuit shall be No. 12 minimum.
d) Conductors shall be continuous from outlet to outlet and no splices shall be made except within outlet or junction boxes.
e) MC Cable will not be used.

5) Feeders
a) Each raceway will contain only those conductors constituting a single feeder circuit.
b) Where multiple raceways are used for a single feeder, each raceway will contain a conductor or each phase and neutral, if used, and a grounding conductor.
c) Where feeder conductors are run in parallel, conductors will be of same length, material, size, and insulation type and will be terminated in same manner.
d) Feeders will be sized for a maximum voltage drop of 2%.

6) Branch Circuits
a) Other branch circuits will be sized for maximum voltage drop of 3%.
b) All 120V and 277V branch circuits will have a dedicated neutral conductor for each circuit.
c) All current carrying conductors will be considered current carrying for derating purposes.
d) No more than three 120V or 277V circuits will be allowed in a single home run.

4. Grounding System

a. System Description
1) The grounding system is comprised of conductors, bus bars, ground rods, and service grounding equipment.
2) Systems to be bonded together to common ground include but are not limited to all power distribution systems, lightning protection systems (if required), low voltage systems, and building steel structural system. At no point shall multiple, independently grounded systems exist.
3) Ground bus bars will be provided in the main electrical and all telecommunications rooms.

5. Power Utilization System

a. System Description

1) The power utilization system is comprised of receptacles, switches, disconnects, and motor controllers/starters allowing for connection of equipment to the power distribution system.
2) Interior convenience receptacles will be located throughout the facility such that any point along the floor can be reached with a 25' extension cord. Exterior convenience receptacles will be located adjacent to exterior entrances.
3) Receptacles in back-of-house service areas and mechanical/electrical spaces will be mounted a minimum of 46" AFF. All other receptacles will be mounted at 18" AFF unless specific needs require otherwise.
4) Switches shall be mounted at 48" AFF unless specific needs require otherwise.
5) Disconnects will be located directly adjacent to equipment being served unless such an installation would prove a safety hazard.
6) Generally, non-fusible switches shall be used for loads below 240V or where the fault current is below 10,000A. Generally, fusible switches shall be used for loads above 240V or where the fault current is above 10,000A.
7) For fractional horsepower loads, horsepower-rated switches will be used.
8) Controllers will be located directly adjacent to equipment being served unless such an installation would prove a safety hazard. Controllers will be located in motor control centers where large groups of equipment are located together and within plain sight of the motor control center.
9) Combination controller/disconnects shall be used wherever practical.
10) Receptacles

    a) Convenience receptacles will be specification grade 125V, 20A, NEMA 5-20R configuration. All other receptacles will be heavy-duty, specification grade of rating and configuration to match intended use. Receptacles connected to normal system will be provided in color matching the surrounding finish as closely as possible.
    b) Receptacles in secure areas shall have stainless steel wall plates with detention fasteners.
    c) Receptacles in areas not subject to physical damage will be provided with nylon covers. Receptacles in back-of-house areas subject to physical damage will be provided with stainless steel covers.
    d) Receptacles installed in all exterior and interior damp/wet locations will be of the GFCI type and provided with in-use weatherproof covers.

11) Switches

    a) Switches will be heavy-duty, specification grade 125V, 20A and rated for 120/277 volts. Switches will have quiet action toggle type mechanism and silver alloy contacts for longevity.
    b) Switches in secure areas shall have stainless steel wall plates with detention fasteners.
    c) Switches installed in all exterior and interior damp/wet locations shall be of the weatherproof type.

12) Disconnects

    a) Enclosure shall be steel NEMA Type 1 for interior dry locations; NEMA Type 3R for exterior wet locations; NEMA Type 4X fiberglass for interior corrosive areas; and NEMA 4X stainless steel for exterior corrosive areas.
    b) Fusible and non-fusible switches shall be heavy duty, single throw, 240V and 600V, 1200A and smaller.
    c) Fusible and non-fusible switches shall be capable of being locked in the open position.
    d) Fusible and non-fusible switches shall be provided with an equipment ground kit, neutral kit, auxiliary contact kit ((2) NO/NC form "C" contacts) and compression type lugs.

13) Controllers

    a) Enclosure shall be steel NEMA Type 1 for interior dry locations; NEMA Type 3R for exterior wet locations; NEMA Type 4X fiberglass for interior corrosive areas; and NEMA 4X stainless steel for exterior corrosive areas.

b) Accessories (Hand-Off-Auto, LED pilot lights, auxiliary contacts, etc.) shall be provided as required.
c) Manual controllers shall be general purpose, Class A, with “quick-make, quick-break” toggle action, marked to show whether unit is “Off,” “On,” or “Tripped.”
d) Magnetic controllers shall be Class A, full voltage, non-reversing, across the line unless noted otherwise

6. Lighting System

a. System Description

1) All light fixtures will utilize LED technology unless noted otherwise.
2) LED modules will be rated for a minimum of L70 light level. LED modules will have a minimum CRI of 85, will generally be provided with a color temperature of 4000K and will utilize lenses activity areas to shield diodes to reduce unwanted glare.
3) Lighting system is comprised of fixtures, controls, and emergency lighting equipment. This basis of design covers support and back-of-house lighting only. All front-of-house lighting and detention area will be as selected by the lighting designer.
4) Light fixtures within all detention areas and all security ceiling spaces will be maximum security detention grade-rated fixtures
5) Emergency, exit signage and egress lighting will be provided in accordance with NFPA 101 and local codes.
6) Normal and emergency lighting control will be provided to meet applicable codes and standards.

7. Fire Alarm System

a. System Description

1) The fire alarm system will comply with requirements of NFPA 72 and Life Safety Codes
2) Fire alarm system is comprised of the fire alarm control panel, remote annunciator, detection appliances, notification appliances, and connections to ancillary systems as required.
3) Per IBC requirements, the fire alarm system will be a digital, addressable, with voice evacuation and firefighter communications functions.
4) The FACP to be located in fire command center. Fire Command Center components and functions will be coordinated with the AHJ to comply with applicable codes.
5) Fire alarm detection and notification appliances will be designed to meet the requirements of NFPA 72.
6) Fire alarm emergency power will be achieved through connection to the generator.
7) Initiating devices will include manual pull stations, smoke detectors, duct smoke detectors, heat detectors, flow switches, and tamper switches.
8) Notification devices will include visual, audio, and combination devices. Notification devices shall be red if wall-mounted and white if ceiling-mounted.
9) Ancillary equipment will include connections to HVAC digital control system.

PLUMBING SYSTEMS BASIS OF DESIGN

A. Overview

1. The plumbing scope of work consists of providing water supply, sanitary drain and vent, garage drain and vent, and storm drain systems for a 13 story building addition to the Dane County Jail.

B. Base Design Criteria

1. The following applicable Codes, Standards, and Guidelines are intended to be used to determine acceptable design criteria, standard of performance, workmanship, etc. Based on industry best practice and Owner's experience, system design criteria that exceed the minimum standards will be applied as appropriate.
2. Applicable Codes

SPS 380 - 387	Wisconsin Plumbing Code

3. Applicable Guides and Standards

ASPE PEDH	Plumbing Engineering Design Handbook, Volumes 1-4 (Current Editions)

C. Design Conditions

1. Water supply flow is based on the following values obtained from City of Madison:

WATER SUPPLY FLOW

DATE OF TEST:	10/14/1992
LOCATION:	115 W. Doty St.
TEST HYDRANTS:	N/A
HYD. OUTLET ELEV.:	20" OFF FINISHED GRADE
STATC PRESSURE:	75 PSI
RESIDUAL PRESSURE:	60 PSI
FLOW GPM:	1300 GPM

2. Water quality is based on the following values obtained from Water Quality Report

Total Hardness, gpg	19

3. Proposed manufacturers of major equipment will be as indicated:

EQUIPMENT	**MANUFACTURER(S)**
Water Heater	AO Smith, HTP, Bock, Bradford White, Navien
Plastic or Fiberglass Interceptor	Green Turtle, Schier, Canplas
Water Supply Pump	Bell & Gossett, Grundfos, Wilo, Taco, SyncroFlo, QuantumFlo
Wastewater Pump	Bell & Gossett, Grundfos, Weil, Zoeller, EBARA
Drains	Watts, Zurn, JR Smith, Josam, Wade
Plumbing Fixtures	American Standard, Kohler, Zurn, Mansfield
Faucets and Flush Valves	American Standard, Kohler, Chicago Faucets, Sloan, Moen, Zurn
Institutional Grade Fixtures	Acorn, Bradley, Willoughby

D. System Descriptions

1. Plumbing Demolition

a. System Description

1) The existing plumbing systems will remain in place to the greatest extent possible. The system demolition will be limited to the local area being renovated.

b. Design Criteria

1) The sanitary sewer serving the facility will be relocated as part of the scope of work. Coordinate the installation of the new sewer to minimize the amount of time the system is out of service.
2) Existing systems outside the project limits must remain in service.
3) Obtain permission from Owner no fewer than 7 days in advance of any system interruptions or shut downs.

2. Domestic Water Supply

a. System Description

1) Plumbing fixtures are attached to a cold and hot water distribution system containing potable water that is connected to water supply through a water meter and backflow prevention device.
2) Hot water is generated with [**insert number**] steam-fired heat exchanger(s). The water heater is located in the mechanical room adjacent to the water service entrance.
3) Hot water is continuously circulated through the system and returned back to the hot water source.
4) Mechanical equipment is attached to a non-potable water distribution system that is connected to water supply through a backflow prevention device.

b. Design Criteria

1) The 4-inch water service entrance will be dedicated to the potable water supply. The water service will be designed at 5 feet per second maximum allowable velocity. Velocity limitation is to provide capacity for future expansion of the system.
2) The water distribution system will be designed by the segmented loss method. This method requires the following information: the load factor in water supply fixture units or gallons per minute flow rate, the minimum pressure available from the water source (water main or pressure tank), the pressure loss due to the difference in elevation between the water source and the controlling plumbing fixture, the pressure loss due to equipment (water softener, backflow prevention device, etc.), the minimum flow pressure required at the controlling fixture, and the pressure loss through piping, valves, fittings, and appurtenances. The maximum allowable velocity shall be 6 feet per second in cold water supply, 5 feet per second in hot water supply, and 4 feet per second in hot water recirculation. Velocity limitations are to reduce the potential for pipe wall erosion.
3) The water distribution system will be segregated into two pressure zones. The lower half of the facility shall be served by the available utility supply pressure. The upper half of the facility shall be served by domestic water pressure booster pumps. The hot and cold water supply systems shall have separate booster pumps. Each pressure zone shall have a maximum water supply pressure of 80 psi.
4) Domestic water booster pumps will be required to overcome system pressure losses. Triplex variable speed domestic water booster pumps will be provided, with each pump sized to provide 40% of the full demand load for the facility. This equipment will provide a maximum of 120% design flow during periods of high demand.
5) A water softener will be required based on the water quality report. The water softener will provide softened water to the hot water distribution system. A triplex water softener will be provided, with each tank sized to provide 50% of the full demand load for the facility at a maximum of 15 psi pressure loss.

6) The water heater will be selected based on the average hourly demand method. This method requires the following information: the average hourly use for each plumbing fixture type, the simultaneous usage factor based on facility type, and the storage factor based on facility type.

c. Equipment and Materials

1) Domestic plumbing distribution pipe shall be Type L copper with solder joints, brazed pipe joints, or press-fit joints. Pipe insulation shall be performed fiberglass pipe insulation.
2) Domestic plumbing valves intended for shut-off duty shall be two-piece, full port ball valves for pipe sizes 3" and smaller, or butterfly valves for pipe sizes larger than 3". Hot water recirculation systems shall include calibrated balancing valves at each system branch connection. Swing check valves shall be included to ensure the proper direction of flow.
3) The backflow prevention device serving the domestic water service shall be a reduce pressure zone style backflow preventer. Hose thread style backflow preventers will be provided for all loose hose connections, hose bibb or wall hydrants, janitor's sinks, and any hose thread spout outlets.
4) Circulation Pumps shall be variable speed, electronically commutated motor (ECM) high efficiency pumps with integral thermal controls.
5) Booster Pumps for domestic water shall be a triplex, variable speed, skid mounted booster pump package.
6) Water Heaters shall be steam fired, semi-instantaneous water heater. The thermal expansion tank shall utilize a field replaceable bladder system. Hot water storage tanks shall be glass-lined steel.

d. Distribution:

1) All plumbing pipe will be routed overhead and square to building structure.
2) No plumbing pipe will be routed in electrical or technology rooms.

3. Drain and Vent

a. System Description

1) Plumbing fixtures are connected to a sanitary drain and vent collection system that is connected to a municipal sanitary sewer system thru a grinder sewage ejector pump.
2) Floor drains located in vehicle traffic and parking areas are connected to a garage drain and vent collection system that is connected to a municipal sanitary sewer system thru a garage catch basin.
3) Clearwater drains are connected to a clearwater drain and vent collection system that is connected to a storm drain system through a backflow prevention device.

b. Design Criteria

1) Drain and vent systems will be designed using the fixture unit method. This method requires the following information: the load factor in drainage fixture units or gallons per minute flow rate, and the slope of the connected drainage pipe. The drain and vent systems will be designed with a minimum 2 feet per second velocity to ensure solids remain suspended in the wastewater.
2) Grinder sewage ejector pumps will be required to ensure no large debris passes from the facility to the municipal sewer system. Triplex submersible pumps will be provided, with each pump sized to provide 40% of the full demand load for the facility. This equipment will provide a maximum of 120% design flow during periods of high demand.

c. Equipment and Materials

1) Sanitary drain and vent pipe will be Service Weight Cast Iron Soil Pipe with drainage pattern fittings and hub-and-spigot or no-hub coupling joints.
2) Garage drain and vent pipe will be the same material as the sanitary drain and vent pipe.
3) Clearwater drain and vent pipe will be the same material as the sanitary drain and vent pipe.
4) Elevator pit pump will be simplex configuration. The sump basin will be fiberglass reinforced plastic. And oil sensor will be provided to prevent system operation if hydraulic fluid is present in

the wastewater. The oil sensor and a high-water alarm will be connected to the building automation system.

5) Grinder sewage ejector pump will be duplex configuration. The sump basin will be fiberglass reinforced plastic. Automatic controls will be provided to alternate the operation of the pumps.
6) Backwater valves will be bolted steel with a removable flapper inserted into a valve body. The backwater valve will be accessible via handhole.

d. Distribution

1) All plumbing pipe will be routed overhead and square to building structure.
2) No plumbing pipe will be routed in electrical or technology rooms.

4. Storm Drain

a. System Description

1) Primary roof drains are connected to a stormwater collection system that is connected to a municipal storm sewer system. Secondary roof drains are connected to a stormwater collection system that discharges to grade.

b. Design Criteria

1) Storm drain systems will be designed for a 20-year storm one hour in duration. This is equivalent to three Inches per hour rainfall rate. The pipe sizes will be determined based on the expected gallons per minute flow rate and the slope of the connected pipe.

c. Equipment and Materials

1) Storm drain pipe will be the same as used for the sanitary drain and vent system.
2) Roof drains will be large diameter cast iron roof drains with cast iron dome strainers and extra large sump.
3) Downspout nozzles will be bronze with vermin screen.

d. Distribution

1) All plumbing pipe will be routed overhead and square to building structure.
2) No plumbing pipe will be routed in electrical or technology rooms.

5. Plumbing Fixtures

a. Equipment and Materials

1) Correctional grade fixtures will be combination lavatory and water closet, stainless steel, ligature resistant design. Lavatory will have individual hot and cold water controls, rated for 0.5 gallons per minute flow rate. Water closet will have dedicated controls, rated for 1.6 gallons per minute flow rate.
2) Lavatories will be vitreous china, undermount bowl with single temperature sensor faucet rated for 0.5 gallons per minute flow rate.
3) Water Closets will be vitreous china, wall hung flush valve style fixtures with 1.28 gallons per flush.
4) Urinals will be vitreous china, wall hung flush valve style fixtures with 0.25 gallons per flush.
5) Correctional grade showers will be flush mounted, stainless steel cabinet with single handle manual valve and fixed showerhead. All components shall be ligature resistant design. Shower enclosures will be tile.
6) Showers will be single handle manual valve with fixed showerhead. Shower enclosures will be prefabricated fiberglass. Accessible showers will include a diverter valve, handshower on vertical slide mount, and fold-up seat.
7) Break Room Sink will be one compartment stainless steel drop-in with two handle swing spout faucet rated for 1.0 gallons per minute flow rate.

8) Drinking Fountain will be wall hung stainless steel in high-low configuration, with bottle filler.
9) Hose bibbs will be cast brass with rough bronze finish and wheel handle operation. Wall hydrants will be freezeproof with loose key operation. Roof hydrants will be freezeproof with 1-gallon collection tank to eliminate drain port.
10) Floor drains in finished areas will be cast iron body with nickel bronze heel proof grate. Floor drains in mechanical rooms will be cast iron body with heavy duty tractor grate. Floor drains in process rooms will be cast stainless steel with stainless steel strainer.
11) Floor sinks will be fabricated stainless steel with stainless steel grate.

FIRE SUPPRESSION SYSTEMS BASIS OF DESIGN

A. Overview

1. The fire suppression scope of work consists of providing a wet pipe fire sprinkler system and a wet pipe automatic standpipe system for a 13 story building addition to the Dane County Jail.

B. Base Design Criteria

1. The following applicable Codes, Standards, and Guidelines are intended to be used to determine acceptable design criteria, standard of performance, workmanship, etc. Based on industry best practice and Owner's experience, system design criteria that exceed the minimum standards will be applied as appropriate.

2. Applicable Codes

NFPA 1	Fire Code 2012
SPS 314	Wisconsin Fire Prevention Code 2018

3. Applicable Guides and Standards

NFPA 13	Sprinkler Systems 2010
NFPA 14	Standpipe and Hose Systems 2010
NFPA 20	Stationary Pumps for Fire Protection 2010
NFPA 24	Private Fire Service Mains 2010
NFPA 25	Inspection, Testing, and Maintenance 2011

C. Design Conditions

1. Building hazard classifications are based on the following occupancies as found in NFPA 13:

NFPA-13 Hazard Classifications

Light	Unless Otherwise Noted
Ordinary Hazard Group 1	Automobile parking, Laundry, Production kitchen, Mechanical and Electrical rooms, Storage rooms, Porte cochere
Ordinary Hazard Group 2	Exterior loading dock, Generator room

2. Overall fire sprinkler design is based on the following sprinkler demand values as found in NFPA 13:

NFPA-13 HYDRAULIC CALCULATION STANDARD

HAZARD CLASSIFICATION	DENSITY GPM/SQ FT	AREA OF SPRINKLER OPERATION SQ FT	TOTAL HOSE STREAM GPM	DURATION MINIMUM
LIGHT HAZARD	0.10	1500	100	60
ORDINARY HAZARD GROUP 1	0.15	1500	250	60-90
ORDINARY HAZARD GROUP 2	0.20	1500	250	60-90

3. Hose stream demand is based on the following values as found in NFPA 13

NFPA 13 Hose Stream Allowance and Duration

HAZARD CLASSIFICATION	HOSE DEMAND, GPM INSIDE	TOTAL COMBINED INSIDE AND OUTSIDE	DURATION, MIN
LIGHT	0, 50, OR 100	100	30
ORDINARY	0, 50, OR 100	250	60–90

4. Water supply flow is based on the following values obtained from City of Madison:

WATER SUPPLY FLOW BASIS FOR BID

NOTE: INFORMATION SHOW FOR BID ONLY, NOT FOR DESIGN.

FIRE PROTECTION DESIGN / INSTALLATION CONTRACTOR SHALL CONDUCT SEPARATE WATER FLOW TEST AND USE RESULTS IN HYDRAULIC CALCULATIONS.

DATE OF TEST: 10/14/1992

LOCATION: 115 W. Doty St.

TEST HYDRANTS: N/A

HYD. OUTLET ELEV.: 20" OFF FINISHED GRADE

STATC PRESSURE: 75 PSI

RESIDUAL PRESSURE: 60 PSI

FLOW GPM: 1300 GPM

5. Proposed manufacturers of major equipment will be as indicated:

EQUIPMENT	MANUFACTURER(s)
Double Check Valve Assembly	Apollo, FEBCO, Zurn
Dry-pipe Valve	Reliable, Tyco, Victaulic, Viking
Air Compressor	General, Viking, Ingersoll-Rand, Quincy
Specialty Devices	Elkhart, Guardian, Potter, Tyco, Viking
Sprinklers	Reliable, Tyco, Victaulic, Viking
Fire Pump	Peerless, Patterson, Aurora
Fire Pump Controller	Eaton, Hubbell, Firetrol

D. Systems Descriptions

1. Fire Protection Demolition

a. System Description

1) The existing facility is fully sprinkled. The existing fire sprinkler system will remain in place to the greatest extent possible. Demolition will be limited to removal or relocation of sprinkler heads to accommodate new partition wall layouts.

2) The existing fire pump will be demolished and replaced with a new fire pump.

b. Design Criteria

1) Coordinate the replacement of the fire pump with the construction schedule, to minimize the amount of time the system is out of service.
2) Existing systems outside the project limits must remain in service.
3) Obtain permission from Owner no fewer than 7 days in advance of any system interruptions or shut downs.

2. Wet Pipe Fire Sprinkler System

a. System Description

1) Automatic sprinklers are attached to piping containing water and that is connected to water supply through an alarm valve. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hydraulic and electric sensors send alarms when water flows.
2) Wet pipe fire sprinkler system will serve all building spaces unless noted otherwise.

b. Design Criteria

1) The existing 6-inch water service entrance is dedicated to the fire sprinkler system.
2) All fire suppression systems will be hydraulically calculated with a computer calculation system.

c. Equipment and Materials

1) Fire sprinkler pipe shall be black steel. Pipe 2-inch and smaller will be Schedule 40 with threaded joints. Pipe larger than 2-inch shall be Schedule 10 with welded or roll groove joints, or Schedule 40 with welded, threaded, or cut groove joints.
2) Sprinkler heads shall be quick response standard spray. Institutional grade, concealed, ligature resistant, tamper resistant sprinkler heads shall be installed in housing units. Concealed sprinklers shall be installed in areas with ceilings. Upright or pendant sprinklers shall be installed in areas without ceilings. Sprinkler guards shall be used in mechanical and storage rooms.
3) Fire Pump shall be 150 HP electric and shall include all appurtenances including fire pump controller and automatic power transfer switch.
4) Fire Pump Controller shall be soft start and shall include disconnect and transfer switch.

d. Distribution

1) All fire sprinkler pipe will be routed overhead and square to building structure.

3. Dry Pipe Fire Sprinkler System

a. System Description

1) Automatic sprinklers are attached to piping containing compressed air. A dry pipe valve separates the piping from a water supply. Sprinklers open when heat melts a fusible link or destroys a frangible device. Compressed air discharges immediately from sprinklers when they are opened. The reduced air pressure allows the dry valve to open. When the dry valve opens, water travels to the open sprinklers and then discharges from the open sprinklers. Hydraulic and electric sensors send alarms when water flows.
2) Dry pipe fire sprinkler system will serve the building overhang above exterior ramp access to subbasement parking and loading docks.

b. Design Criteria
1) All fire suppression systems will be hydraulically calculated with a computer calculation system.

c. Equipment and Materials

1) Equipment and Materials shall be of the same type as the wet pipe sprinkler system.

2) The air compressor shall be a simplex, single stage, receiver mounted, oil lubricated air compressor.

d. Distribution

1) All fire sprinkler pipe will be routed overhead and square to building structure.

4. Standpipe System

a. System Description

1) A system that supplies hose connections for manual firefighting operations. The system servesboth hose connections and automatic sprinklers. Hose connections are located in fire rated stairwells.
2) Automatic Wet Standpipe System: A standpipe system containing water at all times that is attached to a water supply capable of supplying the system demand at all times and that requires no action other than opening a hose valve to provide water at hose connection.
3) Class I System: A system that provides 2-1/2" hose connections to supply water for use by fire departments.

b. Design Criteria

1) The standpipe system shall provide a minimum of 100 psi residual pressure at the top of each standpipe. Each hose connection shall be capable of 250 gallons per minute flow rate. The most remote standpipe shall include two hose connections at the top of the standpipe, for a total of 500 gallons per minute flow rate.

c. Equipment and Materials

1) Equipment and Materials shall be of the same type as the wet pipe sprinkler system.

d. Distribution

1) All standpipe pipe will be routed overhead and square to building structure.

TECHNOLOGY SYSTEMS BASIS OF DESIGN

1. Overview:

   A. The overall technology philosophy proposed for the Dane County Jail facility demands that the infrastructure have the technical flexibility to allow the facility the capability to deliver the highest quality technology today and in the future. These guidelines address pathways, spaces and cabling designs necessary to sustain various information transport systems, including an administrative telephone system for voice and voice grade services, local area network (LAN) and wide area network (WAN) systems, wireless systems, video distribution, audio distribution, and the like.

2. Base Design Criteria

   A. The following applicable Codes, Standards and Guidelines are intended to be used to determine acceptable design criteria.

      1) Regulatory Codes: City, state and federal
      2) NFPA 70-2017 National Electric Code (NEC)
      3) Wisconsin Administrative Code, DOC 350 Jails
      4) International Building Code 2015
      5) TIA 568.1-D Commercial Building Telecommunications Cabling Standard
      6) TIA 568.2-D Balanced Twisted-Pair Telecommunications Cabling and Components Standard
      7) TIA 568.3-D Optical Fiber Cabling Components Standard
      8) TIA 568.4-D Broadband Coaxial Cabling and Components Standard
      9) TIA-569-D Commercial Building Standards for Telecommunications Pathways and Spaces
      10) TIA-606-A Administration Standard for Commercial Telecommunications Infrastructure
      11) TIA-607-C Commercial Building Grounding and Bonding Requirements for Telecommunications
      12) BICSI TDMM BICSI Telecommunications Distribution Methods Manual

3. Systems Descriptions

   A. Technology Spaces

      1) MTR- The Main Telecommunications / Technology Room (labeled as MTR on plans) will be located on the ground floor and will serve as the telecommunications utility services entrance point and distribution point for all telecommunications backbone cabling to the existing building and other Technology and Security Equipment Rooms throughout the building

         a) The underground utility entrance for telecommunications shall consist of multiple 4” conduits stubbed into the MTR from the existing city fiber optic duct systems. A new fiber optic connection will be installed from the City County Building MTR to the MTR in the new Dany County Jail building. Discussion with the Dane County IT staff during the DD phase will be required to determine the final location, size and quantity of fiber cabling into the building.
         b) The MTR will connect to the existing Dane County Jail building utilizing multi-pair Category 3 unshielded twisted pair (UTP) copper voice cable, OM4 Multi-mode fiber optic cable, OS2 Single Mode fiber optic cable and .500 inch coaxial cable. Further details specifying quantity of pairs and strands will be determined during design phase.
         c) The MTR room will be of sufficient size to contain the voice, data and TV equipment for various telecommunications service providers as well as the core, head-end distribution equipment for various communications and security systems throughout the facility.
         d) All walls in these rooms will be covered with 3/4" thick grade AC fire-rated void-free plywood.
         e) The rooms will be designed with adequate working clearances to facilitate the installation, use and maintenance of the equipment within the room and will include equipment racks / cabinets, wall termination space, copper termination patch panels, fiber optic termination panels (if applicable) and horizontal/vertical cable management for all cabling.
         f) Overhead ladder rack for distribution of cabling and equipment patch cords, vertical and horizontal cable management on equipment racks, and D-rings at wall-mounted equipment will be included in these rooms
         g) Copper backbone cabling will be terminated on wall- or rack-mounted 110 patch panels, as applicable to the project. Fiber optic backbone cabling will be terminated in rack-mounted fiber optic termination cabinets.
         h) The MTR will be designed to current telecommunications industry standards and best practices and will have the necessary ventilation, cooling, lighting, fire protection and power.

i) The MTR room will serve as the Telecommunications Room (TR) all work areas and telecommunications outlets (TOs) located within 275 cable feet of the MTR.
j) The telecommunications grounding and bonding system will connect to a wall-mount bus bar located in the MTR, rack-mount bus bars on each equipment rack, bonding backbone conductors and equipment hardware, and device bonding conductors.

2) TR- Technology Rooms Each TR shall be located at a minimum on each floor and be spaced to not cause any horizontal voice/data cable to exceed 275 feet in length.

a) Each TR shall be connected to the MTR with a minimum of one (1) 50 pair Category 3 UTP copper voice cable, one (1) 24 strand OM4 Multi-Mode fiber optic cable, one (1) 24 strand OS2 Single Mode fiber optic cable, and one .500 inch coaxial cable.
b) The TRs will contain backbone cable terminations and connectivity, horizontal terminations and network equipment.
c) Each TR will be sized to accommodate additional communications and security equipment.
d) All walls in these rooms will be covered with 3/4" thick grade AC fire-rated void-free plywood.
e) The rooms will be designed with adequate working clearances to facilitate the installation, use and maintenance of the equipment within the room and will include equipment racks / cabinets, wall termination space, copper termination patch panels, fiber optic termination panels (if applicable) and horizontal/vertical cable management for all cabling.
f) The TR will be designed to current telecommunications industry standards and best practices and will have the necessary ventilation, cooling, lighting, fire protection and power.
g) Overhead ladder rack for distribution of cabling and equipment patch cords, vertical and horizontal cable management on equipment racks, and D-rings at wall-mounted equipment will be included in these rooms
h) Copper backbone cabling will be terminated on wall- or rack-mounted 110 patch panels, as applicable to the project. Fiber optic backbone cabling (if applicable) will be terminated in rack-mounted fiber optic termination cabinets.
i) The telecommunications grounding and bonding system will connect to a wall-mount bus bar located in the MTR, rack-mount bus bars on each equipment rack, bonding backbone conductors and equipment hardware, and device bonding conductors.

3) Cable Pathway

a) Cable pathways for all horizontal structured cabling will consist of conduit, J-hooks, and/or cable tray.
b) Typical telecommunications outlet location rough-in will consist of a minimum of one (1) 4-11/16” square x 2-1/8” deep back box with single-gang plaster ring and a minimum 1" EMT conduit routed up to a J-hook route or cable tray above the nearest accessible ceiling.

4) Telecommunications Outlet

a) Jack
   i. Cables at the work station shall be terminated on a Category 6 rated RJ45 jack.

b) Faceplate
   i. Shall be suitable to accept 4 positions
   ii. Color to match electrical outlets
   iii. Blank inserts for any unused positions

c) Telecommunications Outlet (TO) configuration(s) and locations will be determined by Owner's standards, equipment that requires structured cabling connection(s), and through direction from the Owner.

5) Wireless Access Points

a) Telecommunications outlet locations for Owner's wireless access points (APs) will be provided, spaced to provide AP coverage with a 30-foot radius to support 802.11ac connectivity throughout the project area.
b) Provide plenum-rated AP enclosures in areas with plenum-rated accessible ceilings.
c) Layout of AP locations will be confirmed by owner prior to issuance of bid documents.

B. Structured Cabling System

1) Structured cabling design and installation will adhere to applicable ANSI, TIA, and IEEE standards, BICSI guidelines and recommendations and industry standard installation practices to the greatest extent possible within the confines of the project.

2) Horizontal Cabling

a) Data cabling will consist of Category 6 UTP Plenum copper cabling
b) All horizontal cabling shall be suitable for use for traditional analog/digital PBX-based voice, IP-based voice (VoIP) and data communications (Ethernet).
c) All horizontal cabling shall be fed from the nearest TR or MTR and not exceed 275 cable feet in length.
d) The structured cabling system shall be a certified cabling system. The manufacturer or manufacturers of the cable and termination components will qualify as a system and warranty the performance of the entire system.

3) Coaxial Cabling

a) Television cabling shall be quad-shielded plenum RG-6 coaxial cabling and 'F'-type connectors.
b) Coax cabling will be provided at various locations throughout the facility fed from the MTR
c) The TV infrastructure – including a pathway to the roof for the installation of a rooftop-mounted satellite TV antenna – shall be constructed so as to support Owner-contracted television services.

C. AV Systems

1) Conference Rooms

a) Audio-Visual (AV) systems consisting of input ports, pathways, cabling and a flat-panel display(s) will be provided for the Conference Rooms on both the first and second floors.
b) Each TV location will have adequate blocking to support a wall-mounted flat-panel display and a duplex power receptacle for the display
c) This display will be configured for showing portable content (e.g. laptop or tablet) and either cable (CATV) or satellite TV content.
d) All inputs will be HDMI.
e) No audio reinforcement is planned for these spaces

2) Flat-panel display (s) will be provided in the first floor Lobby to allow for Dane County-developed or Dane County-contracted content such as advertising or marketing.

3) Flat-panel displays will also be provided in the Fitness area for showing either cable (CATV) or satellite TV content.

4) Board Room/Gathering Space

a) AV systems will consist of input ports, pathways, cabling, projectors and motorized projection screens.
b) Sound reinforcement including speakers, input ports, wireless microphone(s), an audio mixer and audio amplifiers will be included.
c) Control of the AV systems (relative to the open/closed stated of the partition) will be manual.

5) Discussion with the Dane County management to further define the AV systems described above will be required during the DD phase of the design.

D. Other Technology Considerations

1) Pathways for Radio Systems Antenna Cabling between the radio location and the roof will be provided and shall be of sufficient size and quantity to allow the Owner's radio equipment provider to install the necessary cabling between the radio equipment and the antennas. Radio systems are not included in the Technology Systems scope of work for the project.

	25' Bay Spacing			30' Bay Spacing			**35' Bay Spacing**		
	Two-Way Flat Slab with Drop Panels 9" deep slab 7" deep X 8'-4" square drop panel 2.7 PSF Grade 60 reinforcement 0.815 CF/SF 4000 PSI concrete	Waffle Slab 30"X30" voids with 6" ribs @ 36" 14" rib depth + 4 1/2" slab depth 2.1 PSF Grade 60 reinforcement 1.20 CF/SF 4000 PSI concrete	One-Way Pan Joist 30" forms + 6" ribs @ 36" 14" rib depth + 4 1/2" slab depth 3.6 PSF Grade 60 reinforcement 0.80 CF/SF 4000 PSI concrete	Two-Way Flat Slab with Drop Panels 11" deep slab 9" deep X 10'-0" square drop panel 3.5 PSF Grade 60 reinforcement 1.00 CF/SF 4000 PSI concrete	Waffle Slab 30"X30" voids with 6" ribs @ 36" 14" rib depth + 4 1/2" slab depth 2.7 PSF Grade 60 reinforcement 1.20 CF/SF 4000 PSI concrete	One-Way Pan Joist 30" forms + 6" ribs @ 36" 16" rib depth + 4 1/2" slab depth 4.8 PSF Grade 60 reinforcement 0.93 CF/SF 4000 PSI concrete	**Two-Way Flat Slab with Drop Panels 9" deep slab 11" deep X 11'-8" square drop panel 4.5 PSF Grade 60 reinforcement 1.10 CF/SF 4000 PSI concrete**	**Waffle Slab 30"X30" voids with 6" ribs @ 36" 14" rib depth + 4 1/2" slab depth 3.6 PSF Grade 60 reinforcement 1.20 CF/SF 4000 PSI concrete**	**One-Way Pan Joist 30" forms + 6" ribs @ 36" 20" rib depth + 4 1/2" slab depth 5.6 PSF Grade 60 reinforcement 1.08 CF/SF 4000 PSI concrete**
Roof	Roof	Roof	Roof	Roof	Roof	Roof	**Roof**	**Roof**	**Roof**
Dead Load (PSF)	132	190	130	160	190	150	**175**	**190**	**172**
Live Load (PSF)	25	25	25	25	25	25	**25**	**25**	**25**
P - dead (K)	83	119	81	144	171	135	**214**	**233**	**211**
P - live (K)	16	16	16	23	23	23	**31**	**31**	**31**
Pu (K)	124	168	123	209	241	197	**306**	**328**	**302**
Level 7M (Option 2)	Level 7M (Option 2)	Level 7M (Option 2)	Level 7M (Option 2)	Level 7M (Option 2)	Level 7M (Option 2)	Level 7M (Option 2)	**Level 7M (Option 2)**	**Level 7M (Option 2)**	**Level 7M (Option 2)**
Dead Load (PSF)	70	70	70	70	70	70	**70**	**70**	**70**
Live Load (PSF)	40	40	40	40	40	40	**40**	**40**	**40**
P - dead (K)	44	44	44	63	63	63	**44**	**44**	**44**
P - live (K)	25	25	25	36	36	36	**25**	**25**	**25**
Pu (K)	93	93	93	133	133	133	**93**	**93**	**93**
Level 7 (Option 2)	Level 7 (Option 2)	Level 7 (Option 2)	Level 7 (Option 2)	Level 7 (Option 2)	Level 7 (Option 2)	Level 7 (Option 2)	**Level 7 (Option 2)**	**Level 7 (Option 2)**	**Level 7 (Option 2)**
Dead Load (PSF)	192	250	190	220	250	210	**235**	**250**	**232**
Live Load (PSF)	40	40	40	40	40	40	**40**	**40**	**40**
P - dead (K)	120	156	119	198	225	189	**288**	**306**	**284**
P - live (K)	25	25	25	36	36	36	**49**	**49**	**49**
Pu (K)	184	228	183	295	328	284	**424**	**446**	**419**
Level 6M (Option 2)	Level 6M (Option 2)	Level 6M (Option 2)	Level 6M (Option 2)	Level 6M (Option 2)	Level 6M (Option 2)	Level 6M (Option 2)	**Level 6M (Option 2)**	**Level 6M (Option 2)**	**Level 6M (Option 2)**
Dead Load (PSF)	70	70	70	70	70	70	**70**	**70**	**70**
Live Load (PSF)	40	40	40	40	40	40	**40**	**40**	**40**
P - dead (K)	44	44	44	63	63	63	**86**	**86**	**86**
P - live (K)	25	25	25	36	36	36	**49**	**49**	**49**
Pu (K)	93	93	93	133	133	133	**181**	**181**	**181**
Level 6 (Option 2)	Level 6 (Option 2)	Level 6 (Option 2)	Level 6 (Option 2)	Level 6 (Option 2)	Level 6 (Option 2)	Level 6 (Option 2)	**Level 6 (Option 2)**	**Level 6 (Option 2)**	**Level 6 (Option 2)**
Dead Load (PSF)	192	250	190	220	250	210	**235**	**250**	**232**
Live Load (PSF)	40	40	40	40	40	40	**40**	**40**	**40**
P - dead (K)	120	156	119	198	225	189	**288**	**306**	**284**
P - live (K)	25	25	25	36	36	36	**49**	**49**	**49**
Pu (K)	184	228	183	295	328	284	**424**	**446**	**419**
Level 5M (Option 2)	Level 5M (Option 2)	Level 5M (Option 2)	Level 5M (Option 2)	Level 5M (Option 2)	Level 5M (Option 2)	Level 5M (Option 2)	**Level 5M (Option 2)**	**Level 5M (Option 2)**	**Level 5M (Option 2)**
Dead Load (PSF)	70	70	70	70	70	70	**70**	**70**	**70**
Live Load (PSF)	40	40	40	40	40	40	**40**	**40**	**40**
P - dead (K)	44	44	44	63	63	63	**44**	**44**	**44**
P - live (K)	25	25	25	36	36	36	**25**	**25**	**25**
Pu (K)	93	93	93	133	133	133	**93**	**93**	**93**
Level 5 (Option 2)	Level 5 (Option 2)	Level 5 (Option 2)	Level 5 (Option 2)	Level 5 (Option 2)	Level 5 (Option 2)	Level 5 (Option 2)	**Level 5 (Option 2)**	**Level 5 (Option 2)**	**Level 5 (Option 2)**
Dead Load (PSF)	192	250	190	220	250	210	**235**	**250**	**232**
Live Load (PSF)	40	40	40	40	40	40	**40**	**40**	**40**
P - dead (K)	120	156	119	198	225	189	**288**	**306**	**284**
P - live (K)	25	25	25	36	36	36	**49**	**49**	**49**
Pu (K)	184	228	183	295	328	284	**424**	**446**	**419**
Level 5	Level 5	Level 5	Level 5	Level 5	Level 5	Level 5	**Level 5**	**Level 5**	**Level 5**
Dead Load (PSF)	132	190	130	160	190	150	**175**	**190**	**172**
Live Load (PSF)	150	150	150	150	150	150	**150**	**150**	**150**
P - dead (K)	83	119	81	144	171	135	**214**	**233**	**211**
P - live (K)	94	94	94	135	135	135	**184**	**184**	**184**
Pu (K)	249	293	248	389	421	377	**551**	**573**	**547**
Level 4	Level 4	Level 4	Level 4	Level 4	Level 4	Level 4	**Level 4**	**Level 4**	**Level 4**
Dead Load (PSF)	192	250	190	220	250	210	**235**	**250**	**232**
Live Load (PSF)	40	40	40	40	40	40	**40**	**40**	**40**
P - dead (K)	120	156	119	198	225	189	**288**	**306**	**284**
P - live (K)	25	25	25	36	36	36	**49**	**49**	**49**
Pu (K)	184	228	183	295	328	284	**424**	**446**	**419**
Level 3	Level 3	Level 3	Level 3	Level 3	Level 3	Level 3	**Level 3**	**Level 3**	**Level 3**
Dead Load (PSF)	192	250	190	220	250	210	**235**	**250**	**232**
Live Load (PSF)	40	40	40	40	40	40	**40**	**40**	**40**
P - dead (K)	120	156	119	198	225	189	**288**	**306**	**284**
P - live (K)	25	25	25	36	36	36	**49**	**49**	**49**
Pu (K)	184	228	183	295	328	284	**424**	**446**	**419**
Level 2	Level 2	Level 2	Level 2	Level 2	Level 2	Level 2	**Level 2**	**Level 2**	**Level 2**
Dead Load (PSF)	192	250	190	220	250	210	**235**	**250**	**232**
Live Load (PSF)	40	40	40	40	40	40	**40**	**40**	**40**
P - dead (K)	120	156	119	198	225	189	**288**	**306**	**284**
P - live (K)	25	25	25	36	36	36	**49**	**49**	**49**
Pu (K)	184	228	183	295	328	284	**424**	**446**	**419**
Level 1	Level 1	Level 1	Level 1	Level 1	Level 1	Level 1	**Level 1**	**Level 1**	**Level 1**
Dead Load (PSF)	192	250	190	220	250	210	**235**	**250**	**232**
Live Load (PSF)	40	40	40	40	40	40	**40**	**40**	**40**
P - dead (K)	120	156	119	198	225	189	**288**	**306**	**284**
P - live (K)	25	25	25	36	36	36	**49**	**49**	**49**
Pu (K)	184	228	183	295	328	284	**424**	**446**	**419**

	25' Bay Spacing			30' Bay Spacing			**35' Bay Spacing**		
	Two-Way Flat Slab with Drop Panels 9" deep slab 7" deep X 8'-4" square drop panel 2.7 PSF Grade 60 reinforcement 0.815 CF/SF 4000 PSI concrete	Waffle Slab 30"X30" voids with 6" ribs @ 36" 14" rib depth + 4 1/2" slab depth 2.1 PSF Grade 60 reinforcement 1.20 CF/SF 4000 PSI concrete	One-Way Pan Joist 30" forms + 6" ribs @ 36" 14" rib depth + 4 1/2" slab depth 3.6 PSF Grade 60 reinforcement 0.80 CF/SF 4000 PSI concrete	Two-Way Flat Slab with Drop Panels 11" deep slab 9" deep X 10'-0" square drop panel 3.5 PSF Grade 60 reinforcement 1.00 CF/SF 4000 PSI concrete	Waffle Slab 30"X30" voids with 6" ribs @ 36" 14" rib depth + 4 1/2" slab depth 2.7 PSF Grade 60 reinforcement 1.20 CF/SF 4000 PSI concrete	One-Way Pan Joist 30" forms + 6" ribs @ 36" 16" rib depth + 4 1/2" slab depth 4.8 PSF Grade 60 reinforcement 0.93 CF/SF 4000 PSI concrete	**Two-Way Flat Slab with Drop Panels 9" deep slab 11" deep X 11'-8" square drop panel 4.5 PSF Grade 60 reinforcement 1.10 CF/SF 4000 PSI concrete**	**Waffle Slab 30"X30" voids with 6" ribs @ 36" 14" rib depth + 4 1/2" slab depth 3.6 PSF Grade 60 reinforcement 1.20 CF/SF 4000 PSI concrete**	**One-Way Pan Joist 30" forms + 6" ribs @ 36" 20" rib depth + 4 1/2" slab depth 5.6 PSF Grade 60 reinforcement 1.08 CF/SF 4000 PSI concrete**
Basement	Basement	Basement	Basement	Basement	Basement	Basement	**Basement**	**Basement**	**Basement**
Dead Load (PSF)	192	250	190	220	250	210	**235**	**250**	**232**
Live Load (PSF)	40	40	40	40	40	40	**40**	**40**	**40**
P - dead (K)	120	156	119	198	225	189	**288**	**306**	**284**
P - live (K)	25	25	25	36	36	36	**49**	**49**	**49**
Pu (K)	184	228	183	295	328	284	**424**	**446**	**419**
P - dead (K)	1258	1619	1244	2061	2331	1967	**2905**	**3089**	**2868**
P - live (K)	384	384	384	554	554	554	**705**	**705**	**705**
P (K)	1642	2003	1628	2615	2885	2520	**3610**	**3794**	**3574**
Pu (K)	2124	2558	2108	3359	3683	3245	**4615**	**4835**	**4571**
P - dead (K)	657	838	650	1071	1206	1024	**1466**	**1558**	**1447**
P - live (K)	259	259	259	374	374	374	**460**	**460**	**460**
P (K)	916	1097	909	1445	1580	1397	**1926**	**2018**	**1908**
Pu (K)	1203	1420	1195	1883	2045	1826	**2495**	**2606**	**2473**
Design Pu (K)	996	1213	988	1584	1746	1527	**2127**	**2237**	**2105**
Column Size		24" X 24" + 12-#14 @ 6000 PSI			26" X 26" + 16-#14 @ 6000 PSI			**30" X 30" + 16-#14 @ 6000 PSI**	
Design Pu (K)	1817	2250	1800	2916	3240	2803	**4050**	**4271**	**4006**
Column Size		30" X 30" + 12-#14 @ 6000 PSI			36" X 36" + 16-#14 @ 6000 PSI			**40" X 40" + 16-#14 @ 8000 PSI**	
Footing Size (FT)	13	14	13	16	17	16	**19**	**19**	**19**
Details		4'-0" X 14'-0" SQ + 15-#11 EW			5'-6" X 17'-0" SQ + 20-#11 EW			**6'-6" X 19'-0" SQ + 23-#11 EW**	

Dane County Jail Consolidation

Schematic Design Report

Report prepared by

Mead & Hunt

In association with

Potter Lawson
Success by Design

HDR

Gilbane

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Dane County Jail Consolidation

Schematic Design Contents

1 Introduction

The following Schematic Design Report is based on the work started in July of 2019 by the Architect/Engineer (AE) consulting team of Mead & Hunt, Potter Lawson, and HDR; Staffing Plan by MJ Martin; Cost Estimating by BCC and The Concord Group and the County's Construction Manager (CM) Gilbane.

Project Goals Include:

- Provide one consolidated jail facility.
- Replace the outdated cell blocks in the City County Building to improve inmate and staff security.
- Provide appropriate medical and mental health housing
- Provide additional program, education and recreation spaces.
- Eliminate or greatly reduce solitary confinement.
- Provide visitation at the housing units.
- Provide multipurpose space to meet the spiritual needs of the inmates.
- Provide a downtown location close to the courthouse and bus transportation.
- Reduce the total number of beds. (1013 to 922)
- Improve staffing and operational costs.
- Minimize impacts to the existing operation during construction.
- Replace the Ferris Huber Center.
- Project Budget = $148M

This report and the attached drawings further details the Schematic Design of the Dane County Jail Consolidation Project which includes providing a South Tower Addition and renovation to parts of the existing Public Safety Building (Jail).

2 Acknowledgements

The team of Mead & Hunt, Potter Lawson, HDR, MJ Martin, and Gilbane would like to thank and acknowledge the assistance and the important contributions made by the following individuals and committees. Without their help and support, this schematic design would not have been possible.

County Executive's Office

Joe Parisi, Dane County Executive

Josh Wescott, Chief of Staff

Department of Administration

Greg Brockmeyer, Chief Administration Officer and Director

Charles Hicklin, Chief Financial Officer and Controller

Dane County Department of Public Works, Highway & Transportation

Jerry Mandli, DCPW Commissioner/Director

Scott Carlson, Project Manager

Todd Draper, Deputy Director

Dane County Sheriff's Office

Sheriff David Mahoney

Chief Deputy Jeff Hook

Captain Chris Nygaard

Lieutenant Jeff Heil

Michelle DeForest

Deputy Kurt Lochner

Deputy John Reiser

Deputy Greg Wagner

Deputy Mark Richardson

Deputy Cole Blakey

Department of Corrections

Nathan White

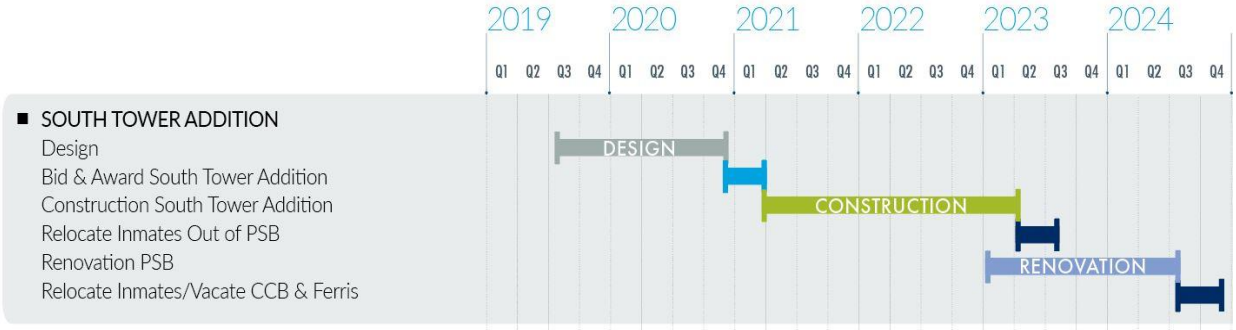
We would also like to thank the Sheriff's Office, County Staff and Board Members that have helped us understand and address the issues of the Dane County Security Service.

3 Project Schedule

The following high-level project schedule shows the durations for design and construction of the South Tower Addition and the PSB Renovations.

Project Schedule highlights include:

- This estimated project schedule is based on a Design-Bid-Build Project Delivery method.
- This estimated project schedule is based on Design completing in 2020 with a 3-month Bid and Award phase.
- The proposed schedule includes a 24-month Construction phase for the South Tower Addition and an 18-month procurement and renovation construction phase of the existing PSB. A 6-month procurement phase is overlapped with the completion of the South Tower Addition Construction and the DCSO Transition (Move) phase. This overlap will save time by allowing the General Contractor/Construction Manager to start the submittal process and purchase and store materials just ahead of the estimated 12-month renovation construction phase.
- The Project Team will be updating the detailed project schedule at the start of the next phase of design – Design Development.
- The Project Team is planning to bring on the selected Detention Equipment Contractor (DEC), the Security Electronics Contractor (SEC) and the prefabricated Steel Cell manufacture to provide Design Assist for this project in early 2020.
- The Project Team is planning to issue an early site electrical construction package to relocate the primary electrical service to the Courthouse. The electrical vault is below the ramp to the Courthouse and needs to be removed from the footprint of the South Tower prior to starting construction in 2021.



4 Operational Approach

The Dane County Jail Consolidation project will incorporate proven principles and concepts in effective inmate supervision. The facility is designed to use the Direct Supervision model of inmate management. In the Direct Supervision model, deputies are stationed directly in housing units where they can actively and continuously interact with and supervise inmates. With their continuous presence, deputies are able to identify potential problems at the lowest level and prevent them from escalating. Jurisdictions with facilities designed and operated as Direct Supervision have experienced reduced levels of vandalism, violence, and other inmate misbehavior. Experience has demonstrated that most classifications of inmates may be effectively managed in Direct Supervision settings.

The facility design also incorporates transitional housing for inmates who require more restrictive settings to address specific risk or behavioral issues. In these housing areas, deputies are stationed close so they can interact and supervise inmates in more controlled settings. When inmates are placed in this type of housing, the goal is to transition them to less restrictive settings in a timely manner consistent with their behavior. The transitional housing will be used only as a last resort for inmates who present a security/safety threat to the facility or others; those who fail to consistently adjust their behavior to follow the jail's rules and regulations and cannot be housed in a general population environment. Inmates in transitional housing generally retain the same access to programs, services, activities, etc. as the general population and will be given opportunities for out of cell time for counseling, programs, exercise, visitation, and eating in small congregate numbers.

The facility is designed to promote positive behavior from the time inmates enter the facility. The intake and booking area incorporate an "open booking" concept where cooperative inmates are seated in an open area while awaiting processing. Secure holding cells are also available. Lighting, colors, finishes, and furnishings in both the intake area and facility-wide provide environmental cues of expected positive inmate behavior through the use of biophilic design concepts.

An objective classification process will be used to assess risk and needs of inmates to determine appropriate housing assignment. Orientation will be provided to convey behavior expectations in a positive way and to provide newly admitted inmates with information they need to function within the jail.

In housing units, inmates will have opportunities to stay productively occupied through a variety of structured and unstructured activities. Providing treatment and programming to the inmates is one of the ways Dane County hopes to reduce recidivism. In an effort to help achieve this, increased programs and services will be offered. Meeting rooms where inmates may attend programs are located inside or adjacent to housing units where possible. Centralized programming space will also be provided.

The facility design provides for a robust mental health and medical component. Different types of housing for inmates with medical and mental health issues of varying levels of acuity will be provided. Health professionals will be stationed directly in the medical and mental health housing alongside the deputies to provide needed services.

Improvements have also been made to provide for more efficient provision of support services, including food services and laundry. Technology is incorporated to enhance communication, security, and overall facility safety. Visitation spaces have been accommodated at each housing unit to allow more access to visitors for inmates in the facility.

The facility concepts incorporated into the planned consolidation and renovation work in concert to provide a facility that is staff-efficient and is safe and secure for staff, visitors, and the community.

5 Building and Site Organization

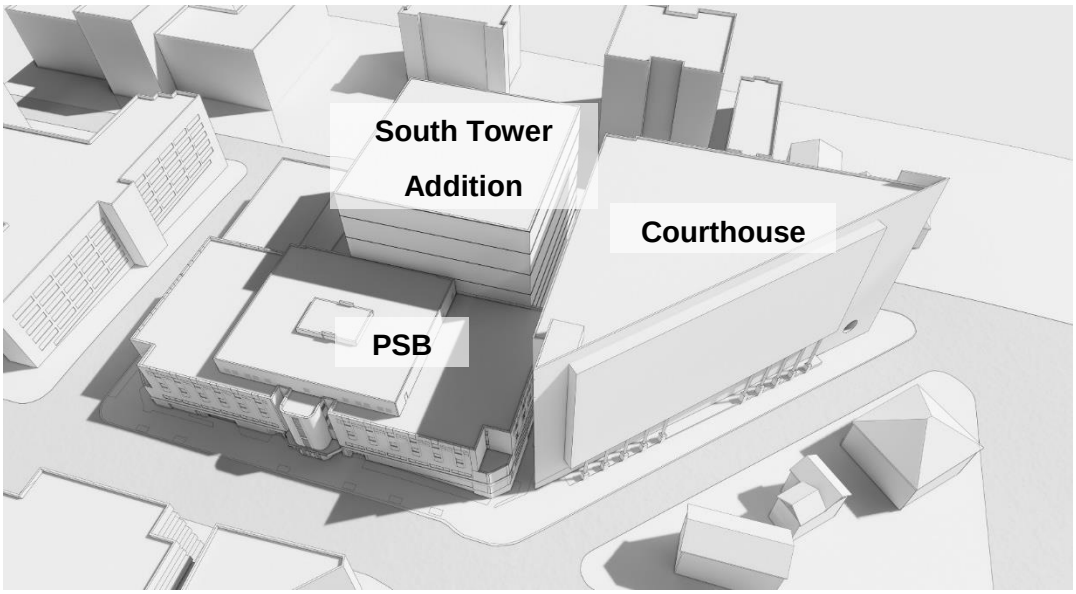


Figure 1 - Conceptual Massing Diagram

Site Organization & Design

The tower addition occupies an area of the site that accommodates a parking structure and two vehicular ramps, one that accesses the Dane County Courthouse to the southwest, and another that accesses the lower levels of the Dane County Jail. A dock that serves the Courthouse and Jail is located on the upper level of the parking structure. The footprint of the South Tower extends over the ramps, requiring each ramp to be reconfigured. The tower site includes frontage on Wilson Street, and is adjacent to privately owned properties at the corner of Wilson and Carroll Streets.

Figure 2 - Existing Courthouse & PSB

The design of the site reflects both the buildings location in downtown Madison and its mission as a secure facility. The Wilson Street Façade recognizes the dignity of the adjacent courthouse, the importance for discretion with regards to the secure vehicular ramps, and the desire to be an active presence in vibrant downtown Madison. The utilitarian functions of the dock will reside behind closed doors, and the scale of façade in this zone is appropriate for the pedestrian nature of the street. Building services, warehousing, facilities services and waste collections are to occur at a new level, Sub-Basement 2, which is accessed from the Courthouse parking garage access ramp. All building services will enter

Figure 3 - Project Location

from Wilson Street. Located between the Courthouse and the PSB Sub-Basement ramps will be two interior docks. Both of which are designed for dock level delivery. The raised floor will have levelers which adjust for vans or semi-trailers. The larger dock truck bay is 60' deep to allow for semi-tractor trailer deliveries. Given the extreme temperature swings that Madison experiences, both heating and ventilation will be included in the dock.

Figure 4 - Project Site & Existing PSB

The design provides a clear circulation strategy by physically separating primary entries for the public, for staff, for building services, and for secure inmate movement. The existing Vehicular Sallyport will remain, with an entry from Doty Street and exit to Carroll Street. The use of the Vehicular Sallyport will be restricted to arrestees and processing, reducing the transport function from this area. On Carroll Street, a new public entry will be provided for individuals reporting for outstanding warrants. Public access for Visitation, Jail Administration, and the Dane County Sheriff's Office will remain at the existing Doty Street lobby, the Public Safety Building's (PSB) primary historically identified public entry. Additionally, access to Jail Diversion will be provided from the main public lobby. The Doty Street façade of the Dane County Jail will be modified to include a new door for the Huber Entry & Exit. By providing a separate entry for inmates going to and from work, the design alleviates congestion in the main lobby and provides an opportunity to improve the important public facing functions of the jail lobby.

Construction Phasing

Construction will be phased in a manner which supports continued operation of the existing PSB while the new South Tower is constructed. This approach will maintain access for the existing courthouse and access to the Public Safety Building (PSB). The South Tower needs to be constructed and occupied prior to the renovation of the PSB. Existing occupants of the PSB will be relocated to the South Tower during the PSB renovation.

Building Organization & Design

The Dane County Jail Consolidation Project is comprised of a new 8-level tower, as well as two lower levels, and renovated spaces in the existing Public Safety Building. The design seeks to create a single, cohesive facility by aligning the floors of the South Tower with the existing building and coordinating services and building systems accordingly.

Certain programmatic functions were located to provide connections to existing spaces within the PSB. New space for Security Operations is provided on Level 1, proximate to the existing booking area and visitation. Additionally, a Transitional Housing unit and new dormitory housing for Male Reception are located on Level 1, as these are housing units that often require quick response from security staff.

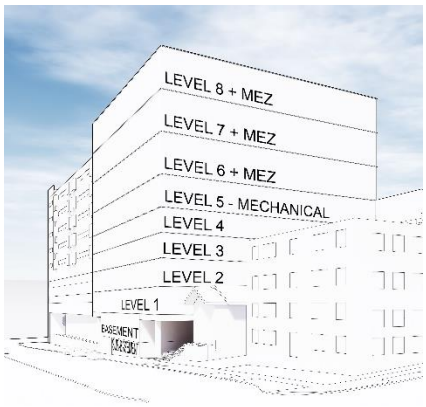


Figure 5 - Project Floor Concept

In an effort to provide separation of Youthful Inmates from the adult population, the new male and female housing units for youths are on Level 2, with only an emergency connection between youth housing and the adjacent Dane County Sheriff's Office.

Female Housing is consolidated on Level 3, in the existing Huber dormitories and 2 new 32-bed general population units. Programming space, including classrooms, for the female population is centrally located near the Huber and GP housing units.

Medical and Mental Health Housing has been collocated on Level 4, with the outpatient clinic and health services administration. The clinic will be used by the entire jail population.

On Level 5, a mechanical floor has been located in the South Tower to connect to the existing PSB penthouse.

Levels 6-8 accommodate new male GP 64 bed housing units, 2 units per level. These levels do not connect to the PSB. Providing housing for 384 inmates, the upper floors of the tower also provide the best opportunity for daylight and views of the sky from the facility.

Vertical Circulation

The consolidated jail will have two elevator cores. An existing, vacant elevator shaft in the PSB will accommodate a new elevator dedicated to the movement of visitors to levels 3 and 4 for non-contact visitation. In the South Tower, two elevators will stop at all levels for the delivery of goods and services and movement of staff and inmates. An additional elevator will connect each housing floor to visitation, allowing for non-contact visiting between inmates and visitors, both personal and professional. The South Tower.

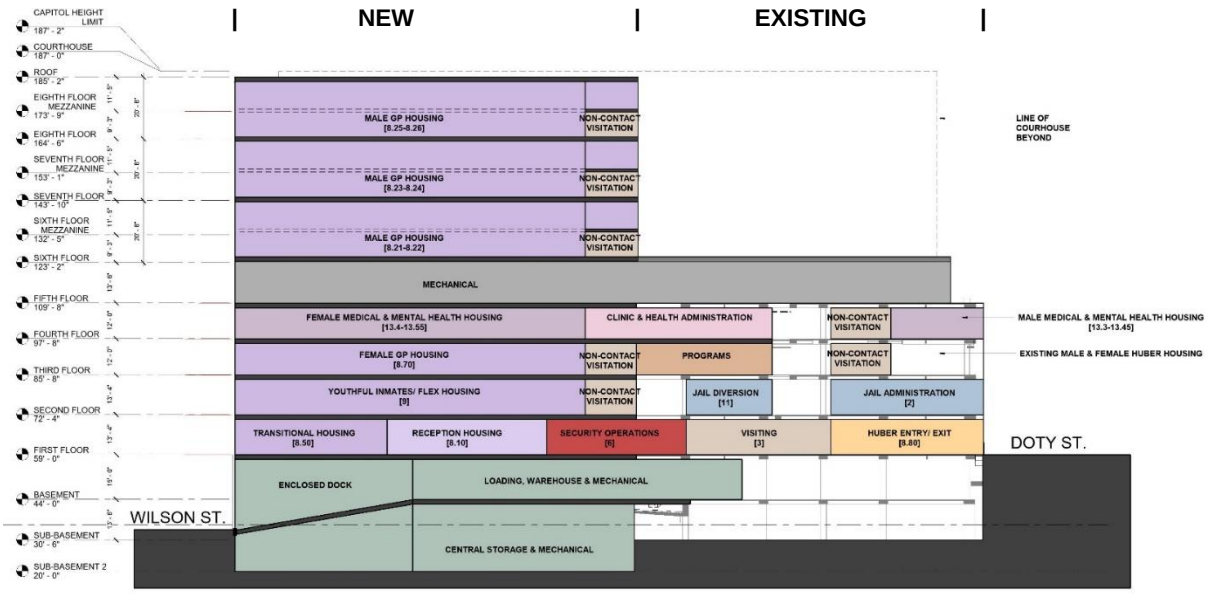
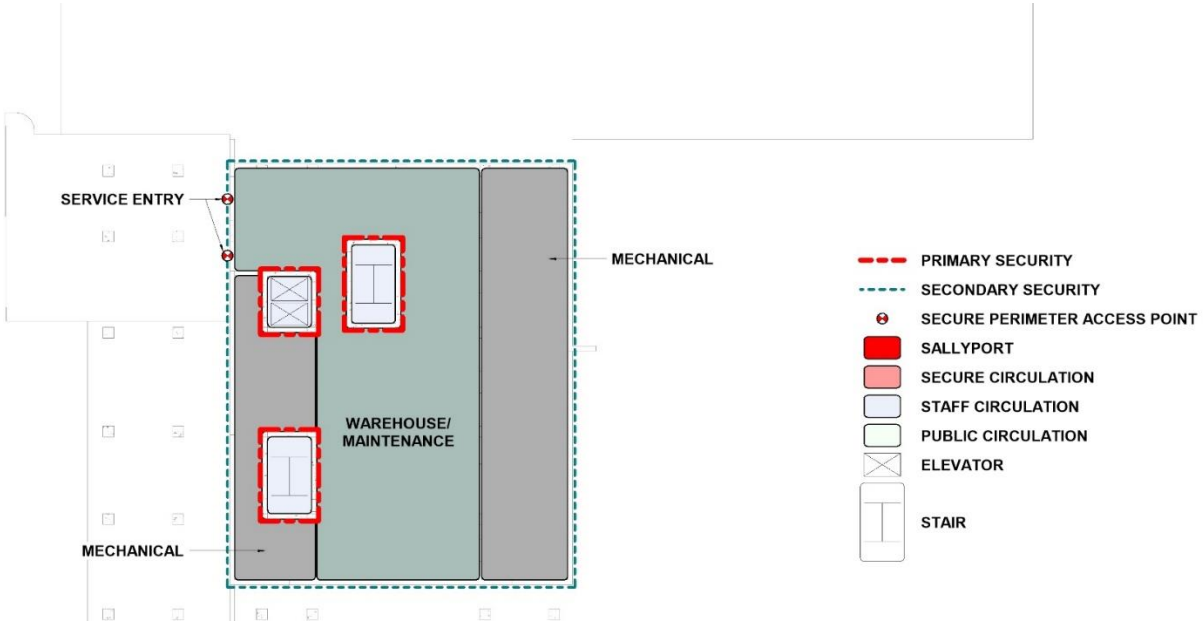


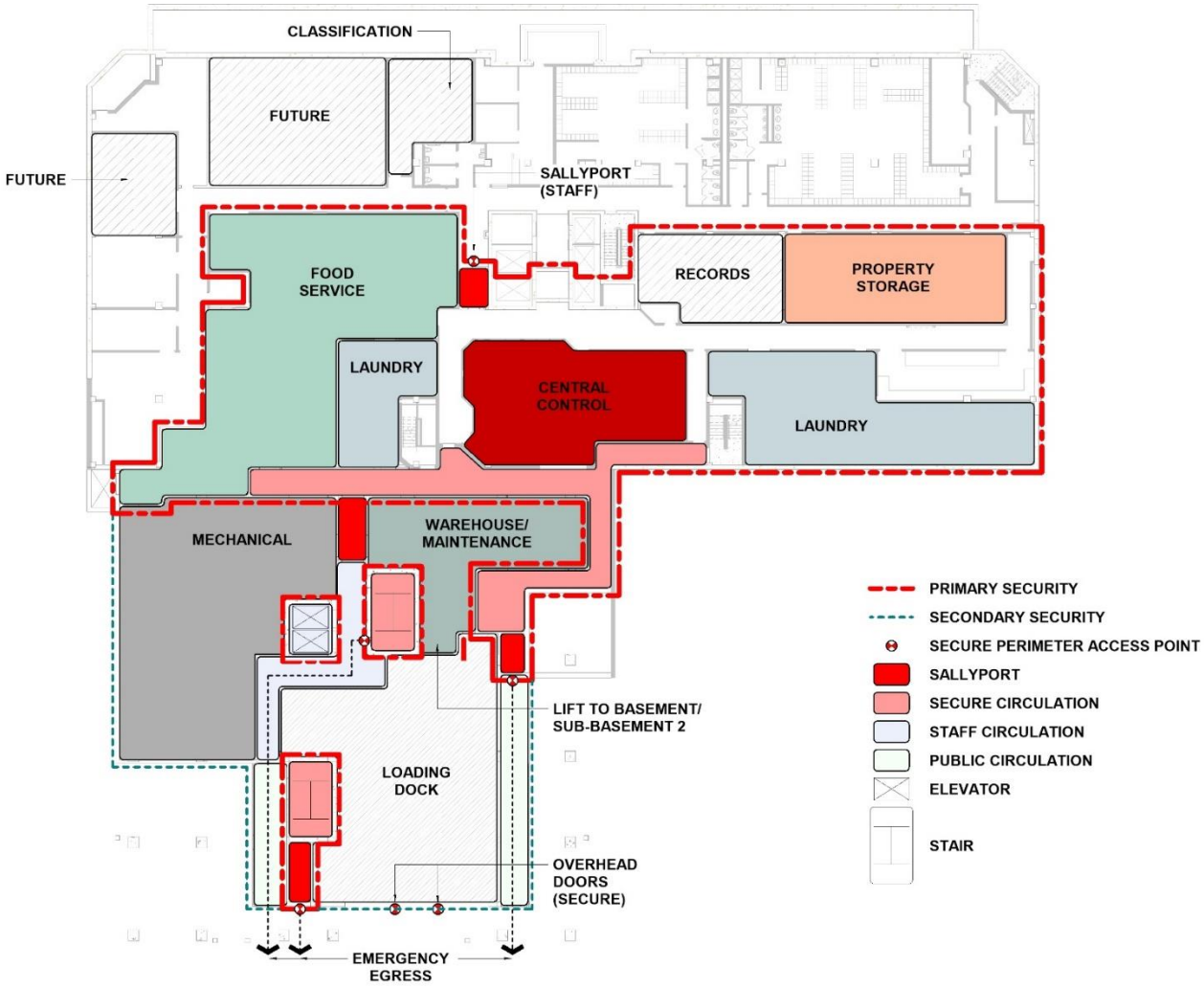
Figure 6 - Vertical Stacking by Department

Sub-Basement & Sub-Basement 2 levels



There is no Sub-Basement Level in the South Tower. A new level (Sub-Basement 2), approximately 10 feet lower than the existing Sub-Basement, will accommodate a central storage facility as well as mechanical space. A service entry, shared with the adjacent courthouse, provides access to the warehouse and mechanical spaces on this level.

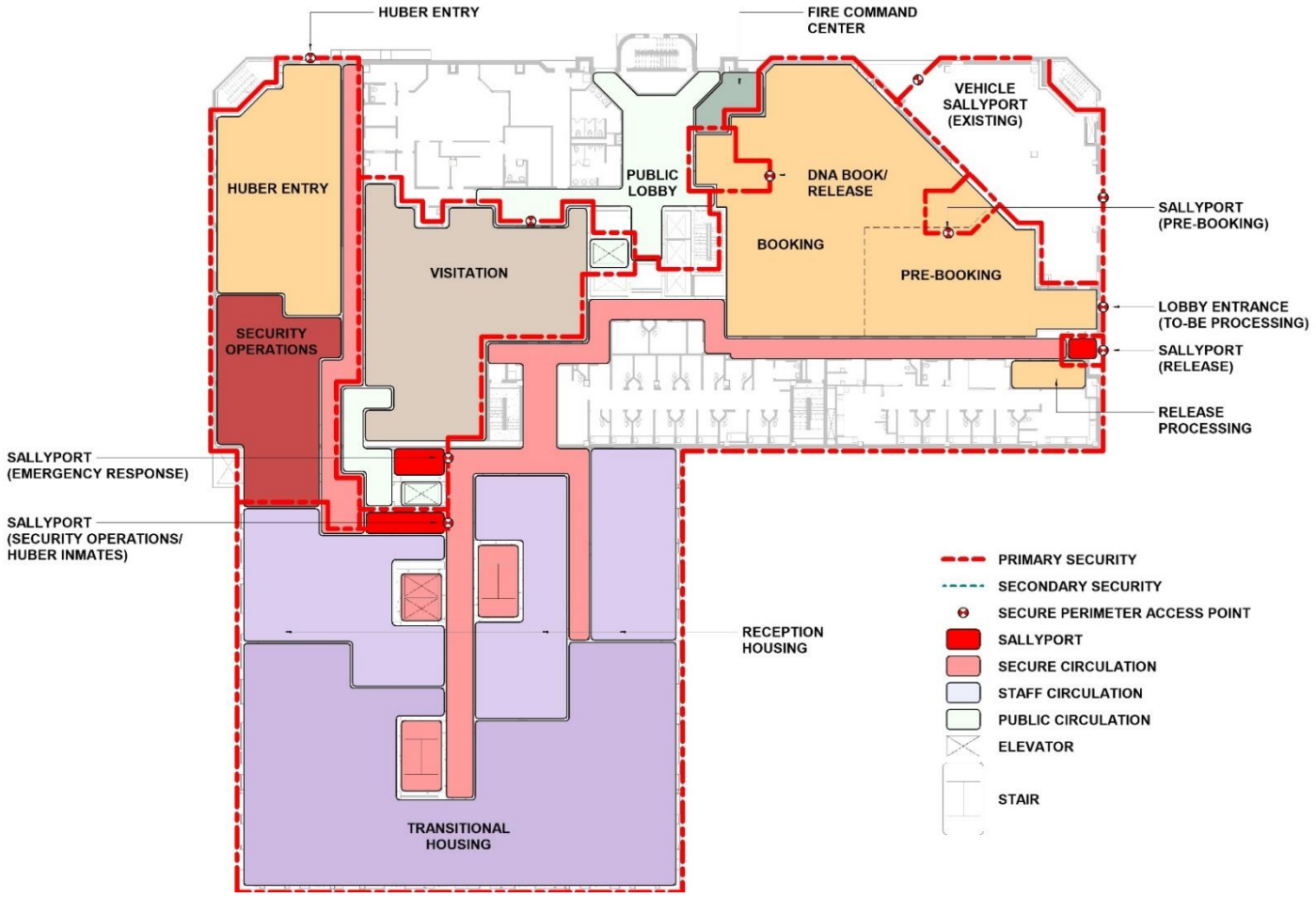
Basement level



Both Laundry and Food Services are outsourced. Food is precooked offsite by a County provider and delivered daily. Deliveries will be received at the new dock and moved to preparation and storage areas from both new construction and renovated space in the PSB at the existing Basement level. Renovation of the basement floor includes areas for food tray preparation, cold storage and cleaning of food carts, thermal trays and serving equipment. Storage will be created for the serving carts which will be required to complete the operations.

Laundry services are provided by contracted outsourcing for heavy linens. Personal linens are cared for internally within the facility. For delivered laundry there will be a storage area accessible from the new facility loading dock. In addition, a laundry area, designed for inmate personal laundry will be constructed within renovated space of the PSB. The renovated laundry area will be sized to allow for future laundry equipment to be added in the event they would like to bring laundry in house.

Level 1



Several primary exit/entry points to the facility are located on Level 1, and the design creates a clear and concise treatment of public, staff, and secure spaces to facilitate safe and efficient movement and operations. The Public Lobby will remain, but some of the functions currently accommodated in the lobby will be relocated. The Initial Appearance Court and Visitation will continue to be accessed through the Public Lobby. A Fire Command Center, adjacent to the Public Lobby, has been added that will serve the entire new and renovated facility.

The connection to Booking from the Public Lobby will only be for DNA Booking and Release. Inmate Property will be relocated, and the existing conveyor system will be moved to the new renovated space, connected to Booking by a new opening in the floor slab. Currently the properties coordinator assists the booking officers, and movement will be allowed through the properties area to the booking counters. Public interface with Property Storage will now be through a new entry lobby off Carroll Street. Release functions, as well as Warrants, will also be relocated to this new Carroll Street entrance. The existing booking area will be renovated to allow staff to observe and review the conditions of detainees as the arresting officer completes the commitment paperwork. Prior to acceptance to the jail, arrestees will remain in the custody and charge of the arresting officer. In order to prevent processing of individuals which should not be accepted, prescreening and verification will be completed outside of the Booking Area.

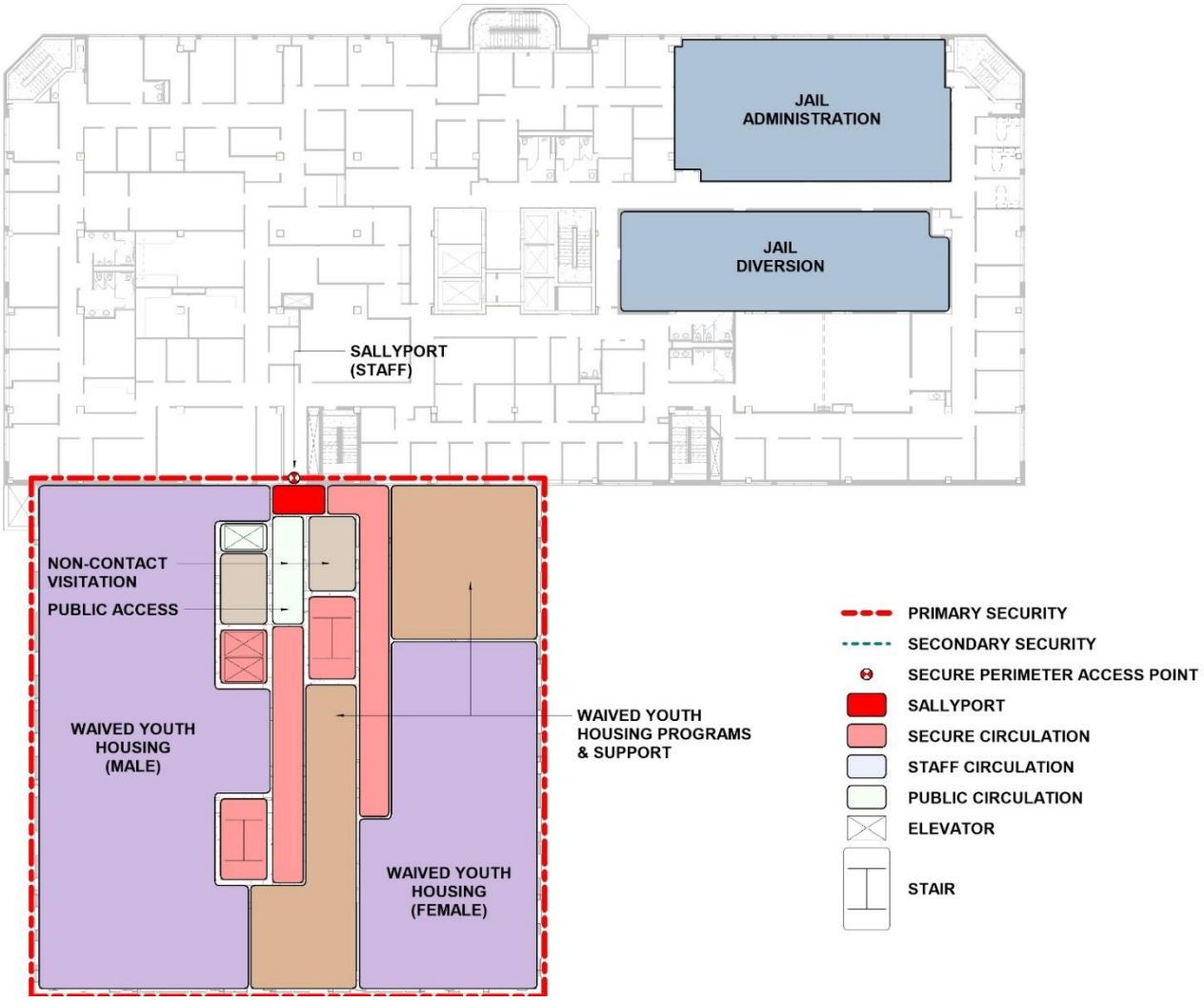
If determined not acceptable for admittance, the facility will not take custody of the arrestee, the Arresting Officer will leave with the arrestee. Acceptable detainees are admitted for booking where they wait in an open waiting area, as long as they are adhering to operational policies. Otherwise, they will be placed in holding.

The existing contact visitation area will be both renovated and expanded in its current location. A new screening process for visitors will be accommodated with space for a metal detector, and a pedestrian sallyport connected to the Public Lobby. Non-contact visitation can be provided in this area and this has been expanded to each housing floor. Visitors will be required to enter the controlled visitation area through a secure interlocking vestibule, then allowed to enter the elevator moving to the appropriate floor. In addition, the new visitation area will have private non-contact/attorney visitation booths, video visitation, hearing rooms and contact visitation tables.

A new entry will be provided off Doty Street for Huber inmates allowed to work or volunteer outside of custody. A ramp from the sidewalk, which is lower than Level 1, will be constructed within the property line to accommodate the change in elevation.

Two new housing units are located on Level 1. A new reception housing unit for males is located close to the new elevator core and the renovated booking area. Reception housing is used for short stays during classification and has been designed to allow for communication between inmates and Classification Officers. Because of the short length of stay, access to daylight was not prioritized for the dormitories, but any opportunity for borrowed light should be maximized. A new transitional housing unit is also located on Level 1. This unit will be subdivided into 12-bed pods, with single bed cells that each have access to a dayroom and recreation area. The purpose of this unit is to accommodate inmates that are having difficulty in general population, to provide them an opportunity to stabilize and work on behavioral and social skills to prepare them to return to general population. While the length of stay in this unit is envisioned as being relatively short, the nature of the inmates housed here and the importance of the programs they will receive demand special attention. Limited direct daylight into the unit will be available through the recreation area, so additional light will need to be provided into each cell through the rear chase. This will require detailed coordination of the mechanical systems in the chase, the arrangement of furnishings and fixtures in the cell, and the exterior glazing system of the facade.

Level 2

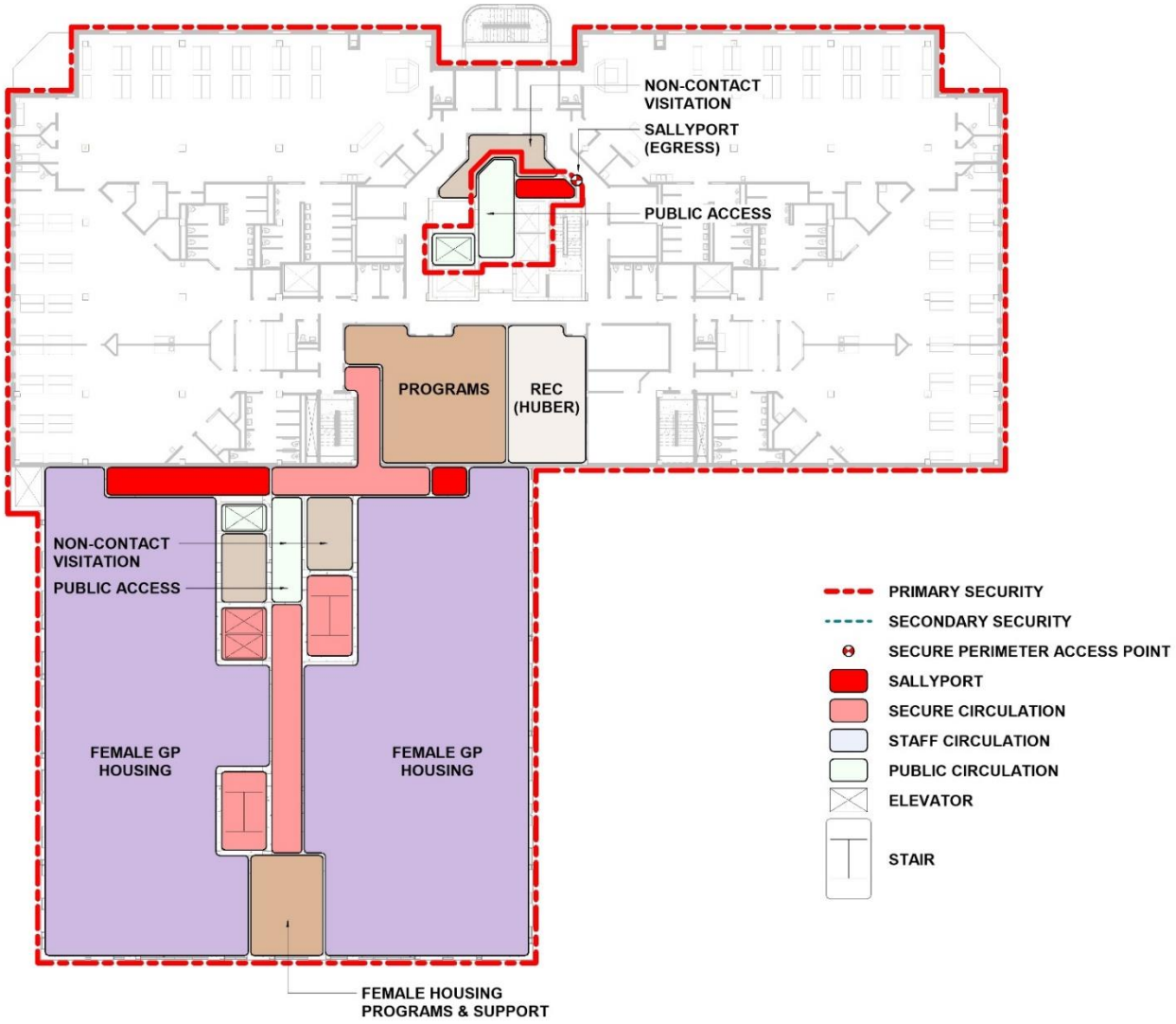


Renovations will occur in the existing PSB on level 2 to accommodate offices for the Sheriff's Office Jail Administration and Jail Diversion. The entry to Jail Diversion, which is accessible to the public, will be near the public elevators. The large conference rooms associated with Jail Diversion are envisioned to be spaces that are shared with other Sheriff's Office functions when not in use by Jail Diversion.

Juveniles are housed on the second floor within the new construction. There are three units designed to maximize flexibility. The area shares the same central core arrangement that's used for the upper level units located in the South Tower. Trends for juveniles support the use of diversion to jail incarceration. Therefore, the populations of juveniles in custody varies at any given period with males being the most common juveniles in custody. Female juveniles are less frequently placed in jail. Overall, the population in custody rarely exceeds more than 8 males or female juveniles. The three units are sized appropriately to allow more flexibility to house based on the number of juveniles in custody. These units have access to educational programs and recreational areas. The units are sized to accommodate up to 8, 12 and 28 total

beds when cells are double occupied. Best practice supports single occupancy for juveniles in custody; therefore, the three units will be reduced to 4, 6 and 14 single occupancy cells as necessary. State and federal laws mandate education programs for juveniles in custody. In addition, Dane County, as most communities housing juveniles in detention, provide program opportunities and social services support with a focus towards positive outcome measures and diversion from custody. Spaces are designed for social services support, programs and educations. For times when the juvenile populations in custody are low, the housing units are designed to be self-supporting to allow unused spaces to be assigned to the adult populations. Because of the partitioned nature of the new youth housing units for females, additional daylight will need to be brought into each cell from the rear chase.

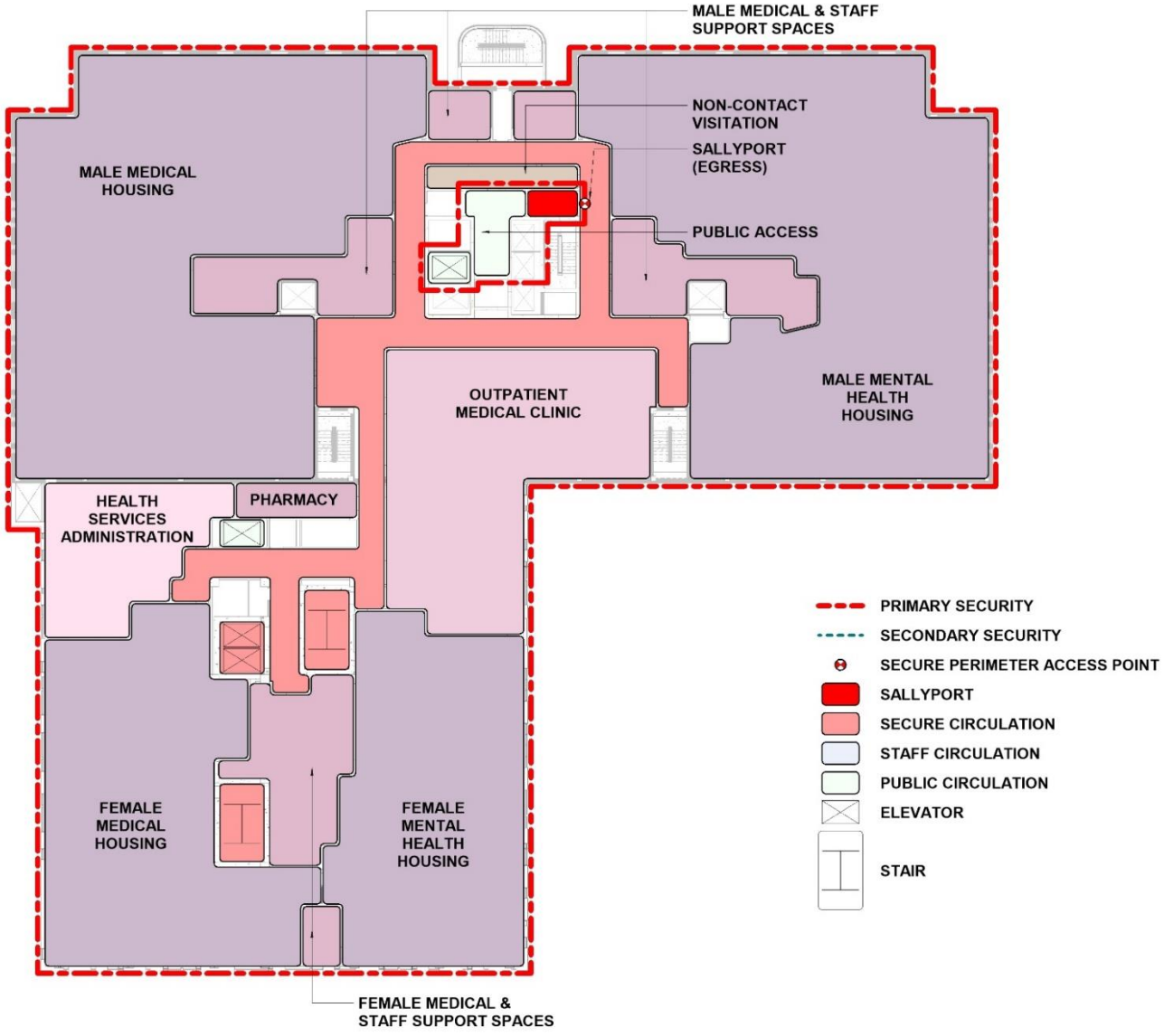
Level 3



Level 3 accommodates the male and female Huber housing in the consolidated jail. Additionally, new female GP units have been placed on this floor in the South Tower. To

support the DCSO's mission to provide more programming in the jail, the existing two story gym area will be infilled with classrooms. While the classrooms are multifunction and can be used by any of the inmates in the jail, they have been arranged to allow for use by females and males at the same time while maintaining separation. Non-contact visitation is provided adjacent to the existing PSB elevators, allowing public and professional visitors to come to the housing floor unaccompanied and outside of the secure perimeter of the jail. Visitors will check-in and be screened in the visiting space on Level 1, after coming in through the Public Lobby. Non-contact visitation is also provided at the female GP units, with visitors checking in and using a dedicated elevator in the South Tower.

Level 4

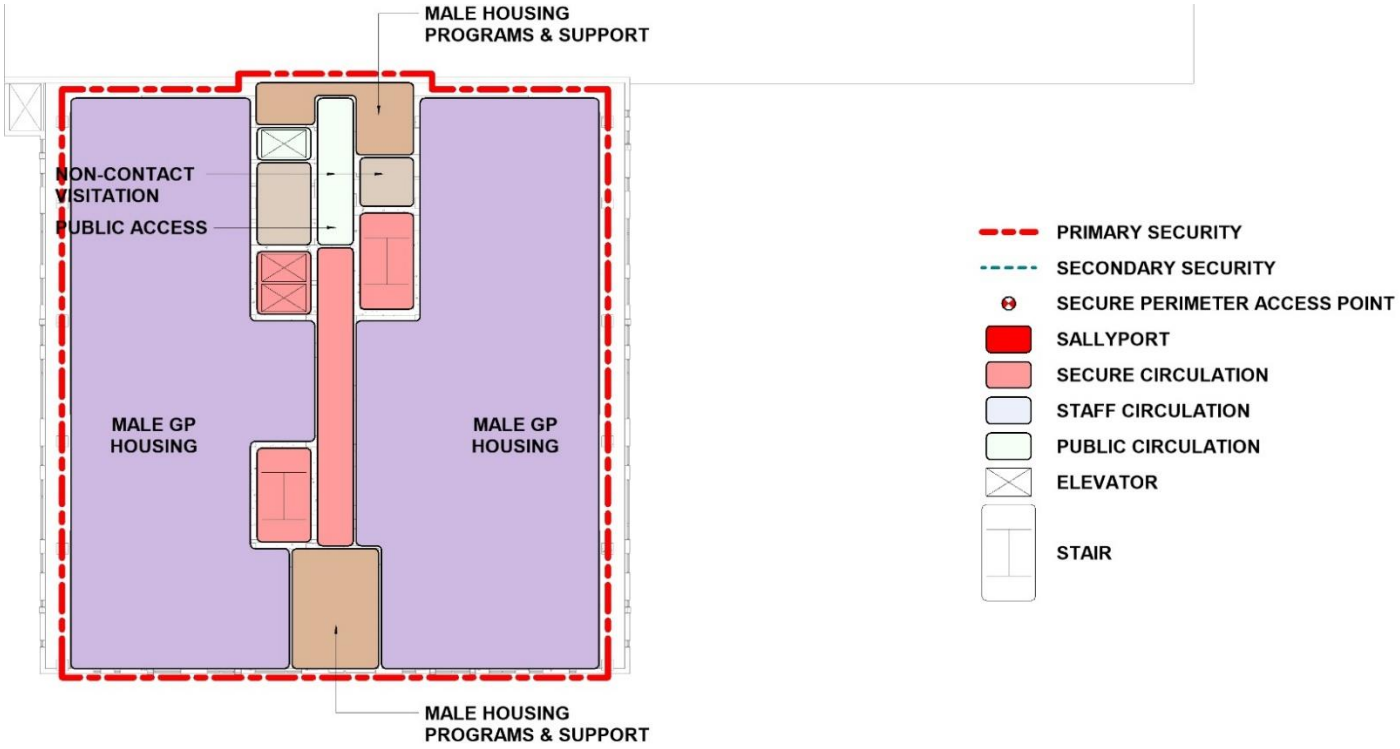


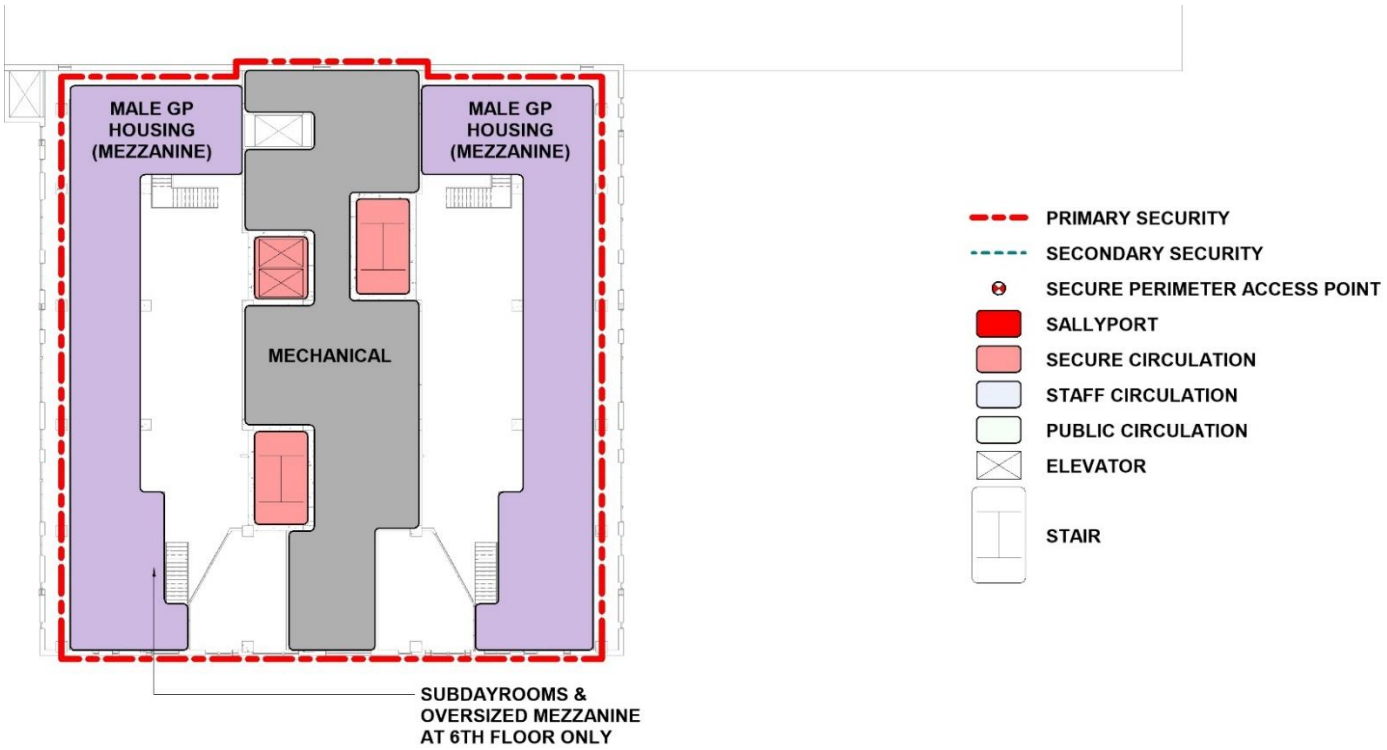
All the medical and mental health housing in the consolidated jail is collocated with the outpatient medical clinic and medical staff offices on Level 4, which enhances staff efficiency and leverages shared services. The clinic is in the new space created in the existing gym infill area through the addition of a new floor. The medical and mental health housing units each serve different levels of acuity from a shared support core, which includes a housing officer post, nurse's station, and mental health staff offices. The male mental health housing units are located such that daylight may be brought in through some new roof skylights, to supplement light that comes directly into the cells through the mechanical chase. Non-contact visitation is provided adjacent to the existing PSB elevators, allowing public and professional visitors to come to the housing floor unaccompanied and outside of the secure perimeter of the jail.

Level 5

Level 5 of the South Tower is a mechanical and utility support floor that works with the existing 5th level PSB penthouse. Additional mechanical equipment, including a large cooling tower, will be placed on the east side of the PSB roof.

Levels 6, 7 & 8





Male inmates in General Population will occupy the top 3 levels of the South Tower. The housing units, which each accommodate 64 inmates, are designed with tiered cells around a large, open dayroom. On Level 6, each housing unit has a 4-bed flex sub-pod that can be used for inmates that require some separation before returning to the larger unit, or for inmates that have demonstrated good behavior. The units are designed with large expanses of glass on the south facade to allow daylight to saturate the dayroom. Daylight will be borrowed into each cell through clear glass in the cell door, with the expectation that inmates in the units will spend most of their day in the dayroom or outside of the unit participating in programs. The finishes in the unit reflect a desire to provide a more normalized, treatment focused environment for inmates. With a centrally located housing officer workstation, the dayroom is organized into two distinct zones, allowing inmates a certain degree of autonomy during the day. One side of the dayroom has fixed tables for dining and other group activities, while the other side will have movable seating that is intended for passive activities such as watching TV. In an effort to mitigate the negative health impacts of excessive noise, carpeting is intended for the flooring material in this area and the ceiling will be commercial grade acoustical tile, which also serves to normalize the environment.

A layered approach has been taken to amenities and programs in the male GP units. While each unit can be considered self-sufficient, with programs and recreation provided directly from the dayroom, the design also includes shared spaces that allow inmates the opportunity to participate in activities with other inmates from different units. The additional programming space also allows a wider variety of programs to be provided simultaneously. Each housing unit will have uniform infrastructure for providing dayroom amenities, which will allow the DCSO

to make adjustment to offerings based on the current classification demographics of the population.

INTERIOR DESIGN

The desire of the Dane County Sheriff's Office is to provide inmate housing that is safe, humane, and supportive of treatment. Wherever possible, the design team has taken an approach that introduces colors, texture, and imagery that is appropriate for the inmate population and has characteristics that reduce stress. Biophilic design elements, such as landscape views and natural materials, are featured in the dayroom spaces, programs rooms, and visiting area.

Design images in the drawing set illustrate the interior design concepts further.

6 Area Summary and Bed Count

DCJ CONSOLIDATION PROGRAM SUMMARY								
Department Number	*Sub-Department Number*	*Department Name*	*Staff per Area*	*Total Staff*	*Program Area (NSF)*	*Departmental Area (DGSF)*	*Actual DGSF*	*Beds*
01		PUBLIC LOBBY			520	676	921	
02		JAIL ADMINISTRATION			2,135	2,882	3,255	
03		VISITATION			3,385	4,739	5,479	
04		INITIAL APPEARANCE COURT			-	-		
05		STAFF SUPPORT			3,630	4,356		
06		SECURITY OPERATIONS			2,625	3,806	4,007	
07		INTAKE/ TRANSFER/ RELEASE			5,103	7,399	7,798	
08		HOUSING (ADULT)			60,093	97,571	82,203	
	100	MALE RECEPTION HOUSING			4,232	6,137	4,281	44
	200	MALE GENERAL POPULATION			41,064	67,756	53,504	256
	250	MALE GENERAL POPULATION (FLEX)			-	-	-	128
	500	MALE TRANSITIONAL			3,714	6,128	7,588	24
	700	FEMALE GENERAL POPULATION			8,828	14,566	11,821	60
	800	HUBER ENTRY/ EXIT			1,055	1,424	2,363	
	950	DECENTRALIZED PROGRAMS & ACTIVITIES CENTER			1,200	1,560	2,646	
		HOUSING (EXISTING)						246
09		HOUSING (YOUTHFUL INMATES)			8,606	14,200	10,381	46
10		PROGRAMS & SERVICES			5,310	7,169	2,439	
11		JAIL DIVERSION			2,855	3,712	2,321	
12		INDUSTRIES			-	-		
13		HEALTH CARE SERVICES			4,859	6,560	2,519	
13		HOUSING (MEDICAL & MENTAL HEALTH)			16,779	27,391	34,778	
	200	OUTPATIENT CLINICAL SERVICES					3,773	
	300	MALE MEDICAL			5,903	8,855	12,779	40

	400	MALE MENTAL HEALTH	4,809	8,656	8,660	39
	500	FEMALE MEDICAL	3,468	5,202	5,129	22
	600	FEMALE MENTAL HEALTH	2,599	4,678	4,437	18
14		FOOD SERVICE	900	1,350	3,995	
15		LAUNDRY	470	705	2,888	
16		WAREHOUSE	4,005	4,406	8,905	
17		MAINTENANCE & CENTRAL PLANT	12,011	13,212	38,519	
18		DANE COUNTY SHERIFF'S OFFICE	3,000	4,050		
19		PARKING				
Subtotals			136,286	204,183	210,408	**923**
		Grossing Factor		30,627	62,195	
		Gross Building Area		**234,810**	**272,603**	**923**

7 Cell Construction

One of the critical decisions in the design of a correctional facility is the construction of the cells. The cell construction selected impacts cost, quality, schedule and future maintenance. The Dane County's Sheriff's Office, working with the design team reviewed Concrete Masonry (CMU), Precast Concrete Modular, Modular Steel Panel and Pre-Manufactured Modular Steel cells for the planned renovation and expansion. As a result of several building site constraints which include the limited site availability, the need to match up to the existing floors of the PSB, the need to stay under the building height requirement (capitol view preservation), and the total total number of beds needed, the focus moved from the significantly heavier and larger CMU & Precast Concrete systems to the lighter and more space efficient Steel Panels and Pre-Manufactured Steel Cells. To assure a full understanding of all availabilities, the project team reviewed products offered by Trussbilt, SteelCell of North America, Maximum Security Systems and Cornerstone Detention Products who represent the current available offerings for steel cell systems.

The intent of this schematic design report is to provide comparative information regarding prefabricated modular steel cells and steel cell panels. Information was gathered from all reputable manufacturers of modular steel and steel panel products. It is the intent of this report to provide information that can be compared to concrete masonry unit (CMU) construction.

Legend

◙ Best ● Better ○ Fair

	Modular Steel	Steel Panel	Concrete Masonry	
Initial Cost	◙	●	○	Initial costs in the speed and sequencing of construction activities favor the prefabricated modular units. Close behind are steel panel cells which are lightweight and can be erected quickly.
Operation & Maintenance	◙	◙	●	All 3 systems are durable and long lasting with routine cleaning and maintenance. Coatings for steel cells and steel panels are high performing and should have very little maintenance. Coatings for CMU are similar; however the natural imperfections in the face of CMU units cannot achieve the same cleanliness standards.
Program Ramifications	◙	◙	○	With thinner walls, both modular and panelized steel cells systems take less overall square feet.

Fabrication	◙	●	○	Fabrication of modular cells provides the best opportunity for higher quality and a better schedule if coordination and sequencing activities are managed by the contractor.
Schedule	◙	●	○	Fabrication of the modular steel cells can have a tremendous positive impact on the overall construction schedule with cell units being fabricated while the building structure is being constructed. When prefabricated units arrive, other trades need only provide hook-ups for internal building utilities. Steel panels do not offer quite the same opportunities for prefabrication, but assembly moves quickly. The panelized units are lightweight and come ready to assemble. CMU is more time consuming, take more coordination of steel reinforcing, grout and mounting embeds.
Sustainability	●	◙	◙	Both steel and masonry have opportunities to use recycled content. The analysis of carbon footprint and embodied energy can have a lot of unique variables. CMU has an advantage of production regarding closer proximity to the project site. Steel panels are lighter and easier to ship which reduces the carbon footprint. Modular steel cells are likely less efficient to ship, but more efficient to install on site.
Flexibility in Design	●	◙	◙	CMU and steel panels provide the most flexibility creating room that may vary slightly. However, there is enough repetition in most room types that modular steel cells are feasible.

In the past CMU was considered the most cost effective means for cell construction. However, the cumulative effect to scheduling, schedule management and increased building area, especially for building with multiple stories, the resultant cost as it compares to prefabricated or modular steel systems CMU has become higher in overall cost. When reviewing the total cost for a completed cell, steel panels and Modular pre-manufactured steel cells are competitive.

CMU construction can be weather sensitive and require extended schedules for installation. As a benefit, pre-manufactured and panelized cells are not affected by weather in that they are primarily constructed offsite, within a controlled building environment.

Panelized steel cell construction can provide benefits over concrete masonry unit or precast concrete cell construction. The reduced cell footprint due to thinner walls (2” versus 8”) and

reduced weight (less than half the weight of masonry / square foot) decreases the dead load and allows for a reduction of the structural frame and foundations.

In addition to the trade work mentioned above, panels and/or modules are delivered with electrical and special systems conduit, door frames, and other elements ready for acceptance and final connections by local trades.

The pre-manufactured steel cell product takes significantly less labor at the job site than concrete masonry unit cells. The steel cell modules arrive at a specific point in the schedule, thus will be on the critical path as they require large openings in the exterior wall and a crane to install. The modules will come with fixtures already installed; whereas the panels will require field labor for installation of fixtures. The steel cell panel will be installed after the superstructure has been completed.

As with most modular construction, steel modular cells can arrive at the project site pre-fitted with fixture cutouts, some fixtures and internal piping and wiring; ready for final connections by local trades which has a direct cost and quality advantage. Some steel panel/steel modular cell products can provide an R-values of up to R-7 per inch on the rear chase wall; contributing to the reduction of heating/cooling load.

A high performance epoxy or urethane coating is used for steel cells and/or panels and is a very durable inert non-porous surface that will remain easy to clean and sanitize. In addition, one manufacturer coats cells with electrostatic powder coating. Though durable and this may have an extended life, modular products are easily recoated. Smooth texture-less surfaces minimize sanitation to assist with control of staph and/or MERSA contamination.

- Primecoat is used by Trussbilt for both wall panels and pre-manufactured cells
- Sherwin Williams Polyurea is used by Steel Cell N.A & Trussbilt.
- Powder Cost is used by MSSI for Cells

Prefabricated modular cells and/or panels can represent a significant improvement in the overall schedule. The contractor will need to sequence key activities such as coordination with other trades along with review and approval of materials and systems. When the pre-fabrication activities are scheduled correctly, shop fabrication of modular or panelized cells can occur concurrently during the construction of the concrete structure. Steel modular and panel cells are not affected by weather conditions as much as concrete masonry.

8 Life Safety Codes and Design Standards

The South Tower Addition to the Dane County Public Safety Building (PSB) will be designed under the Wisconsin Commercial Building Code, amended in April 2018 which references the 2015 International Building Code (IBC) and 2015 International Existing Building Code (IEBC). The existing PSB, while constructed prior to the enactment of the International Building Code adoption in Wisconsin, appears from a review of the construction documents provided by the Owner to be constructed in accordance with IBC Type 1 Fire Resistive A Class of Construction with an unlimited allowable area.

The extents of the improvements to the PSB to be classified per IEBC 504.1, Alteration – Level 2 where alterations include the reconfiguration of space, the addition or elimination of any new doors or window, the reconfiguration or extension of any system, or the installation of any additional equipment up to 50 percent of the building area. The alterations planed may include about 70,000 SF of area in the existing PSB which has a total area of approximately 200,000 SF. Work in the existing PSB to follow IEBC Chapter 8 – Alterations-Level 2.

The new addition will be designed as a Type 1 Class of Construction (IBC 602.2) with an unlimited allowable area based upon the Class of Construction of the PSB and the new South Tower Addition. There is no requirement for a fire wall between the existing PSB and the new addition. The fire-resistive ratings for the new South Tower building addition elements would be as follows: 3-hour for primary structural frame, 3-hour for exterior and interior bearing walls, 1-hour for non-bearing exterior partitions, 2-hour for floor construction and 1-hour for roof construction (reduced per IBC 403.2.1.1), and 0-hour for non-bearing interior partitions.

The occupancy for the building will be Institutional Group I-3, Condition 4 (Jail), Business Group B (Sheriff's Office), and Low-Hazard Storage Group S-2 (Vehicle Sallyport, Parking Garage).

The existing PSB and new addition construction shall be constructed in accordance with an automatic sprinkler system per IBC 903.2.6 and NFPA 13.

Allowable area and height for the building would be unlimited per IBC Table 504.3 and 504.4. The Madison Zoning Code has a limit of 10-story per Madison Zoning Code 28.071(2) and height of 187.2-feet city datum, Capitol Preservation View limits per Madison Zoning Code 28.134(3).

Refer to Code Plans drawings for exiting requirements and other code requirements.

Accessibility (ADA) Improvements and Safety Upgrades:

Design References:

Building/Accessibility	2015 International Building Code, modified by Comm 61 and 62
Accessibility	ANSI 107.1 and American Disabilities Act Accessibility Guidelines

The accessibility (ADA) improvements for the building will be contained to those facilities required for public, staff and inmates use, including cells, showers, and toilet facilities.

The inmate housing cells will provide accessibility to a minimum 3% of all cells for compliance.

Wisconsin Department of Corrections:

Design References:

Building Chapter DOC 350 Register August 2014 No. 704, effective September 1, 2014

Physical environment for new and substantially remodeled jails to meet requirements of DOC 350.05.

At male and female housing areas, at least 15% of the jail's total number of cells shall be maintained for single occupancy.

9 Exterior Construction

The exterior envelope of the Dane County Public Safety Building (PSB) South Tower Addition will be a rain screen system. The first thought eight floors will consist of a stacked bond terra-cotta panel system (equal to NeaCera Adaptive System) with 3” of rigid rock wool insulation (R = 10) on a cold-formed steel framed exterior wall infill between structural perimeter beams. Between the terra-cotta at the floors will be a horizontal accent band of approximately 1’- 4” of aluminum composite metal (ACM) panels. The exposed portions of the lower floors (Dock and Basement) will consist of a face brick veneer with 3” of rigid rock wool insulation on a concrete masonry (CMU) exterior wall.

Exterior glazing to be 1” insulated glazed unit with translucent surface (R = 0.29) installed in a commercial grade aluminum curtainwall system with a 6” nominal wide cap or structural glazed at the vertical joints and structural glazed at the horizontal joints. Spandrel glazing to be 1” insulated glazed unit (R = 0.29) with 3” rock wool insulation (R = 12) installed in a commercial grade aluminum curtainwall system

Thin vane louvers to be provided where required for HVAC and fresh air to outdoor recreation space.

The roof system to be a fully-adhered EPDM on tapered rigid insulation (R = 25), sloped at 1/4” per 12” to storm water roof drains. An overflow roof drain system will be utilized.

During the next phase of design, the design team will explore the option of utilizing a green and/or a blue roof system to provide a storm water management system.

10 Interior Construction

Interior Cell Construction

Prefabricated modular steel cells are being considered for the areas with repetitive cell types. Modular steel panel cells will be utilized in areas where the Prefabricated modular steel cells are not used. The modular steel cells will be fabricated off site and shipped to the site for installation complete with detention doors, detention fixtures/equipment, plumbing and some electrical. Steel cell walls are coated with a polyurea (or similar high performance) coating.

Interior Construction

There will still be a significant amount of masonry for non-cell construction in the housing pods and for other secure areas throughout the building. Masonry will be grouted with flush seems, reinforced and will be painted with a high performance coating.

Non-secure areas – Primarily metal stud framing and gypsum board partitions. Abuse resistant gyp board will be used in many areas used by officers within the secure perimeter. Doors and frames will be welded hollow metal except wood doors may be used in some administrative and program spaces to soften the space.

Doors:

Detention Hollow metal doors and frames will be used for cells along with security glazing and food pass. Sliders are likely for doors along main circulation and may be considered for some housing mezzanine levels. Detention glazing will be detention grade laminate with physical attack resistance. The level of physical attack resistance will be determined in Design development based on ASTM testing criteria. Further determination of grades, attack resistance, door type and hardware will be in design development.

Non-detention interior doors will be determined in design development. Most swing style doors will be hollow metal doors and frames. Some wood doors may be used in non-secure administrative areas. Further determination of grades, attack resistance, door type and hardware will be in design development.

Wall Finishes

Surfaces will be painted, and materials may vary due to the anticipated durability, maintenance and repair. It is common for lower (reachable) wall surfaces in inmate areas to be coated with epoxy or similar high performance coatings. Administrative and public areas will also need to be a durable paint finish, but not likely as an epoxy coating.

- Painted masonry walls with flush seems will be used in secure areas (in addition to prefinished cells)
- Painted gypsum wallboard finishes will be used in public, administrative and staff spaces. GWB walls may be selectively used in educational and programs spaces. Abuse resistant may be used in select locations

- Tile wall finishes is anticipated in staff and public restrooms.
- Paints shall be no-VOC or low VOC as approved by Dane County.
- Any composite wood products shall use formaldehyde free binders to promote good indoor air quality.

Floor Finishes

Floor finishes will vary in the facility based on use and durability. More specific interior design workshop sessions will be scheduled, but the following are guidelines for common interior finishes. The following are presented to establish general parameters. It is understood that materials and finishes will be discussed in more detail with input from facilities and the CORE team.

- Resilient tile – used in corridors and other program spaces.
- Resilient Athletic Flooring – used in physical training areas and select inmate booking areas.
- Epoxy/Urethane Coating, slip resistant – used in inmate showers, kitchen/laundry area, medical areas and dayrooms. Sheet vinyl may be acceptable in some medical exam or treatment spaces.
- Tile Floor Finishes – public and staff restrooms
- Carpeting – likely carpet tiles used in administrative, program/education spaces, and select areas of inmate dayroom.
- Raised Access Flooring is used in control rooms.
- Polished/Sealed concrete is an option for corridors, housing and select inmate areas.
- Carpeting shall typically be carpet tiles in public areas and either broadloom or carpet tiles in administrative. Recycled/ recyclable content is preferred.
- Floor finishes in public areas are preferred to be either porcelain tile or terrazzo.

Ceiling Finishes

Ceiling finishes will vary widely in the facility based on use and durability. More specific interior design workshop sessions will be scheduled, but the following are common interior finishes.

- Security metal ceiling – used in areas where ceiling is within reach of an inmate and in areas that an inmate may be present without regular observation/supervision by a guard.
- Suspended acoustical ceiling – used in most corridors, public and staff. Also used in inmate dayrooms where the ceiling is not accessible or reachable. Hold down clips may be needed in select locations.

- Suspended gypsum board – used in areas that require a solid surface for durability, cleaning or as a deterrent to inmates.

Elevators

- All elevator cabs to be sized for gurney.
- Visitor's Elevators – one (1) passenger elevator located in existing PSB elevator shaft to transport visitors to third and fourth floor visitation areas. Elevator to be a 3,500 LB, 125 ft/min, holeless, hydraulic elevator with remote machine room at mechanical penthouse. Finishes and fixtures to be determine during Design Development.
- Visitor's Elevators – one (1) passenger elevator located in new South Tower Addition to transport visitors from first through eighth floor visitation areas. Elevator to be a 3,500 LB, 200 ft/min, machine-roomless traction elevator. Finishes and fixtures to be determine during Design Development.
- Inmate Circulation Elevators – two (2) passenger elevators located in new South Tower Addition to transport inmates from basement through eighth floor housing areas. Elevator to be a 3,500 LB, 200 ft/min, machine-roomless traction elevator. Security finishes and fixtures to be determine during Design Development.
- Freight Elevators – one (1) service elevator in the South Tower Addition for back of house movement of foodservice and laundry from basement through sub-basement 2 floors. Elevator to be a 5,000 LB, 125 ft/min, holeless, hydraulic elevator. Finishes and fixtures to be determine during Design Development.
- Upgrade the existing controls and finishes on the four existing elevators in the PSB. Finishes and fixtures to be determine during Design Development.

Miscellaneous Accessories

Common architectural accessories will include the following:

- Toilet Partitions – Floor mounted/Overhead braced enameled steel or solid phenolic depending on location within the facility, unless Owner has a preference for another material.
- Non-Detention Toilet Accessories and Hand Dryer.
- Marker Boards/Tack Boards in conference and meeting rooms
- Room & Door Identification
- Lockers for Public and Staff
- Fire Extinguisher & Cabinets
- Casework & Counters
- Firestopping Penetrations

- Entrance Floor Mats

Stairs

Construction of stairs will be determined in conjunction with the structural system. It is common for stairs to be fabricated from steel and concrete. Likewise, railings and guardrails will be constructed of tube steel.

- Interior Stairs & Railings for Mezzanines
- Egress Stairs
- Stair Handrails and Guardrails

Equipment

Equipment for the facility will be evaluated in future phases. A general list follows:

- Laundry Equipment
- Fixed Medical Equipment.
- Property Storage System
- Body Scanner
- Fixed/Mounted Detention Equipment
- Loading Dock Equipment – leveler, seals, truck restraint, bumpers
- Warehouse Equipment – racks and storage shelves
- Food Service Equipment
- Waste Handling Equipment – recycling and baler
- Athletic & Recreational – at inmate recreation spaces & staff wellness areas

Furnishings

Furnishings for the facility will be evaluated in future phases. A general list follows:

- Window Treatments
- Non-Detention/Moveable Seating
- Modular Prefabricated Furniture
- Freestanding Furniture

11 Sustainability

The Dane County Jail Consolidation project will not be seeking LEED accreditation from the U.S. Green Building Council; however, we will incorporate sustainable design principles in the project. These guiding principles will improve building performance and the interior environment for the building occupants.

The project plans to include these sustainable design features:

- Water Efficient Fixtures
- Energy Performance
- Regional Materials
- Recycled Content in Materials
- Indoor Air Quality
- Daylighting
- Acoustical Performance

Other sustainable guidelines may be introduced by the Construction Manager and the Building Contractors to divert recycling and waste to appropriate collection points. The project team will also be exploring other sustainable design options including: Blue Roof, Green Roof and Solar Panel Systems in the next design phase.

12 Structural Systems

A. Codes and standards

1. International Building Code, IBC 2015 (per The State of Wisconsin SPS 361) and all other local and state agencies having jurisdiction over this project.

2. Code-Prescribed Standards:
    a. Minimum Design Loads for Buildings and Other Structures (ASCE 7-10)
    b. Building Code Requirements for Structural Concrete (ACI 318-14)
    c. Specification for Structural Steel Buildings (AISC 360-10)
    d. Steel Deck Institute Specifications and Load Tables
    e. American Welding Society (AWS D1.1, D1.3, D1.4)
    f. Building Code Requirements for Masonry Structures (ACI 530-13)
    g. ASTM Material Standards as noted
    h. AISI Specifications for Design of Cold Formed Steel Structural Members

B. Design Criteria

1. Occupancy:
    a. Group: I-3
    b. Risk Category: III

2. Fire Rating:
    a. General Rating of Structure: Type 1A
    b. Specific Rating of Elements:
        1. Columns: 3 hour
        2. Girders: 3 hour
        3. Beams and Joists: 2 hour
        4. Slabs: 2 hour
        5. Roof Girders: 2 hour
        6. Roof Beams and Joists: 1 ½ hour
        7. Roof Deck: 1 ½ hour

1. Geotechnical Conditions:
    a. Geotechnical Report prepared by Soils & Engineering Services, Inc. Report No. 13248, dated December 14th, 2018.

b. Recommended Foundation System:

Shallow spread footings. Bottom of footings to rest 3 ½ feet below lowest finished floor slab elevation adjacent to the footings. Footings to bear on 2 feet of thoroughly-compacted glacial till or compacted crushed stone overlying 2 feet of thoroughly-compacted native glacial till soil.

c. Allowable Net Soil Bearing Capacities:

1) At EL. 27.5' to 25.5' = 20,000 PSF
2) At EL. 25.51' to 23.0' = 25,000 PSF
3) At EL. Less than 23.0' = 20,000 PSF

d. Groundwater Considerations:

i. Water Elevation: The water level was approximately at elevation 2.0 feet as seen at the time borings were completed. Previous borings performed in 1992 ranged in elevation from 9.3 to 14 feet. Anticipate levels to fluctuate as influenced by precipitation, surface water runoff, City of Madison municipal well pumping, lake levels of Lakes Mendota and Monona and other hydrological and hydrogeological factors. Groundwater levels at the time of construction may be higher or lower than those observed when borings were performed.

ii. Waterproofing: Exterior of below-grade basement foundation walls should be water-proofed and drainage medium and drain tile should be installed to avoid hydrostatic pressures from developing. Install drain tile adjacent to and around exterior walls on both exterior and interior faces of wall. Existing drain tile should tie into additions drain tile or be left intact to avoid blocking existing drainage of water.

e. Frost Depth: 48"

1. Existing Construction Documents:

Original construction drawings exist for the adjacent structures. The Owner has provided the following documentation which forms the basis of design:

a. Dane County Jail, Madison Wisconsin – Durrant Architects, Inc. October 14th, 1992
b. Dane County Jail, Madison Wisconsin – Durrant Engineers, Inc. October 14th, 1992
c. Dane County Jail, Madison Wisconsin – Durrant Engineers, Inc. July 21st, 1995 (Record Drawings)

d. Dane County Jail, Madison Wisconsin – Addendum No. 1, November 3rd, 1992
e. Dane County Jail, Madison Wisconsin – Addendum No. 2, November 10th, 1992
f. Dane County Jail, Madison Wisconsin – Addendum No. 3, November 18th, 1992
g. Dane County Courthouse, Madison Wisconsin – Durrant, Inc. December 6th, 2002

1. Existing Construction Description – General:
   a. Dane County Jail:
      1) Foundations: Spread footings.
      2) Superstructure:
         a) Floors and Roof: One-way concrete joist and slab system typical.
         b) Penthouse roof: Majority is steel-framed with precast slab roof. North bay consists of load-bearing metal studs and steel bar joist with metal roof deck. Exterior south wall is 12 inch load-bearing concrete masonry units.
      3) Exterior wall system: Brick with concrete masonry unit backup
   b. Dane County Courthouse
      1) Foundations: Spread footings
      2) Superstructure: Concrete flat slab at first level. Composite steel beams with deck and concrete slab on the upper floors
      3) Exterior wall system: Architectural precast concrete panels

C. Design Loads - Gravity

Live Loads

1. Roof (minimum):	20 psf
2. Floor:	
a. Penal Institutions:	
1) Cell blocks:	40 psf
2) Corridors:	100 psf
b. Tier walkways:	100 psf
c. Mechanical floors:	150 psf
d. Mechanical mezzanines:	100 psf
e. Dock area:	250 psf
f. Stairs and exit ways:	100 psf
g. Dayrooms:	100 psf
h. Covered outdoor recreation areas:	100 psf
i. Storage on mezzanines:	100 psf

j. Warehouse Storage (Light): 125 psf
k. Administrative Areas: 50 psf
l. Office Space: 50 psf
m. Office space lobbies and first-floor corridors: 100 psf
n. Office space corridors above first floor: 80 psf

2. For live loads of 80 psf or less, a 15 psf minimum partition load is code mandated unless actual weight and location is designed for. For live loads greater than 80 psf, there is no code partition load requirement.
3. Live loads to be reduced as allowed per code.

Dead Loads

1. Roof:
   a. Self-weight of the structural system As Calculated
   b. Ceiling 5 psf
   c. Mechanical/Electrical/Plumbing 5 psf
   d. Roofing/Insulation 20 psf
2. Floor:
   a. Self-weight of the structural system As Calculated
   b. Ceiling 5 psf
   c. Mechanical/Electrical/Plumbing: 5 psf
3. Mezzanine:
   a. Self-weight of the structural system As Calculated
   b. Ceiling 5 psf
   c. Mechanical/Electrical/Plumbing: 5 psf
4. Stairs:
   a. Drop in steel stairs with an assumed self-weight of 50 psf
5. Exterior Walls:
   a. Terracotta rain screen with metal studs 15 psf
   b. Curtain wall 15 psf
   c. Metal Panel with metal studs 15 psf
   d. Louver 15 psf
6. Interior Partitions:
   a. Metal stud: Use code prescribed 15 psf for live loads less than 80 psf

b. Concrete masonry units (CMU): As calculated based on thickness, height and grouting requirements.

7. Cells – Steel wall construction: (To be verified based on units selected)
   a. Single level 85 psf
   b. Stacked 170 psf

Snow Loads:

1. Ground Snow (Pg): 30 psf
2. Flat-Roof Snow (Pf): 23.1 psf
3. Exposure Factor (Ce): 1.0
4. Thermal Factor (Ct): 1.00
5. Importance Factor (Is): 1.1
6. Minimum Snow Load (Pm): 22.0 psf
7. Snow loads modified for drifting as required.
8. Rain on Snow: Pg > 20, therefore rain-on-snow load N.A.

D. Design Loads – lateral

Wind:

1. Building Main Frame: (Directional procedure for buildings of all heights)
   a. Ultimate Wind Speed (Vult): 120 mph
   b. Nominal Wind Speed (Vasd): 93 mph
   c. Wind Directionality Factor (Kd): 0.85
   d. Exposure Category: B
   e. Topographic Factor (Kzt): 1.0
   f. Gust Effect Factor: 0.85
   g. Importance Factor (Iw): 1.0
   h. Enclosure Classification: Enclosed
   i. Internal Pressure Coefficient (GCpi): +/- 0.18
   j. Design Pressures:

z	Kz	WW+LW
0 to 15	0.57	36.6
20	0.62	38.0
30	0.67	40.3
40	0.76	42.0

50	0.81	43.4
60	0.85	44.7
70	0.89	45.8
80	0.93	46.8
90	0.96	47.7
100	0.99	48.6
110	1.02	49.3
120	1.04	50.1
150	1.11	52.1
152	1.11	52.1

Secondary Members/Cladding:

Roof						
	GCp			Surface Pressure		
Area	10 sf	100 sf	500 sf	10 sf	100 sf	500 sf
Zone 1 (-)	-1.40	-1.11	-0.90	-54.9	-44.7	-37.6
Zone 2 (-)	-2.30	-1.89	-1.60	-86.2	-71.9	-61.9
Zone 3 (-)	-3.20	-2.67	-2.30	-117.5	-99.1	-86.2
Zones 1-3 (+)	-	-	-	16.0	16.0	16.0

Walls						
	GCp			Surface Pressure at h		
Area	20 sf	100 sf	500 sf	20 sf	100 sf	500 sf
Zone 4 (-)	-0.90	-0.80	-0.70	-37.6	-34.1	-30.6
Zone 5 (-)	-1.80	-1.40	-1.00	-68.8	-54.9	-41.0
Zones 4&5 (+)	0.90	0.75	0.60	37.6	32.3	27.1

Parapets			
	Surface Pressure		
	10 sf	100 sf	500 sf
Pos. Interior Zone (case A*)	111.7	92.1	76.8
Pos. Corner Zone (case A*)	143.1	119.4	101.2
Neg. Interior Zone (case B*)	-62.8	-54.1	-45.4
Neg. Corner Zone (case B*)	-94.2	-75.0	-55.8

*Case A = pressure towards building (pos)

*Case B = pressure away from building (neg)

Earthquake (Seismic):

1. Project Location:
   a. Latitude: 43.07177 deg N
   b. Longitude: -89.38350 deg W
2. Building Main Frame:
   a. Spectral Acceleration for Short Period (Ss): 0.085
   c. Spectral Acceleration for 1-Second Period (S_1): 0.046
   d. Site Class: D
   e. Site Coefficient (Fa): 1.6
   f. Site Coefficient (Fv): 2.4
   g. Spectral Response Coefficient for Short Period (S_{DS}): 0.090
   h. Spectral Response Coefficient for 1-Second Period (S_{D1}): 0.073
   i. Seismic Importance Factor (Ie): 1.25
   j. Seismic Design Category: B
   k. Seismic Force-Resisting System:
      1) Building Frame Systems: Ordinary reinforced concrete shear walls
   l. Response Modification Factor (R): 5
   m. Overstrength Factor (□o): 2.5
   n. Deflection Amplification Factor (Cd): 4.5
   o. Analysis Procedure Used: Equivalent Lateral Force

E. Design Loads – Other

Soil lateral earth pressures:

1. In silty sand:
   a. Moist Density: 135 lbs/ft^3
   b. Friction Angle: 32 deg
   c. Cohesion: 0 lbs/ft^2
   d. Passive earth pressure coefficient (Kp): 3.25
   e. Active earth pressure coefficient (Ka): 0.31
   f. At-rest earth pressure coefficient (Ko): 0.47
2. In poorly-graded sand:
   a. Moist Density: 115 lbs/ft^3
   b. Friction Angle: 30 deg
   c. Cohesion: 0 lbs/ft^2
   d. Passive earth pressure coefficient (Kp): 3.00
   e. Active earth pressure coefficient (Ka): 0.33
   f. At-rest earth pressure coefficient (Ko): 0.50

Equipment and Special Loads:

1. Mechanical Equipment
   a. Air handling units
   b. Cooling towers
2. Electrical Equipment
   a. Generator
   b. Emergency fuel tanks
   c. Transformers
   d. Switch gear
3. Elevators
   a. Size and type to be determined

F. Serviceability and supplemental design Considerations

1. Load Combinations
   a. Load combinations defined per ASCE 7 Chapter 2
2. Floor deflection limits:

a. Immediate deflection due to maximum live load for members not supporting or attached to nonstructural elements likely to be damaged by large deflections, L/360. If brick or stone are chosen as exterior façade materials, supporting member deflections will be limited to L/600.
b. Total deflection occurring after attachment of nonstructural elements, which is the sum of the time-dependent deflection due to all sustained loads and the immediate deflection due to additional live load for supporting or attached elements likely to be damaged by large deflections, L/480.
c. Total deflection occurring after attachment of nonstructural elements, which is the sum of the time-dependent deflection due to all sustained loads and the immediate deflection due to additional live load for supporting or attached elements not likely to be damaged by large deflections, L/240.

3. Drift limits:
   a. Drifting Limits – Wind
      1) Maximum deflection due to wind load = L/400 of building height.
      2) Wind Load based on 100 Year MRI wind speed = 96 mph.
   b. Drifting Limits – Seismic
      Maximum amplified earthquake story drift = 0.015 times story height.

4. Stability:
   a. Dead Load + Permanent Anchorage = 1.5 x Overturning
   b. Dead Load + Permanent Anchorage = 1.5 x Sliding

5. Floor to Floor heights:
   a. Lower Level 2 EL. = 20’-0” (To match Existing Courthouse LL2)
   b. Sub-Basement EL. = 30’-6” (To match Existing PSB Sub-basement) (10’-6”)
   c. Loading Dock EL. = 37’-6” (7’-6”)
   d. Basement EL. = 44’-0” (To match Existing PSB Basement) (6’-6”)
   e. First Floor EL. = 59’-0” (To match Existing PSB First Floor) (15’-0”)
   f. Second Floor EL. = 72’-4” (To match Existing PSB Second Floor) (13’-4”)
   g. Third Floor EL. = 85’-8” (To match Existing PSB Third Floor) (13’-4”)
   h. Fourth Floor EL. = 97’-8” (To match Existing PSB Fourth Floor) (12’-0”)
   i. Roof/Fifth Floor EL. = 109’-8” (To match Existing PSB Fifth Floor) (12’-0”)
   j. Exist. Penthouse Roof EL. = 122’-10”

k. Sixth Floor EL. = 123’-2” (13’-6”)
l. Exist. Elevator Roof EL. = 128’-10”
m. Sixth Floor Mezzanine EL. = 132’-2” (9’-0”)
n. Seventh Floor EL. = 143’-10” (11’-8”)
o. Seventh Floor Mezzanine EL. = 152’-10” (9’-0”)
p. Eighth Floor EL. = 164’-6” (11’-8”)
q. Eighth Floor Mezzanine EL. = 173’-6” (9’-0”)
r. Roof EL. = 185’-2” (11’-8”)

6. Maximum allowable building height is EL = 187’-2” due to the capitol height limit requirement. New floors to match elevations of exist PSB floors.

7. No future expansion has been accounted for in the design.

G. System Descriptions

For general building description, refer to Architectural section.

1. Foundation System:
    a. At columns, foundations will consist of individual shallow spread footings bearing on glacial till soil. Mat foundations bearing on glacial till will support shear walls. Exterior walls will rest on continuous (strip) footings bearing on glacial till.
    b. Existing foundations for the PSB and Courthouse structures might need to be shored and/or underpinned at the interface of new to existing construction. Due to the proximity of the structures and the lower elevation of the new structure relative to the existing structure, existing foundations will need to be re-supported to stabilize existing foundations and prevent undermining existing foundation conditions.

2. Framing and support system

a. The proposed structure will be framed using a concrete system. The criteria to match existing floor-to-floor heights and remain under the capitol building height restriction makes a concrete system the structural system of choice. The floors will be constructed with a one-way beam and “wide form joist” system. The pans will be 16 inches deep with a 4 ½ inch thick slab for a total depth of 20 ½ inches. Joist widths will vary based on pan layout, but initial layouts indicate 18 to 24 inch widths. The interior girders are initially sized as 36 inches wide by 20 ½ inches deep. Typical exterior girders are initially sized as 36 inches wide by 20 ½ inches deep. The depth of exterior girders along the south face will be increased at each level to account for the longer spans created by the limited number of columns. Lower level and basement areas will be framed using flat slabs and deep beams as required to support mechanical and electric equipment and to frame the dock area. Preliminary column sizes start at 36 inches square at the bottom floors and reduce to 30 inches square at the top of the structure. It is anticipated that the floor framing members will be constructed with 4000 psi normal weight concrete and the columns will be constructed with 4000 psi to 8000 psi concrete (as needed by design). Lateral loads will be resisted by 18 inch thick shear walls in both directions located around elevator and stair shafts.

b. Mezzanine floors are to be formed with a thinner “skip joist” system. Initial studies indicate that the pans will be 14 inches deep with a 4 ½ thick slab for a total depth of 18 ½ inches. Mezzanine floor members will be constructed with 4000 psi normal weight concrete.

c. Slabs on grade will consist of 5 inch thick concrete reinforced with #4@16 inches on center each way on a vapor retarder over a minimum of 8 inches of free-draining granular fill.

d. Basement and sub-basement levels will be located below grade that will require concrete foundation walls. A perimeter drain tile system will be installed around the foundation walls on both sides of the wall as required by the geotechnical report.

e. An expansion joint will exist along the north side of the new construction where the building abuts the existing PSB building.

H. Construction Materials

1. Concrete strength, f'c:
    a. Foundations: 4000 psi Normal weight
    b. Walls: 4000 psi Normal weight
    c. Slab-on-grade: 4000 psi Normal weight
    d. Superstructure (Beams/Joists/Girders): 4000 psi Normal weight
    e. Columns: (as required based on design)
        a. 4000 psi Normal weight
        b. 6000 psi Normal weight
        c. 8000 psi Normal weight
    f. General structural concrete: 4000 psi Normal weight
2. Reinforcing Steel - ASTM A615 - Grade 60 Fy = 60 KSI
3. Reinforcing Steel to be welded - ASTM A706 Grade 60 Fy = 60 KSI
4. Structural Steel
    a. Wide Flange and Tee Shapes – ASTM A992 Fy = 50 KSI
    b. Angles, Channels and Plate – ASTM A36 Fy = 36 KSI
    c. HSS Rectangular Shapes – ASTM A500 Grade C Fy = 50 KSI
    d. HSS Round Shapes – ASTM A500 Grade C Fy = 46 KSI
    e. Pipes – ASTM A53 Grade B Fy = 35 KSI
    f. Bolts – ASTM F1852
    g. Anchor bolts – ASTM F1554 Fy = 36 KSI
    h. High Strength Anchor Bolt Assembly
        a. Anchor Bolt – ASTM F1554 Fy = 105 KSI
        b. Nuts – ASTM A563 Grade D
    i. Welding Electrodes – E70XX
    j. Metal Roof Decking (Galvanized) Fy = 33 KSI Structural Quality ASTM A653 G60 (Z180) Zinc Coating
    k. Composite Metal Form Deck (Galvanized) Fy = 50 KSI Structural Quality ASTM A653 G60 (Z180) Zinc Coating
5. Masonry
    a. Concrete Masonry Assemblies F'm = 1.5 KSI
    b. Concrete Masonry Units: ASTM C-90 F'c = 1.9 KSI
    c. Grout: ASTM C476 F'c = 2.0 KSI

d. Mortar: ASTM C270 F'c = 1.8 KSI

e. Joint Reinforcement: Truss Type

6. Non-shrink Grout and Non-Metallic Grout at baseplates and bearing plates
   a. F'c = 4000 PSI at 7 days/ F'c = 8000 PSI at 28 days

I. Special Inspection Requirements:

Special Inspections as required by IBC 2015 Chapter 17

J. Emerging Issues

1. Additional analyses are being performed to determine if the structural system depths can be reduced further to aid in floor to floor clear heights and capitol building height restriction. Multiple depths of concrete pan systems might be required to facilitate the various designs based on the loading requirements of each floor.
2. The structural design is highly dependent on an elevator vendor to provide the design team with equipment loads, pit depths, overrun requirements and other pertinent elevator information.

13 Mechanical HVAC Systems

A. Overview

1. The mechanical scope of work consists of providing an HVAC system for the facility, including temperature controls and utilities services.

B. Design References

1. The following applicable Codes, Standards, Guidelines, and Criteria are intended to be used to determine acceptable design criteria, standard of performance, workmanship, etc. Based on industry best practice and owner's experience, system design criteria that exceed the minimum standards will be applied as appropriate.
2. Applicable Codes

IMC	International Mechanical Code – 2015
IEEC	International Energy Conservation Code – 2015

3. Guidelines, Standards, and Criteria
   a. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)

ASHRAE 55-1010	Thermal Environmental Conditions for Human Occupancy
ASHRAE 62.1-2010	Ventilation for Acceptable Indoor Air Quality
ASHRAE 90.1-2010	Energy Standard for Buildings Except Low-Rise Residential Buildings

   b. National Fire Protection Association (NFPA)

NFPA 90A	Standard for the Installation of Air Conditioning and Ventilating Systems, 2015 Edition
NFPA 101	Life Safety Code

   c. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
   d. Occupational Safety and Health Administration (OSHA)

C. Design Conditions

1. Project Location: Madison, WI
2. Elevation: 625 feet above mean sea level
3. Outdoor Design Conditions
   a. Summer: 87º F DB / 75º F WB
   b. Winter: -15º F DB

4. Indoor Design Conditions

a. Housing/Medical/Program/Offices

Heating:	70ºF ± 2ºF
Cooling:	75ºF ± 2ºF

b. Outdoor Recreation

Heating:	65ºF ± 2ºF
Cooling:	None

c. Maintenance Areas

Heating:	68ºF ± 2ºF
Cooling:	None

d. Unoccupied Spaces/Garage

Heating:	65ºF ± 2ºF
Cooling:	None

5. Heating and Cooling Loads

6. Electrical

1) Housing/Medical/Program/Offices

Lighting:	0.5 watts per sq ft
Equipment:	1.0 watts per sq ft

2) Outdoor Recreation

Lighting:	1.0 watts per sq ft
Equipment:	None

3) Storage/Maintenance Areas

Lighting:	0.5 watts per sq ft
Equipment:	1.0 watts per sq ft

b. Occupancy

1) The number of occupants in each space will be based on the actual occupant density listed in the project program documents when available or will be based on occupancy densities as specified in the International Mechanical Code and ASHRAE 62.1. The typical occupancy heat rejection will be as follows:

2) All Spaces

Sensible	250 Btu/h/person
Latent:	250 Btuh/person

3) Occupancy Schedule – 24 hours / 7 days

c. Infiltration

1) The building heat loss calculations will include an infiltration load based on 1.5 cfm of infiltration air per lineal foot of exterior wall with windows, per floor level, and 1.0 cfm of infiltration air per lineal foot of exterior wall without windows, per floor level.

2) Infiltration rates of 200 cfm per door will be used for exterior main entrance, high use service doors. Infiltration rates of 100 cfm will be used for secondary exterior entrances and exits. Infiltration rates of 10 cfm/sf will be used for exterior overhead doors.

d. Building Envelope

Wall (below ceiling)	U value = TBD Btuh/sf/ºF
Wall (above ceiling)	U value = TBD Btuh/sf/ºF
Wall (below grade)	U value = TBD Btuh/sf/ºF
Partition Wall	U value = 0.11 Btuh/sf/ºF
Roof (New Replacement)	U value = 0.03 Btuh/sf/ºF
Glass	U value = TBD Btuh/sf/ºF
	Shading Coeff. = 0.90)
Service Door	U value = TBD Btuh/sf/ºF
Overhead Door	U value = TBD Btuh/sf/ºF
Slab-on-Grade perimeter	F factor = TBD

e. Pressure Relationships

Garage	Negative to adjacent space
Housing cells	Negative to adjacent space

Maintenance Areas	Positive to Garage and Negative to Administration areas.
Building as a whole	Positive to exterior

f. Ventilation Rates
   1) Outdoor Air
      a) Building ventilation (outdoor air) will comply with the International Mechanical Code. Code minimum rates will be increased as necessary to account for building exhaust rates and to maintain pressure relationships.
   2) Exhaust
      a) Individual room exhaust rates will comply with the International Mechanical Code.

g. Diversity / Redundancy Requirements: Dual redundant steam to hot water heat exchangers and hot water pumps. N+1 chiller design but no redundancy for chilled water pumps.

h. Noise Criteria
   1) Sound attenuation equipment will be provided based on standard design practice. Results are not guaranteed due to many items not under control of the design team and actual building usage.

7. Heating Hot Water System
   a. System Description
      1) Existing low-pressure steam service will be utilized to the extent possible. It appears at this time that the existing service will be adequate during cold weather and peak usage times.
      2) Steam will be converted to hot water for the facility's heating hot water service for air handling units and terminal heating devices, etc. Two heat exchangers will be designed for 100% redundancy.
      3) Gas-fired, condensing domestic hot water heaters will be provided (by plumbing contractor) to meet the need when the central steam plant is shut down for maintenance.
      4) Heating hot water will be distributed at a supply water temperature of approximately 180ºF.
      5) The heating hot water distribution system will be a variable volume primary system utilizing a modulating 2-way control valve at each heating device. It will be sized for the entire new and existing building with the existing system being demolished in its entirety.

b. Design Criteria

1) Heating hot water piping will be sized as follows:

a) Maximum pressure drop of 4 ft. of water/100 ft.

b) Maximum velocity of 8 fps.

c. Equipment and Materials

1) The heating hot water system will also include the following components:

a) Unit heaters.

b) Appropriate valving and piping specialties.

d. Distribution

1) Heating hot water piping 2" and under will be Type L copper with soldered fittings or carbon steel with threaded fittings.

2) Heating hot water piping over 2" will be carbon steel with welded fittings.

3) Unions will not be provided at terminal heating devices in copper piping.

4) Heating hot water piping system will be insulated with rigid glass fiber type insulation with appropriate insulation jacket.

8. Cooling Chilled Water System:

a. System Description

1) The existing chilled water plant in the existing PSB 5th floor penthouse will provide chilled water service for the new facility's chilled water service for air handling units.

2) A new 300 ton centrifugal water-cooled chiller will be added to replace the existing, aging 300 ton centrifugal chiller and supplement the existing modular chillers installed years ago.

3) One additional module will be provided for redundancy.

4) The existing cooling tower located in the penthouse will be removed and two new nominal 300 ton cooling towers will be installed on the existing PSB 4th floor roof.

9. Humidification System – Humidification will not be provided.

10. Air Handling Unit System – General Population Housing Floors 6th, 7th & 8th

a. System Description

1) Indoor air handing units located on each mezzanine level will serve the General Population Housing 6th, 7th & 8th floors. They will be 100% outdoor units with energy recovery wheels for ventilation of the space.

2) This system will be variable air volume with hot water heat and chilled water cooling.
3) The system airflow capacity is approximately 12,000 CFM each.
4) Unit's construction shall be a double insulated panel system similar to manufacturer's Daikin, CES (Nortek) Group, Trane, or York.
5) Conditioned air will be supplied to all program spaces via terminal units with hot water reheat coils. Air supplied to the dayrooms and other spaces will be exhausted through the toilet rooms, cells and showers.
6) A fully ducted supply and exhaust system will be utilized.
7) Unit's supply and exhaust systems will operate 24/7/365.
8) Supply air ductwork will not be lined.

b. Design Criteria

1) Air Handling Unit Component Sizing

a) Maximum allowable nominal face velocities:

Filters:	400 fpm
Heating Coils:	650 fpm
Cooling Coils:	450 fpm

2) Duct System Sizing

a) 0.10 in.wg. per 100 feet.

c. Equipment and Materials

1) The unit will be of galvanized steel double wall construction. The unit will consist of the following components:
   a) Outside air intake and exhaust dampers.
   b) 30% (MERV 7) - 4 inch pre-filters.
   c) 65% (MERV 13) – 6 inch or bag filters.
   d) Hot water heating coil
   e) Chilled water cooling coil.
   f) Supply and exhaust fans with variable frequency drives (VFD).
   g) Smoke detector at supply air discharge ductwork.
2) Supply and exhaust fans will be direct drive, plenum centrifugal type with airfoil blades in fan array configuration. Fan speed and air volume will be modulated by VFD through the building automation system (BAS).
3) An energy recovery wheel will recover approximately 50-60% of the energy exhausted.

d. Distribution

1) Ductwork will be constructed in accordance with SMACNA Standards for the appropriate pressure class. Ductwork will be sealed to meet SMACNA Seal Class A as a minimum and to limit ductwork leakage not to exceed 2% for low pressure ductwork.
2) Low pressure (2" wc) galvanized ductwork.
3) Supply air ductwork will be externally insulated with fiberglass insulation

e. Smoke Control
1) Each of the three General Population Housing floors will consist of two smoke zones split east/west. The same air handling units will be utilized that provide the space conditioning needs.
2) Smoke dampers will operate to maintain required pressure differentials between adjacent zones, initiated by the fire alarm system.

11. Air Handling Unit Systems – Housing floors 1st through 4th
a. System Description
1) Indoor air handing units located in the 5th floor mechanical space will serve the various Housing and Medical/Psychiatric Housing areas on the four floors. They will contain energy recovery wheels.
2) These systems will be variable air volume with hot water heat and chilled water cooling.
3) Unit's construction shall be a double insulated panel system similar to manufacturer's Daikin, CES (Nortek) Group, Trane, or York.
4) Conditioned air will be supplied to all program spaces via terminal units with hot water reheat coils.
5) Air will be supplied to all appropriate spaces and a portion of this air will be returned to the air handling unit. The remaining portion of the air not returned to the air handling unit will be exhausted from the cells and showers.
6) A fully ducted supply and exhaust system will be utilized.
7) Unit's supply and exhaust systems will operate 24/7/365.
8) Supply air ductwork will not be lined.

b. Design Criteria
1) Air Handling Unit Component Sizing
a) Maximum allowable nominal face velocities:

Filters:	400 fpm
Heating Coils:	650 fpm
Cooling Coils:	450 fpm

2) Duct System Sizing

a) 0.10 in.wg. per 100 feet

c. Equipment and Materials

1) The unit will be of galvanized steel double wall construction. The unit will consist of the following components:
   a) Outside air intake and exhaust dampers.
   b) 30% (MERV 7) - 4 inch pre-filters.
   c) 65% (MERV 13) – 6 inch or bag filters.
   d) Hot water heating coil
   e) Chilled water cooling coil.
   f) Supply and exhaust fans with variable frequency drives (VFD).
   g) Smoke detector at supply air discharge ductwork.
2) Supply and exhaust fans will be direct drive, plenum centrifugal type with airfoil blades in fan array configuration. Fan speed and air volume will be modulated by VFD through the building automation system (BAS).
3) An energy recovery wheel or heat pipe will recover approximately 50-60% of the energy exhausted.

d. Distribution

1) Ductwork will be constructed in accordance with SMACNA Standards for the appropriate pressure class. Ductwork will be sealed to meet SMACNA Seal Class A as a minimum and to limit ductwork leakage not to exceed 2% for low pressure ductwork.
2) Low pressure (2” wc) galvanized ductwork.
3) Supply air ductwork will be externally insulated with fiberglass insulation.

e. Smoke Control

1) The second floor will consist of two smoke zones while the first, third and fourth floors will be one zone each. The same air handling units will be utilized for smoke control that provide the space conditioning needs.
2) Smoke dampers will operate to maintain required pressure differentials between adjacent zones, initiated by the fire alarm system.

12. Air Handling Unit System – Existing Building - Outdoor Rec 4th floor Infill

a. System Description

1) An Indoor air handing unit will be located in the existing 5th floor mechanical penthouse space and will serve the new spaces infilled into the outdoor recreation space.
2) This system will be variable air volume with hot water heat and chilled water cooling.

3) Unit's construction shall be a double insulated panel system similar to manufacturer's Daikin, CES (Nortek) Group, Trane, or York.
4) The system airflow capacity is approximately 8,000 CFM.
5) Air will be supplied to all spaces and a portion of this air will be returned to the air handling unit. The remaining portion of the air not returned to the air handling unit will be exhausted from toilet rooms, janitor's closets, etc.
6) A fully ducted supply and exhaust system will be utilized.
7) Unit's supply and exhaust systems will operate based on a programed occupancy schedule.
8) Supply air ductwork will not be lined.

b. Design Criteria
1) Air Handling Unit Component Sizing
a) Maximum allowable nominal face velocities:

Filters:	400 fpm
Heating Coils:	650 fpm
Cooling Coils:	450 fpm

2) Duct System Sizing
a) 0.10 in.wg. per 100 feet.

c. Equipment and Materials
1) The unit will be of galvanized steel double wall construction. The unit will consist of the following components:
a) Outside air intake and exhaust dampers.
b) 30% (MERV 7) - 4 inch pre-filters.
c) 65% (MERV 13) – 6 inch or bag filters.
d) Hot water heating coil
e) Chilled water cooling coil.
f) Supply and exhaust fans with variable frequency drives (VFD).
g) Smoke detector at supply air discharge ductwork.
2) Supply and exhaust fans will be direct drive, plenum centrifugal type with airfoil blades in fan array configuration. Fan speed and air volume will be modulated by VFD through the building automation system (BAS).

d. Distribution
1) Ductwork will be constructed in accordance with SMACNA Standards for the appropriate pressure class. Ductwork will be sealed to meet SMACNA Seal Class A as a minimum and to limit ductwork leakage not to exceed 2% for low pressure ductwork.
2) Low pressure (2" wc) galvanized ductwork.

3) Supply air ductwork will be externally insulated with fiberglass insulation.

13. Air Handling Unit System – Basement

a. System Description

1) Three indoor air handing units will be located on the basement level.
   a) Warehouse: 3000 cfm, single zone VAV
   b) Cart/dish wash, linen, trash: 4000 cfm, constant volume reheat.
   c) Loading Dock: 4000 cfm constant volume, heating only.
2) Unit's construction shall be a double insulated panel system similar to manufacturer's Daikin, CES (Nortek) Group, Trane, or York.
3) Air will be supplied to all spaces and a portion of this air will be returned to the air handling unit. The remaining portion of the air not returned to the air handling unit will be exhausted.
4) A fully ducted supply and exhaust system will be utilized.
5) Unit's supply and exhaust systems will operate based on a programed occupancy schedule.
6) Supply air ductwork will not be lined.

b. Design Criteria

1) Air Handling Unit Component Sizing
   a) Maximum allowable nominal face velocities:

Filters:	400 fpm
Heating Coils:	650 fpm
Cooling Coils:	450 fpm

2) Duct System Sizing
   a) 0.10 in.wg. per 100 feet.

c. Equipment and Materials

1) The unit will be of galvanized steel double wall construction. The unit will consist of the following components:
   a) Outside air intake and exhaust dampers.
   b) 30% (MERV 7) - 4 inch pre-filters.
   c) 65% (MERV 13) – 6 inch or bag filters.
   d) Hot water heating coil
   e) Chilled water cooling coil.
   f) Supply and exhaust fans with variable frequency drives (VFD).
   g) Smoke detector at supply air discharge ductwork.
2) Supply and exhaust fans will be direct drive, plenum centrifugal type with airfoil blades in fan array configuration. Fan speed and air volume will be modulated by VFD through the building automation system (BAS).

14. Air Handling Unit System – Sub-Basement

a. System Description

1) An indoor air handing unit will be located on the sub-basement level and will serve the entire floor, mostly comprised of mechanical space.

2) The system will be variable air volume with hot water heat and chilled water cooling.

3) Unit's construction shall be a double insulated panel system similar to manufacturer's Daikin, CES (Nortek) Group, Trane, or York.

4) The system airflow capacity is approximately 8,000 CFM.

5) Air will be supplied to all spaces and a portion of this air will be returned to the air handling unit. The remaining portion of the air not returned to the air handling unit will be exhausted.

6) A fully ducted supply and exhaust system will be utilized.

7) Unit's supply and exhaust systems will operate 24/7/265.

8) Supply air ductwork will not be lined.

b. Design Criteria

1) Air Handling Unit Component Sizing

a) Maximum allowable nominal face velocities:

Filters:	400 fpm
Heating Coils:	650 fpm
Cooling Coils:	450 fpm

2) Duct System Sizing

a) 0.10 in.wg. per 100 feet.

c. Equipment and Materials

1) The unit will be of galvanized steel double wall construction. The unit will consist of the following components:

a) Outside air intake and exhaust dampers.

b) 30% (MERV 7) - 4 inch pre-filters.

c) 65% (MERV 13) – 6 inch or bag filters.

d) Hot water heating coil

e) Chilled water cooling coil.

f) Supply and exhaust fans with variable frequency drives (VFD).

g) Smoke detector at supply air discharge ductwork.

d. Supply and exhaust fans will be direct drive, plenum centrifugal type with airfoil blades in fan array configuration. Fan speed and air volume will be modulated by VFD through the building automation system (BAS).

15. Existing Building Fifth Floor Mechanical Penthouse Scope

a. System Description

1) The two existing indoor air handing units will be replaced to serve the repurposed spaces on the fourth floor (see below).

2) A new 400 ton centrifugal chiller will replace the existing 300 ton chiller. The existing modular chillers will remain and be re-piped with the new chiller to a new condenser water system consisting of new condenser water and chilled water pumps.

3) New condenser water piping will be extended from two new 350 ton cooling towers located on the 4th floor roof.

4) Chilled water piping will connect to the existing loop in the existing penthouse, the existing AHU in the basement, and the new AHUs in the new 5th floor mechanical room and to AHUs on the basement and sub-basement floors.

16. Existing Building Fourth Floor Remodeling

a. System Description

1) The two existing indoor air handing units located in the existing 5th floor mechanical penthouse space will be replaced to serve the repurposed spaces on the fourth floor and the “existing to remain” dormitory housing on the third floor. They will contain energy recovery wheels as required per the IEEC.

2) The systems will be single duct, variable air volume with hot water heat and chilled water cooling.

3) The third floor (east and west) will continue as constant volume reheat systems with the addition of modulating dampers to maintain a constant pressure, allowing the floor to function as it presently does.

4) The fourth floor system will have multiple, variable volume, zoned terminal units with reheat.

5) Unit’s construction shall be a double insulated panel system similar to manufacturer’s Daikin, CES (Nortek) Group, Trane, or York.

6) Each systems airflow capacity will be approximately 16,000 CFM.

7) Air will be supplied to all spaces and a portion of this air will be returned to the air handling unit. The remaining portion of the air not returned to the air handling unit will be exhausted through toilet rooms, showers, janitor’s closets, etc.

8) A fully ducted supply and exhaust system will be utilized.

9) Unit’s supply and exhaust systems will operate based on a programed occupancy schedule.

10) Supply air ductwork will not be lined.

b. Design Criteria

1) Air Handling Unit Component Sizing

a) Maximum allowable nominal face velocities:

Filters:	400 fpm
Heating Coils:	650 fpm
Cooling Coils:	450 fpm

2) Duct System Sizing

a) 0.10 in.wg. per 100 feet.

b)

c. Equipment and Materials

1) The unit will be of galvanized steel double wall construction. The unit will consist of the following components:

a) Outside air intake and exhaust dampers.

b) 30% (MERV 7) - 4 inch pre-filters.

c) 65% (MERV 13) – 6 inch or bag filters.

d) Hot water heating coil

e) Chilled water cooling coil.

f) Supply and exhaust fans with variable frequency drives (VFD).

g) Smoke detector at supply air discharge ductwork.

2) Supply and exhaust fans will be direct drive, plenum centrifugal type with airfoil blades in fan array configuration. Fan speed and air volume will be modulated by VFD through the building automation system (BAS).

3) An energy recovery wheel will recover approximately 50-60% of the energy exhausted.

d. Distribution

1) Ductwork will be constructed in accordance with SMACNA Standards for the appropriate pressure class. Ductwork will be sealed to meet SMACNA Seal Class A as a minimum and to limit ductwork leakage not to exceed 2% for low pressure ductwork.

2) Low pressure (2” wc) galvanized ductwork.

3) Supply air ductwork will be externally insulated with fiberglass insulation.

4) Ductwork extending down to the third floor will connect to the existing duct mains such that no new ductwork will be required on the third floor.

e. Smoke Control

1) The existing building Fourth Floor Housing areas will consist of two smoke zones. The same (new) air handling units will be utilized for smoke control that provide the space conditioning needs.

2) Smoke dampers will operate to maintain required pressure differentials between adjacent zones, initiated by the fire alarm system.

f.

17. Air Handling Unit System – Existing Building - Outdoor Rec 4th floor Infill

a. System Description

1) An Indoor air handing unit will be located in the existing 5th floor mechanical penthouse space and will serve the new spaces infilled into the outdoor recreation space.

2) This system will be variable air volume with hot water heat and chilled water cooling.

3) Unit's construction shall be a double insulated panel system similar to manufacturer's Daikin, CES (Nortek) Group, Trane, or York.

4) The system airflow capacity is approximately 8,000 CFM.

5) Air will be supplied to all spaces and a portion of this air will be returned to the air handling unit. The remaining portion of the air not returned to the air handling unit will be exhausted from toilet rooms, janitor's closets, etc.

6) A fully ducted supply and exhaust system will be utilized.

7) Unit's supply and exhaust systems will operate based on a programed occupancy schedule.

8) Supply air ductwork will not be lined.

b. Design Criteria

1) Air Handling Unit Component Sizing

a) Maximum allowable nominal face velocities:

Filters:	400 fpm
Heating Coils:	650 fpm
Cooling Coils:	450 fpm

2) Duct System Sizing

a) 0.10 in.wg. per 100 feet.

c. Equipment and Materials

1) The unit will be of galvanized steel double wall construction. The unit will consist of the following components:

a) Outside air intake and exhaust dampers.

b) 30% (MERV 7) - 4 inch pre-filters.

c) 65% (MERV 13) – 6 inch or bag filters.

d) Hot water heating coil

e) Chilled water cooling coil.

f) Supply and exhaust fans with variable frequency drives (VFD).

g) Smoke detector at supply air discharge ductwork.

2) Supply and exhaust fans will be direct drive, plenum centrifugal type with airfoil blades in fan array configuration. Fan speed and air volume will be modulated by VFD through the building automation system (BAS).

d. Distribution

1) Ductwork will be constructed in accordance with SMACNA Standards for the appropriate pressure class. Ductwork will be sealed to meet SMACNA Seal Class A as a minimum and to limit ductwork leakage not to exceed 2% for low pressure ductwork.
2) Low pressure (2" wc) galvanized ductwork.
3) Supply air ductwork will be externally insulated with fiberglass insulation.

18. Air Handling Unit System – 3rd Floor Renovation

a. System Description

1) The same two existing air handing units located in the existing 5th floor mechanical penthouse space that serve the 4th floor will continue to serve the 3rd floor.
2) Supply, return and exhaust ductwork and the zone heating coils will be reconfigured/replaced due to the plumbing system modifications that are required for the 4th floor. Zoning and air quantities will remain the same.

b. Distribution

1) Ductwork will be constructed in accordance with SMACNA Standards for the appropriate pressure class. Ductwork will be sealed to meet SMACNA Seal Class A as a minimum and to limit ductwork leakage not to exceed 2% for low pressure ductwork.
2) Low pressure (2" wc) galvanized ductwork.

c. Supply air ductwork will be externally insulated with fiberglass insulation.

19. Air Handling Unit System – 2nd Floor Renovation

a. System Description

1) The two existing air handing units located in the existing 5th floor mechanical penthouse space will continue to serve the remodeled space. Supply, return and exhaust ductwork and the zone terminal reheat units will be reconfigured/replaced per the new space layout.

b. Distribution

1) Ductwork will be constructed in accordance with SMACNA Standards for the appropriate pressure class. Ductwork will be sealed to meet SMACNA

Seal Class A as a minimum and to limit ductwork leakage not to exceed 2% for low pressure ductwork.

2) Low pressure (2" wc) galvanized ductwork.

20. Air Handling Unit System – First Floor Renovation

a. System Description

1) The two existing air handing units located in the existing 5th floor mechanical penthouse space will continue to serve the remodeled space. Supply, return and exhaust ductwork and the zone heating coils will be reconfigured/replaced per the new space layout.

b. Distribution

1) Ductwork will be constructed in accordance with SMACNA Standards for the appropriate pressure class. Ductwork will be sealed to meet SMACNA Seal Class A as a minimum and to limit ductwork leakage not to exceed 2% for low pressure ductwork.

2) Low pressure (2" wc) galvanized ductwork.

21. Air Handling Unit System – Basement Renovation

a. System Description

1) The four exhaust systems on this floor currently all exhaust through a louver on the south wall where the addition will be built. Of those four systems, two will be abandoned and two will be re-ducted to new exterior wall louvers elsewhere on the floor.

2) Other ductwork modifications will occur on this floor as follows:

a) The locker room exhaust will be redirected through the current mechanical room and generator room to a new area well at the southeast corner of the existing building.

b) The existing mechanical room is being converted to a laundry. The current supply to this space will be reused. Dryer vents will exit through the east wall through the current generator room. Make-up air will be obtained through a new area well at the southeast corner of the existing building.

c) A new DX split system will be added to Master Control to support the additional IT and security electronics loads. Estimate 4 tons.

b. Distribution

1) Ductwork will be constructed in accordance with SMACNA Standards for the appropriate pressure class. Ductwork will be sealed to meet SMACNA Seal Class A as a minimum and to limit ductwork leakage not to exceed 2% for low pressure ductwork.

2) Low pressure (2" wc) galvanized ductwork.

c. Supply air ductwork will be externally insulated with fiberglass insulation.

22. Makeup Air System – Sub-Basement Renovation

a. System Description

1) The existing gas-fired make-up air unit will continue to serve the entire garage. Due to the addition of a wall and overhead door for the vehicle sally port, a transfer duct will be necessary to allow air delivered into the sally port to be exhausted at the opposite end of the garage. No other work is anticipated at that level.

23. Miscellaneous Mechanical Requirements

1) Three of five exhaust systems presently exiting the south face of the existing building at the basement level will need to be relocated as necessary due to the new addition.

2) The air supply and exhaust will be provided for a new emergency generator located on the Basement level.

3) Repurposed spaces on basement, first, and second floors will need supply ductwork, exhaust ductwork and zoning revisions to accommodate new functions and spaces.

4) A gas meter located near the existing loading dock will need to be relocated and piping extended to both existing and new equipment.

5) The existing 10” low pressure steam line and 2-½” pumped condensate line in the existing basement mechanical room will be extended to the new mechanical room in the sub-basement of the new addition. The existing duplex condensate pump and receiver will be replaced with new.

24. Temperature Controls

a. Mechanical systems will be controlled and monitored through a DDC based BAS with distributed processing at the local level. All valves and dampers shall have electric actuation.

b. DDC controllers will utilize distributed architecture and will not rely on "front-end" or higher level controller to perform required control sequence.

c. Each DDC controller will have a minimum of 10% spare points of each type (DI, DO, AI and AO) at each panel. For universal joints, the spares will be divided evenly between the analog and digital types of points.

d. All DDC system primary LAN controllers, PCs and communications equipment that monitors life safety and critical points (fire alarm, CNG alarms, etc.).

e. System will monitor temperature, pressure, status, alarms, runtime, positions, occupancy, etc., as required to provide Owner operators adequate feedback to diagnose system operation.

f. All existing pneumatic actuation of valves and dampers to be converted to DDC/electronic.

25. Stairwell Pressurization Systems

a. The stairwells in the new addition will require pressurization systems to prevent smoke from entering the stairs in a fire event. The fans will be located in the 5th floor mechanical space and ducted down the side of each stairwell with injection points at multiple levels.

b. The egress corridor on the basement level that connects to a stairwell in the existing building will contain a pressurization fan to prevent smoke from entering the existing stairwell.

26. Smoke Control System

a. A smoke control system will be incorporated into the entire building which will consist of multiple smoke compartments on floors 1 through 8, smoke exhaust fans, and fire/smoke dampers per IBC 909.

b. The system shall utilize the pressurization method. The primary mechanical means of controlling smoke shall be by pressure differences across smoke barriers.

c. The fire command center will be in the existing building and will contain the fire fighter's smoke control panel.

14 Fire Protection Systems

A. Overview

1. The fire suppression scope of work consists of providing a wet pipe fire sprinkler system and a wet pipe automatic standpipe system for a 13 story building addition to the Dane County Jail.

B. Base Design Criteria

1. The following applicable Codes, Standards, and Guidelines are intended to be used to determine acceptable design criteria, standard of performance, workmanship, etc. Based on industry best practice and Owner's experience, system design criteria that exceed the minimum standards will be applied as appropriate.

2. Applicable Codes

NFPA 1	Fire Code 2012
SPS 314	Wisconsin Fire Prevention Code 2018

3. Applicable Guides and Standards

NFPA 13	Sprinkler Systems 2010
NFPA 14	Standpipe and Hose Systems 2010
NFPA 20	Stationary Pumps for Fire Protection 2010
NFPA 24	Private Fire Service Mains 2010
NFPA 25	Inspection, Testing, and Maintenance 2011
NFPA 30	Flammable and Combustible Liquids Code 2010

C. Design Conditions

1. Building hazard classifications are based on the following occupancies as found in NFPA 13:

NFPA-13 Hazard Classifications

Light	Unless Otherwise Noted
Ordinary Hazard Group 1	Automobile parking, Laundry, Production kitchen, Mechanical and Electrical rooms, Storage rooms, Porte cochere
Ordinary Hazard Group 2	Exterior loading dock, Generator room
Special Hazard	Fuel storage

2. Overall fire sprinkler design is based on the following sprinkler demand values as found in NFPA 13:

NFPA-13 HYDRAULIC CALCULATION STANDARD

HAZARD CLASSIFICATION	DENSITY GPM/SQ FT	AREA OF SPRINKLER OPERATION SQ FT	TOTAL HOSE STREAM GPM	DURATION MINIMUM
LIGHT HAZARD	0.10	1500	100	60
ORDINARY HAZARD GROUP 1	0.15	1500	250	60-90
ORDINARY HAZARD GROUP 2	0.20	1500	250	60-90

3. Hose stream demand is based on the following values as found in NFPA 13

NFPA 13 Hose Stream Allowance and Duration

	HOSE DEMAND, GPM	

HAZARD CLASSIFICATION	INSIDE	TOTAL COMBINED INSIDE AND OUTSIDE	DURATION, MIN
LIGHT	0, 50, OR 100	100	30
ORDINARY	0, 50, OR 100	250	60–90

4. Water supply flow is based on the following values obtained from City of Madison:

WATER SUPPLY FLOW BASIS FOR BID	
NOTE: INFORMATION SHOW FOR BID ONLY, NOT FOR DESIGN. FIRE PROTECTION DESIGN / INSTALLATION CONTRACTOR SHALL CONDUCT SEPARATE WATER FLOW TEST AND USE RESULTS IN HYDRAULIC CALCULATIONS.	
DATE OF TEST:	10/14/1992
LOCATION:	115 W. Doty St.
TEST HYDRANTS:	N/A
HYD. OUTLET ELEV.:	20" OFF FINISHED GRADE
STATC PRESSURE:	75 PSI
RESIDUAL PRESSURE:	60 PSI
FLOW GPM:	1300 GPM

5. Proposed manufacturers of major equipment will be as indicated:

EQUIPMENT	MANUFACTURER(s)
Double Check Valve Assembly	Apollo, FEBCO, Zurn
Dry-pipe Valve	Reliable, Tyco, Victaulic, Viking
Air Compressor	General, Viking, Ingersoll-Rand, Quincy

Specialty Devices	Elkhart, Guardian, Potter, Tyco, Viking
Sprinklers	Reliable, Tyco, Victaulic, Viking
Fire Pump	Peerless, Patterson, Aurora
Fire Pump Controller	Eaton, Hubbell, Firetrol

D. Systems Descriptions

1. Fire Protection Demolition

    a. System Description

        1) The existing facility is fully sprinkled. The existing fire sprinkler system will remain in place to the greatest extent possible. Demolition will be limited to removal or relocation of sprinkler heads to accommodate new partition wall layouts.

        2) The existing fire pump will be demolished and replaced with a new fire pump.

    b. Design Criteria

        1) Coordinate the replacement of the fire pump with the construction schedule, to minimize the amount of time the system is out of service.

        2) Existing systems outside the project limits must remain in service.

        3) Obtain permission from Owner no fewer than 7 days in advance of any system interruptions or shut downs.

2. Wet Pipe Fire Sprinkler System

    a. System Description

        1) Automatic sprinklers are attached to piping containing water and that is connected to water supply through an alarm valve. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hydraulic and electric sensors send alarms when water flows.

        2) Wet pipe fire sprinkler system will serve all building spaces unless noted otherwise.

b. Design Criteria

1) The existing 6-inch water service entrance is dedicated to the fire sprinkler system. It will remain in place to serve both the existing facility and the new addition.

2) All fire suppression systems will be hydraulically calculated with a computer calculation system.

c. Equipment and Materials

1) Fire sprinkler pipe shall be black steel. Pipe 2-inch and smaller will be Schedule 40 with threaded joints. Pipe larger than 2-inch shall be Schedule 10 with welded or roll groove joints, or Schedule 40 with welded, threaded, or cut groove joints.

2) Sprinkler heads shall be quick response standard spray. Institutional grade, concealed, ligature resistant, tamper resistant sprinkler heads shall be installed in housing units. Concealed sprinklers shall be installed in areas with ceilings. Upright or pendant sprinklers shall be installed in areas without ceilings. Sprinkler guards shall be used in mechanical and storage rooms.

3) Fire Pump shall be 150 HP electric and shall include all appurtenances including fire pump controller and automatic power transfer switch.

4) Fire Pump Controller shall be soft start (wye-delta configuration) and shall include disconnect and transfer switch.

d. Distribution

1) All fire sprinkler pipe will be routed overhead and square to building structure.

3. Dry Pipe Fire Sprinkler System

a. System Description

1) Automatic sprinklers are attached to piping containing compressed air. A dry pipe valve separates the piping from a water supply. Sprinklers open when heat melts a fusible link or destroys a frangible device. Compressed air discharges immediately from sprinklers when they are opened. The reduced air pressure allows

the dry valve to open. When the dry valve opens, water travels to the open sprinklers and then discharges from the open sprinklers. Hydraulic and electric sensors send alarms when water flows.

2) Dry pipe fire sprinkler system will serve the trash/recycling room, loading dock, and building overhangs above exterior ramp access to subbasement parking.

b. Design Criteria

1) All fire suppression systems will be hydraulically calculated with a computer calculation system.

c. Equipment and Materials

1) Dry pipe system pipe shall be galvanized steel. Pipe 2-inch and smaller will be Schedule 40 with threaded joints. Pipe larger than 2-inch shall be Schedule 10 or Schedule 40 with threaded or cut groove joints.

2) Sprinkler heads shall be quick response standard spray. Semi-recessed or sidewall sprinkler heads shall be used in areas with a flat ceiling surface. Upright or pendant heads shall be used in all other areas.

3) The air compressor shall be a simplex, single stage, receiver mounted, oil lubricated air compressor. Air compressor shall not be riser mounted.

d. Distribution

1) All fire sprinkler pipe will be routed overhead and square to building structure.

4. Preaction Fire Sprinkler System

a. System Description

1) Double-Interlock Preaction System: Automatic sprinklers are attached to piping containing compressed air. A deluge valve separates the piping from a water supply. The deluge valve opens when both of the following occur: an electronic heat detection system detects heat, and a sprinkler opens. Sprinklers open when heat melts a fusible link or destroys a frangible device. Compressed air discharges immediately from sprinklers when they are opened.

When the deluge valve opens, water travels to the open sprinkler and then discharges from the open sprinklers. Hydraulic and electric sensors send alarms when water flows.

2) Preaction fire sprinkler system will serve the generator room, diesel fuel storage room (if located on building interior), and security electronics master control room.

b. Design Criteria

1) All fire suppression systems will be hydraulically calculated with a computer calculation system.

c. Equipment and Materials

1) Equipment and Materials shall be of the same type as the wet pipe sprinkler system.

2) Heat detection system shall be of the same type as the building fire alarm system.

3) The air compressor shall be a simplex, single stage, receiver mounted, oil lubricated air compressor. Air compressor shall not be riser mounted.

d. Distribution

1) All fire sprinkler pipe will be routed overhead and square to building structure.

5. Standpipe System

a. System Description

1) A system that supplies hose connections for manual firefighting operations. The system serves both hose connections and automatic sprinklers. Hose connections are located in fire rated stairwells.

2) Automatic Wet Standpipe System: A standpipe system containing water at all times that is attached to a water supply capable of supplying the system demand at all times and that requires no action other than opening a hose valve to provide water at hose connection.

3) Class I System: A system that provides 2-1/2” hose connections to supply water for use by fire departments.

b. Design Criteria

1) The standpipe system shall provide a minimum of 100 psi residual pressure at the top of each standpipe. Each hose connection shall be capable of 250 gallons per minute flow rate. The most remote standpipe shall include two hose connections at the top of the standpipe, for a total of 500 gallons per minute flow rate at this location.

2) The standpipe system shall serve freeze proof rooftop mounted hose connections.

c. Equipment and Materials

1) Equipment and Materials shall be of the same type as the wet pipe sprinkler system.

d. Distribution

1) All standpipe pipe will be routed overhead and square to building structure.

15 Plumbing Systems

A. Overview

1. The plumbing scope of work consists of providing water supply, sanitary drain and vent, garage drain and vent, and storm drain systems for a 13 story building addition to the Dane County Jail.

B. Base Design Criteria

1. The following applicable Codes, Standards, and Guidelines are intended to be used to determine acceptable design criteria, standard of performance, workmanship, etc. Based on industry best practice and Owner's experience, system design criteria that exceed the minimum standards will be applied as appropriate.

2. Applicable Codes

SPS 380 - 387	Wisconsin Plumbing Code

3. Applicable Guides and Standards

ASPE PEDH	Plumbing Engineering Design Handbook, Volumes 1-4 (Current Editions)

C. Design Conditions

1. Water supply flow is based on the following values obtained from City of Madison:

WATER SUPPLY FLOW	
DATE OF TEST:	10/14/1992
LOCATION:	115 W. Doty St.
TEST HYDRANTS:	N/A
HYD. OUTLET ELEV.:	20" OFF FINISHED GRADE
STATC PRESSURE:	75 PSI

RESIDUAL PRESSURE:	60 PSI
FLOW GPM:	1300 GPM

2. Water quality is based on the following values obtained from [insert source]:

Water Quality Report	
Total Hardness, gpg	19

3. Proposed manufacturers of major equipment will be as indicated:

EQUIPMENT	**MANUFACTURER(S)**
Water Heater	AO Smith, HTP, Bock, Bradford White, Navien
Plastic or Fiberglass Interceptor	Green Turtle, Schier, Canplas
Water Supply Pump	Bell & Gossett, Grundfos, Wilo, Taco, SyncroFlo, QuantumFlo
Wastewater Pump	Bell & Gossett, Grundfos, Weil, Zoeller, EBARA
Drains	Watts, Zurn, JR Smith, Josam, Wade
Plumbing Fixtures	American Standard, Kohler, Zurn, Mansfield
Faucets and Flush Valves	American Standard, Kohler, Chicago Faucets, Sloan, Moen, Zurn
Institutional Grade Fixtures	Acorn, Bradley, Willoughby

D. System Descriptions

1. Plumbing Demolition

   a. System Description

      1) The existing plumbing systems have significant problems with leaks, and will be replaced throughout the facility. In areas of renovation, existing systems will be demolished and new systems will be provided to accommodate new floor plan layouts. In all other areas, existing systems will be removed and replaced with new

systems of the same size and in the same location. The demolition will be planned to cause the least disruption possible to existing building finishes.

2) Solar panels for a solar thermal water heating system are located on the penthouse roof. The size and location of the new building addition will block direct sunlight to the panels in their existing location. The building addition and the adjacent courthouse will cast shade on the existing roof for much of the day, severely reducing the capacity of the solar thermal system. The solar thermal system will be demolished and will not be replaced.

b. Design Criteria

1) The domestic water service and sanitary sewer serving the facility will be relocated as part of the scope of work. Coordinate the installation of the new services to minimize the amount of time the system is out of service.

2) Existing systems outside the project limits must remain in service.

3) Obtain permission from Owner no fewer than 7 days in advance of any system interruptions or shut downs.

2. Domestic Water Supply

a. System Description

1) Plumbing fixtures are attached to a cold and hot water distribution system containing potable water that is connected to water supply through a water meter and backflow prevention device.

2) Hot water is generated with steam-fired heat exchanger(s). The water heater is located in the mechanical room adjacent to the water service entrance.

3) Hot water is continuously circulated through the system and returned back to the hot water source.

4) Mechanical equipment is attached to a non-potable water distribution system that is connected to water supply through a backflow prevention device.

b. Design Criteria

1) The 8-inch water service entrance will be dedicated to the potable water supply. The water service will be designed at 5 feet per second maximum allowable velocity.

2) The water distribution system will be designed by the segmented loss method. This method requires the following information: the load factor in water supply fixture units or gallons per minute flow rate, the minimum pressure available from the water source (water main or pressure tank), the pressure loss due to the difference in elevation between the water source and the controlling plumbing fixture, the pressure loss due to equipment (water softener, backflow prevention device, etc.), the minimum flow pressure required at the controlling fixture, and the pressure loss through piping, valves, fittings, and appurtenances. The maximum allowable velocity shall be 6 feet per second in cold water supply, 5 feet per second in hot water supply, and 4 feet per second in hot water recirculation. Velocity limitations are to reduce the potential for pipe wall erosion.

3) The water distribution system will be segregated into two pressure zones. The lower half of the facility shall be served by the available utility supply pressure. The upper half of the facility shall be served by domestic water pressure booster pumps. The hot and cold water supply systems shall have separate booster pumps. Each pressure zone shall have a maximum water supply pressure of 80 psi.

4) Domestic water booster pumps will be required to overcome system pressure losses. Triplex variable speed domestic water booster pumps will be provided, with each pump sized to provide 40% of the full demand load for the facility. This equipment will provide a maximum of 120% design flow during periods of high demand.

5) A water softener will be required based on the water quality report. The water softener will provide softened water to the hot water distribution system. A triplex water softener will be provided, with each tank sized to provide 50% of the full demand load for the facility at a maximum of 15 psi pressure loss.

6) The water heater will be selected based on the average hourly demand method. This method requires the following information: the average hourly use for each plumbing fixture type, the simultaneous usage factor based on facility type, and the storage factor based on facility type.

7) The primary water heater will be steam-fired. A gas-fired backup system will be provided to maintain full operation of the facility during the annual steam utility shut-down.

c. Equipment and Materials

1) Domestic plumbing distribution pipe shall be Type L copper with solder joints, brazed pipe joints, or press-fit joints. Pipe insulation shall be performed fiberglass pipe insulation.

2) Domestic plumbing valves intended for shut-off duty shall be two-piece, full port ball valves for pipe sizes 3" and smaller, or butterfly valves for pipe sizes larger than 3". Hot water recirculation systems shall include calibrated balancing valves at each system branch connection. Swing check valves shall be included to ensure the proper direction of flow.

3) The backflow prevention device serving the domestic water service shall be a reduce pressure zone style backflow preventer. Hose thread style backflow preventers will be provided for all loose hose connections, hose bibb or wall hydrants, janitor's sinks, and any hose thread spout outlets.

4) Circulation Pumps shall be variable speed, electronically commutated motor (ECM) high efficiency pumps with integral thermal controls.

5) Booster Pumps for domestic water shall be a triplex, variable speed, skid mounted booster pump package.

6) Primary water heaters shall be steam fired, semi-instantaneous water heater. Backup water heaters shall be standard efficiency natural gas fired volume water heater. The thermal expansion tank shall utilize a field replaceable bladder system. Hot water storage tanks shall be stainless steel.

7) Water softener shall be triplex progressive flow. Brine making system shall include a fiberglass tank for bulk storage of brine making materials (rock salt or premix liquid).

d. Distribution:

1) All plumbing pipe will be routed overhead and square to building structure.

2) No plumbing pipe will be routed in electrical or technology rooms.

3. Drain and Vent

a. System Description

1) Plumbing fixtures are connected to a sanitary drain and vent collection system that is connected to a municipal sanitary sewer system thru a grinder sewage ejector pump.

2) Grease producing fixtures in the scullery are connected to a grease drain and vent system that is connected to a gravity grease interceptor. Grease separates from the wastewater in the grease interceptor and is collected for future remediation. Grease free wastewater continues downstream from the grease interceptor and connects to the sanitary drain and vent collection system.

3) Floor drains located in vehicle traffic and parking areas are connected to a garage drain and vent collection system that is connected to a municipal sanitary sewer system thru a garage catch basin.

4) Clearwater drains are connected to a clearwater drain and vent collection system that is connected to a storm drain system through a backflow prevention device.

b. Design Criteria

1) Drain and vent systems will be designed using the fixture unit method. This method requires the following information: the load factor in drainage fixture units or gallons per minute flow rate, and the slope of the connected drainage pipe. The drain and vent systems will be designed with a minimum 2 feet per second velocity to ensure solids remain suspended in the wastewater.

2) Wastewater grinder pumps will be required to ensure no large debris passes from the facility to the municipal sewer system. An in-line pump sized for 100% of the facility load will be provided. A bypass with a backup in-line pump will also be provided.

3) A sewage ejector pump will be required to serve building levels below the elevation of the municipal sewer system. A duplex submersible system will be provided, with each pump sized for 100% of the facility load.

4) A gravity grease interceptor will be required for on-site pretreatment of the grease laden wastewater from the scullery. The interceptor will be designed based upon the peak flow rate, defined by code as three-fourths of the holding capacity (in gallons) of all connected fixtures and devices. The grease holding capacity (in pounds) of the interceptor shall be double the peak flow rate.

5) A commercial laundry interceptor will be required for on-site laundry facilities. The interceptor will be a trench type interceptor with sediment bucket, with a holding capacity (in gallons) equal to one full simultaneous discharge load from every connected machine.

c. Equipment and Materials

1) Sanitary drain and vent pipe will be Service Weight Cast Iron Soil Pipe with drainage pattern fittings and hub-and-spigot or no-hub coupling joints.

2) Grease drain and vent pipe will be the same material as the sanitary drain and vent pipe.

3) Garage drain and vent pipe will be the same material as the sanitary drain and vent pipe.

4) Clearwater drain and vent pipe will be the same material as the sanitary drain and vent pipe.

5) Elevator pit pump will be simplex configuration. The sump basin will be fiberglass reinforced plastic. An oil sensor will be provided to prevent system operation if hydraulic fluid is present in the wastewater. The oil sensor and a high-water alarm will be connected to the building automation system.

6) Wastewater grinder pump will be duplex configuration slow speed, high torque macerating pump. The vault will be precast concrete of sufficient size for two grinder pumps plus associated bypass piping.

7) Sewage ejector pump will be duplex configuration submersible pump with lift rail system. The sump basin will be fiberglass with anti-flotation flange. A float system shall control operation of the pumps, with high water alarm connected to the building automation system.

8) Backwater valves will be bolted steel with a removable flapper inserted into a valve body. The backwater valve will be accessible via handhole.

9) Gravity grease interceptor will be fiberglass reinforced plastic with traffic rated covers. It will be located to be accessible to vacuum truck. It will include an automatic level monitor connected to the building automation system to alert staff to high grease levels.

10) Laundry interceptor will be high density polyethylene or stainless steel manufactured trench drain system. The outlet shall be an inline catch basin section with sediment bucket to capture lint, buttons, or other detrimental materials from entering the drain system.

d. Distribution

1) All plumbing pipe will be routed overhead and square to building structure.

2) No plumbing pipe will be routed in electrical or technology rooms.

4. Storm Drain

a. System Description

1) Primary roof drains are connected to a stormwater collection system that is connected to a municipal storm sewer system. Secondary roof drains are connected to a stormwater collection system that discharges to grade.

b. Design Criteria

1) Storm drain systems will be designed for a 20-year storm one hour in duration. This is equivalent to three Inches per hour rainfall rate. The pipe sizes will be determined based on the expected gallons per minute flow rate and the slope of the connected pipe.

2) A sump pump will be required to serve the foundation draintile system. A duplex submersible system will be provided, with each pump sized for 100% of the facility load.

c. Equipment and Materials

1) Storm drain pipe will be the same as used for the sanitary drain and vent system.

2) Foundation draintile system will be perforated Schedule 40 PVC wrapped with geotextile fabric.

3) Roof drains will be large diameter cast iron roof drains with cast iron dome strainers and extra large sump.

4) Downspout nozzles will be bronze with vermin screen.

5) Sump pump will be duplex configuration submersible pump with lift rail system. The sump basin will be fiberglass with anti-flotation flange. A float system shall control operation of the pumps, with high water alarm connected to the building automation system.

d. Distribution

1) All plumbing pipe will be routed overhead and square to building structure.

2) No plumbing pipe will be routed in electrical or technology rooms.

5. Plumbing Fixtures

a. Equipment and Materials

1) Correctional grade fixtures will be combination lavatory and water closet, stainless steel, ligature resistant design. Lavatory will have individual hot and cold water controls, rated for 0.5 gallons per minute flow rate. Water closet will have dedicated controls, rated for 1.6 gallons per minute flow rate.

2) Lavatories for staff or public use will be vitreous china, undermount bowl with single temperature sensor faucet rated for 0.5 gallons per minute flow rate.

3) Water closets for staff or public use will be vitreous china, wall hung flush valve style fixtures with 1.28 gallons per flush.

4) Urinals for staff or public use will be vitreous china, wall hung flush valve style fixtures with 0.25 gallons per flush.

5) Correctional grade showers will be flush mounted, stainless steel cabinet with single handle manual valve and fixed showerhead. All components shall be ligature resistant design. Shower enclosures will be tile.

6) Showers for staff or public use will be single handle manual valve with fixed showerhead. Shower enclosures will be prefabricated

fiberglass. Accessible showers will include a diverter valve, handshower on vertical slide mount, and fold-up seat.

7) Break Room Sink will be one compartment stainless steel drop-in with two handle swing spout faucet rated for 1.0 gallons per minute flow rate.

8) Correctional grade drinking fountain will be wall hung stainless steel in high-low configuration. All components shall be ligature resistant design.

9) Drinking Fountain for staff or public use will be wall hung stainless steel in high-low configuration, with bottle filler.

10) Hose bibbs will be cast brass with rough bronze finish and wheel handle operation. Wall hydrants will be freezeproof with loose key operation. Roof hydrants will be freezeproof with 1-gallon collection tank to eliminate drain port.

11) Floor drains in finished areas will be cast iron body with nickel bronze heel proof grate. Floor drains in mechanical rooms will be cast iron body with heavy duty tractor grate.

12) Floor sinks will be fabricated stainless steel with stainless steel grate.

16 Electrical Systems

A. Overview

1. The electrical scope of work consists of providing lighting and controls, power distribution and a fire alarm system for the new high-rise facility.
2. Electrical scope also consists of providing lighting and controls, power distribution and fire alarm system replacement in the existing building. These electrical distribution modifications include providing new utility (normal) and generator sourced systems. The distribution systems will be replaced and upgraded where required to serve renovated areas.

B. Design References

1. The following applicable Codes, Standards, and Guidelines are intended to be used to determine acceptable design criteria, standard of performance, workmanship, etc. Based on industry best practice and Owner's experience, system design criteria that exceed the minimum standards will be applied as appropriate.
2. Applicable Codes, Standards and Guidelines

SPS 316	WI Commercial Building Electrical Code
NFPA 70	National Electrical Code
NFPA 72	National Fire Alarm and Signaling Code
SPS 363	WI Commercial Building Energy Conservation Code
IBC	International Building Code
IEBC	International Existing Building Code
SPS	WI Commercial Building Code

C. Design Criteria

1. Overall normal building power is calculated based on the following load density values. Where VA/sq. ft values are given, these values are taken over the entire building area or, in the case of exterior lighting, over the entire illuminated area.

Item	Load Density	Unit
General Purpose Receptacles	2.00	VA/sq. ft
Lighting	0.70	VA/sq. ft

Exterior Lighting	0.25	VA/sq. ft
Telecommunication and Security Systems	0.50	VA/sq. ft
Mechanical Equipment	As Scheduled	
Plumbing Equipment	As Scheduled	
Other Equipment	As Scheduled	

2. Lighting levels will be in accordance with recommendations of the Illuminating Engineering Society (IES) and as indicated below. Areas designed by the lighting designer will have maintained levels as selected by that designer.

Area	Maintained Footcandles
Cells/sleeping rooms	30 FC
Dayrooms/ Other Program Spaces	30 FC
Offices / General Office Areas	40 FC
Toilet/shower areas	20 FC
Multipurpose/Exercise Areas	60 FC
Storage areas	30 FC
Workstations	50 FC
Mechanical/electrical	30 FC
Telecommunications rooms	50 FC (at 3’ AFF)

3. Branch Circuit Load Calculations

Lighting	Actual installed VA
Receptacles	180 VA per outlet
Multi-Outlet Assemblies	180 VA per 2’-0”
Special-Purpose Outlets	Actual installed VA of equipment served
Motors	125% of motor VA

4. Demand Factors

Lighting	100% of connected VA
Receptacles	100% of first 10 kVA installed plus 50% of balance
Special-Purpose Outlets	Actual installed VA of equipment served

Motors	125% of VA of largest motor plus 100% of VA of all
Fixed Equipment	100% of connected VA

5. Electrical Quality Level

   a. Equipment selections will be from manufacturers whose products comply with current industry accepted design and testing standards.

   b. Equipment selection, specification, and installation practices will reflect a commitment to long-term longevity of the system, ease of maintenance, and energy efficiency.

   c. The intended level of quality of all wiring devices will be heavy-duty, specification and detention grade.

   d. The intended level of quality of all lighting fixtures will be specification and detention grade.

6. Proposed manufacturers of major equipment will be as indicated:

Equipment	**Manufacturer(s)**
Power Distribution Equipment	Square D, Eaton, ABB GE Industrial
Generators	Caterpillar, Cummins, Kohler, MTU
Automatic Transfer Switches	Caterpillar, Cummins, ABB, Kohler, MTU, ASCO
Wiring Devices	Hubbell, Leviton, Legrand
Fire Alarm System and Devices	Edwards, Notifier, Siemens, Simplex, Honeywell

7. Energy Conservation

   a. Electrical building systems shall be designed using sustainable energy efficiency goals.

   b. Design to meet the requirements of WI Building Code SPS 363 and ASHRAE 90.1.

D. Systems Descriptions

1. Building Demolition

a. System Description

1) Replacement of the existing 4,000A, 480Y/277V 3-phase, 4-wire switchboard.

2) Replacement of existing electrical distribution equipment, lighting and electrical devices serving renovated spaces.

3) Replacement of fire alarm system in its entirety from the existing building. Existing building will be occupied throughout project construction. Therefore, removal of existing fire alarm will occur only after the new fire alarm system is installed and made operational after inspection.

b. Design Criteria

1) Disconnection of electrical power to utilization equipment and circuits removed or affected by demolition work.

2) Electrical services in existing building will be maintained from existing MG&E vault at S. Carroll Street. A new main switchboard will be provided and made operational prior to demolition of any existing distribution.

3) Demolition of the existing main switchboard and associated distribution and panels serving existing equipment in remodeled areas,

4) Demolition of all distribution equipment, including automatic transfer switches (ATSs) and panelboards served from existing 900kW and 50 kW generators.

5) Demolition of existing 900kW and 50 kW diesel generators and associated fuel delivery systems (daytank, main storage tank, transfer pumps, and associated piping).

6) Survey and record condition of existing facilities to remain in place that may be affected by demolition operations.

7) Provide temporary wiring and connections to maintain existing systems in service during construction. Assume all equipment and systems must remain operational unless specifically noted otherwise on drawings.

8) Existing Fire Alarm System: Maintain existing system in service. Disable system only to make switchovers and connections. Obtain permission no fewer than 72 hours in advance of proposed

interruption of fire alarm system before partially or completely disabling systems. Minimize outage duration. If required, make temporary connections to maintain service in areas adjacent to work area. If outages are necessary and unavoidable, provide fire watch in accordance with NFPA 101 requirements. Do not proceed with interruption without Owner's written permission.

2. Power Distribution System

a. System Description

1) The power distribution system is comprised of utility (normal) source, and generator source consisting of emergency, legally required standby, and optional standby systems. Major system components include switchboards, distribution and appliance panelboards, transformers, generator, and automatic transfer switches.

2) Emergency systems are those essential for human safety if the normal power fails, such as egress lighting, fire alarm systems, fire pumps, public safety communications systems and automatic doors.

3) Legally required standby systems are typically installed to provide electric power to aid in firefighting, rescue operations, control of health hazards, and similar operations. These loads include heating systems, ventilation and smoke removal systems, elevators, selected lighting, and communication systems

4) Optional standby systems are typically those that life safety does not depend on for the performance of the system, but that Owner would like to have on generator sourced power.

5) The existing 4,000A 480Y/277V, 3-phase, 4-wire switchboard in the existing building basement will be replaced. A new MG&E approved, switchboard containing MG&E metering cabinet and a 4,000A fused switch with ground fault protection will be provided in the existing building basement electrical room B048 to serve as the building main disconnect. The new switchboard section(s) will be energized from the existing MG&E vault on S.. Carroll St. simultaneously with the existing 4,000A switchboard. A new multi-section distribution switchboard will be provided in Basement

electrical room B048, separate from the new building disconnect and is anticipated to contain the following breakers:

a) 3,000A, 3-pole, solid state (LSIG) to serve the new 3,000A switchboard in the addition.

b) 1,200A, 3-pole, solid state (LSIG) to serve existing switchboard MDP-2L.

c) 1,600A, 3-pole, solid state (LSIG) to serve existing ATS and switchboard MDP-EL until new generator and transfer switches are in place and all existing loads on panel MDP-EL are re-fed.

d) 200A, 3-pole, solid state (LSIG) to serve existing panels L2, L4 and L5.

e) 400A, 3-pole, solid state (LSIG) to serve existing panel L3.

f) 400A, 3-pole, solid state (LSIG) to serve existing panel MDP-1P.

g) 200A, 3-pole, solid state (LSIG) to serve existing panel L1.

h) (2) 200A, 3-pole, solid state (LSIG) spare breakers.

i) (2) 100A, 3-pole, solid state (LSIG) spare breakers.

j) (2) 400A, 3-pole spaces.

k) (6) 200A, 3-pole spaces.

Once the new switchboard distribution section is in place, all existing equipment loads will be refed from this new switchboard one-by-one to minimize outage disturbances to the facility. Upon transfer of all existing loads to the new switchboard, the existing switchboard will be demolished.

6) A new 1,200A 480Y/277V 3-phase, 4-wire switchboard MDP-2L to serve remodeled spaces within the 3rd, 4th and penthouse floors of the existing facility. This switchboard will contain the following breakers:

a) 1,200A, 3-pole, solid state (LSIG) main breaker.

b) 500A, 3-pole, solid state (LSI) to serve new 300 kVA step-down transformer and 1000 switchboard for 208Y/120V loads on existing 3rd, 4th and penthouse floors.

c) (3) 125A, 3-pole, solid state (LSI) to serve lighting panels on existing 3rd, 4th and penthouse floors.

d) 400A, 3-pole, solid state (LSI) to serve mechanical / chiller loads.

e) (2) 400A, 3-pole spaces.

7) A new 1,200A 208Y/120V 3-phase, 4-wire switchboard MDP-2P to serve remodeled spaces within the 3rd, 4th and penthouse floors of the existing facility. This switchboard will contain the following breakers:

a) 1,000A, 3-pole, solid state (LSI) main breaker

b) (1) 225A, 3-pole, solid state (LSI) to serve panel on existing penthouse floor.

c) (4) 300A, 3-pole, solid state (LSI) to serve panels on existing 3rd and 4th floors.

d) (3) 225A, 3 pole spaces.

e) (1) 400A, 3 pole spaces.

8) A new 3,000A 480Y/277V 3-phase, 4-wire switchboard will be provided in the building addition main electrical room. This switchboard will contain the following breakers:

a) 3000A, 3 pole solid state (LSIG) main breaker.

b) 400A, 3-pole, solid state (LSIG) to serve ATS-E.

c) 1200A, 3-pole, solid state (LSIG) to serve ATS-X.

d) 1200A, 3-pole, solid state (LSIG) to serve ATS-O.

e) 400A, 3-pole, solid state (LSIG) to serve mechanical panel in LL2.

f) 250A, 3-pole, solid state (LSIG) to serve 150kVA transformer and distribution panel to serve 208Y/120V loads on LL, Sub Basement, Basement and First floors.

g) 1200A, 3-pole, solid state (LSIG) to serve 5th floor penthouse level switchboard.

h) (2) 200A, 3-pole, solid state (LSIG) spare breakers.

i) (2) 100A, 3-pole, solid state (LSIG) spare breakers.

j) (2) 400A, 3-pole spaces.

k) (6) 200A, 3-pole spaces.

9) A new 1,200A, 480Y/277V 3-phase, 4-wire switchboard will be provided in the building addition 5th floor mechanical space. This switchboard will contain the following breakers:

a) 3000A, 3 pole solid state (LSIG) main breaker.

b) 250A, 3-pole, solid state (LSIG) to serve 150kVA transformer and distribution panel to serve 208Y/120V loads on 2nd, 3rd, 4th and 5th floors.

c) 70A, 3-pole, solid state (LSIG) to serve 45kVA transformer and 208Y/120V panel on 6th floor mezzanine.

d) 70A, 3-pole, solid state (LSIG) to serve 45kVA transformer and 208Y/120V panel on 7th floor mezzanine.

e) 70A, 3-pole, solid state (LSIG) to serve 45kVA transformer and 208Y/120V panel on 8th floor mezzanine.

f) Various breakers to serve 5th floor mechanical equipment.

g) (2) 200A, 3-pole, solid state (LSIG) spare breakers.

h) (2) 100A, 3-pole, solid state (LSIG) spare breakers.

i) (2) 400A, 3-pole spaces.

j) (6) 200A, 3-pole spaces.

10) The building addition will contain a new dual fuel diesel/natural gas fueled generator system serving Emergency, Legally Required and Optional Standby distribution branches in the new and existing facility. The new generator set rating is planned to be 480Y/277 volts, three-phase, 4-wire with an estimated size of 1,250 kW. There is a generator study currently taking place that will recommend an exact size for this new generator, as well as fuel capacity to maintain facility operation meeting the County's desired amount of run time. Note that it is anticipated that a remote fuel tank located in the basement will be required. Additionally, a 500-gallon day tank will be installed directly adjacent to the generator. The generator will be provided with ground fault indication.

11) A new 3,000A, 480Y/277V, 3-phase, 4-wire standby power switchboard will be provided in a room adjacent to the new generator. The switchboard will have individually mounted,

partitioned circuit breakers to feed each of the standby branches of power. The switchboard is anticipated to be five sections:

a) Section 1: Pull sections

b) Section 2: 400A, 3-pole, solid state (LSI) circuit breaker to serve NEC 700 – Emergency loads.

c) Section 3: 350A, 3-pole, solid state (LSI) circuit breaker to serve the fire pump.

d) Section 4: 1200A, 3-pole, solid state (LSI) circuit breaker to serve NEC 701 – Legally Required Standby loads.

e) Section 5: 1200A, 3-pole, solid state (LSI) circuit breaker to serve NEC 702 – Optional Standby loads.

12) Three (3) automatic transfer switches (ATS) will be provided, one switch for each branch of generator sourced power. The automatic transfer switches will be open, programmed transition, 4-pole switches and equipped with bypass isolation. Digital power monitors will be provided integral to each transfer switch for County monitoring of loads on each branch of power. Transfer switches for NEC 700 (ATS-E) 701 (ATS-X) and 702 (ATS-O) will be rated at 400A, 1200A and 1200A respectively.

13) A code required generator connection cabinet will be installed in the LL level space and connected into the emergency (NEC 700) feeder for temporary back-up of the emergency system while the permanent generator is being serviced for maintenance or repairs. The connection cabinet will be 480Y/277V 3-phase, 4-wire and compliant with NEC 700.3(F).

14) The existing generator sourced power distribution system, currently served from a single 1600 ATS, will be replaced so that loads are segregated to meet current NEC requirements. Phased construction will require temporarily refeeding the existing generator sourced distribution system while the new facility is made operational. The existing generator distribution systems will be replaced entirely by new, segregated emergency/standby generator distribution to meet current NEC requirements. The existing 900 kW generator and remote radiator will be removed from service after all loads have been refed from the new generator system. This will require temporary, trailer mounted 500 kW generator during construction.

15) Both normal and generator sourced power will be distributed at 480Y/277V and transformed to 208Y/120V for utilization equipment. Maximum single 480V:208Y/120V transformer size in any electrical space or room of the tower addition shall be 150kVA. All 480V and 208V power will be distributed throughout the facility from electrical rooms.

16) In general, lighting and appliance panelboards will be located in dedicated electrical spaces and rooms. Exceptions to this include panelboards serving telecommunications equipment remote from electrical rooms. In these cases, panelboards will be located within the respective spaces they serve.

b. Design Criteria

1) Panelboards

a) Power panelboards comparable to Square D I-Line style; Lighting and appliance panelboards comparable to Square D NF (480V) and NQOD (208V) style; rated for 3 phase, 4 wire, 60 Hz service.

b) Enclosures will be NEMA Type 1 for indoor dry locations; NEMA Type 3R for outdoor locations; NEMA Type 4 for other wet or damp indoor locations; and NEMA Type 12 for indoor locations subject to dust, falling dirt and dripping non-corrosive liquids.

c) Main devices to be fixed, individually mounted. Branch devices to be bolt-on.

d) Phase, neutral and ground buses will be hard-drawn copper, tin-plated.

e) Conductor connectors will be compression type.

2) Transformers

a) Enclosure will be ventilated, NEMA Type 2 for indoor transformers.

b) Primary shall be 480V delta connected; secondary shall be 208Y/120V wye connected; rated for 60 Hz service.

c) Transformers 15kVA and higher will comply with 10 CFR 431 (DOE 2016) efficiency levels.

d) Taps shall be provided as indicated below.

Transformer Size	Taps
15 - 24 kVA	(2) 5% taps below rated voltage
25 kVA and >	(2) 2.5% taps above and (4) 2.5% taps below rated voltage

e) Insulation class will be 220-degree C, UL component recognized system with a maximum of 150-degree C rise above 40-degree C ambient temperature.

f) All transformers will be capable of being floor- or wall-mounted. All floor-mounted transformers will be mounted on a housekeeping pad. Only transformers 75 kVA or smaller will be allowed to be wall mounted.

3) Circuit Breakers

a) All circuit breakers will be provided with AL/CU listed connector lugs. Generally, bolt-on types will be provided.

b) All circuit breakers will be fully rated for the available fault current.

c) Thermal magnetic circuit breakers will be provided with an inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits in each pole. Adjustable magnetic trip setting for circuit breaker sizes 150A and larger will be provided.

d) Adjustable, instantaneous-trip circuit breakers will be provided with a front-mounted, field-adjustable trip setting magnetic trip element.

e) Electronic trip circuit breakers will be provided with field-replaceable rating plug, rms sensing and with the following field-adjustable settings: instantaneous trip, long- and short-time pickup levels, long- and short-time adjustments, ground-fault pickup level, time delay and I2t response.

f) GFCI circuit breakers will be provided with Class A ground-fault protection (6 mA trip) for personnel protection.

g) GFP circuit breakers will be provided with Class B ground-fault protection (30 mA trip) for equipment protection.

h) Provide solid-state circuit breakers with fully adjustable trip functions where required to achieve selective coordination with all supply side overcurrent devices

4) Fuses

a) Fuses will be nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

5) Surge Protection Device

a) Surge suppression equipment shall be connected via a circuit breaker to allow for ease of maintenance.

3. Raceway and Wiring System

a. System Description

1) The raceway and wiring system is comprised of conduit, boxes, conductors, and support equipment.

b. Design Criteria

1) Conduit

a) Conduit type will be as indicated below.

Location	**Conduit Type**
Exterior Exposed	RGS
Exterior Concealed	RGS
Underground (outside building foundation)	PVC Sch 40 (normal)
Underground (below slab)	PVC Sch 40
Interior Dry (not exposed to physical damage)	EMT
Interior Dry (exposed to physical damage)	RGS (below switch height) EMT (above switch height)
Interior Dry (concealed)	EMT
Interior Damp/Wet	RGS (below 96” AFF) EMT (above 96” AFF)
Interior Corrosive	PVC Sch 40
Connection to Vibrating Equipment	FMC (dry) LFNC (damp/wet/corrosive)

b) Minimum conduit size shall be ¾””.

c) (1) 1” spare conduit from panelboard to above accessible ceiling will be provided for each (3) spaces or spare breakers in panelboards. All spare conduits will be provided with a pull

string and will be labeled at each end with the terminus of opposite end.

d) Conduit in areas exposed to the public will be run parallel or perpendicular to structure and will be painted to match surrounding finish.

2) Boxes

a) Box type will be as indicated below.

Location	**Box Type**
Exterior	Ferrous Alloy
In Concrete	Ferrous Alloy
Interior Dry	Galvanized Steel
Interior Damp/Wet	Ferrous Alloy
Interior Corrosive	PVC

b) Minimum box size shall be 4” square.

3) Support Equipment

a) Hangers and supports will be as indicated below.

Location	**Box Type**
Exterior	Hot-Dip Galvanized Steel
Interior Dry	Hot-Dip Galvanized Steel
Interior Damp/Wet	Non-Metallic
Interior Corrosive	Non-Metallic

4) Conductors and Cables

a) All branch circuits will be copper. All feeders will be copper.

b) Conductor insulation shall be type THHN/THWN.

c) Conductors to first device on a branch circuit shall be No. 12 minimum.

d) Conductors shall be continuous from outlet to outlet and no splices shall be made except within outlet or junction boxes.

e) MC Cable will not be used.

5) Feeders

a) Each raceway will contain only those conductors constituting a single feeder circuit.

b) Where multiple raceways are used for a single feeder, each raceway will contain a conductor or each phase and neutral, if used, and a grounding conductor.

c) Where feeder conductors are run in parallel, conductors will be of same length, material, size, and insulation type and will be terminated in same manner.

d) Feeders will be sized for a maximum voltage drop of 2%.

6) Branch Circuits

a) Other branch circuits will be sized for maximum voltage drop of 3%.

b) All 120V and 277V branch circuits will have a dedicated neutral conductor for each circuit.

c) All current carrying conductors will be considered current carrying for derating purposes.

d) No more than three 120V or 277V circuits will be allowed in a single home run.

4. Grounding System

a. System Description

1) The grounding system is comprised of conductors, bus bars, ground rods, and service grounding equipment.

2) Systems to be bonded together to common ground include but are not limited to all power distribution systems, lightning protection systems (if required), low voltage systems, and building steel structural system. At no point shall multiple, independently grounded systems exist.

3) Ground bus bars will be provided in the main electrical and all telecommunications rooms.

4) A 4/0 copper bonding jumper will be installed between the building addition electrical service ground bar and the existing building service ground bar to ensure both systems are at equal potential.

5. Power Utilization System

a. System Description

1) The power utilization system is comprised of receptacles, switches, disconnects, and motor controllers/starters allowing for connection of equipment to the power distribution system.

2) Interior convenience receptacles will be located throughout the facility such that any point along the floor can be reached with a 25' extension cord. Exterior convenience receptacles will be located adjacent to exterior entrances.

3) Receptacles in back-of-house service areas and mechanical/electrical spaces will be mounted a minimum of 46" AFF. All other receptacles will be mounted at 18" AFF unless specific needs require otherwise.

4) Switches shall be mounted at 48" AFF unless specific needs require otherwise.

5) Disconnects will be located directly adjacent to equipment being served unless such an installation would prove a safety hazard.

6) Generally, non-fusible switches shall be used for loads below 240V or where the fault current is below 10,000A. Generally, fusible switches shall be used for loads above 240V or where the fault current is above 10,000A.

7) For fractional horsepower loads, horsepower-rated switches will be used.

8) Controllers will be located directly adjacent to equipment being served unless such an installation would prove a safety hazard. Controllers will be located in motor control centers where large groups of equipment are located together and within plain sight of the motor control center.

9) Combination controller/disconnects shall be used wherever practical.

10) Receptacles

    a) Convenience receptacles will be specification grade 125V, 20A, NEMA 5-20R configuration. All other receptacles will be heavy-duty, specification grade of rating and configuration to match intended use. Receptacles connected to normal system will be provided in color matching the surrounding finish as closely as possible.

b) Receptacles in secure areas shall have stainless steel wall plates with detention fasteners.

c) Receptacles in areas not subject to physical damage will be provided with nylon covers. Receptacles in back-of-house areas subject to physical damage will be provided with stainless steel covers.

d) Receptacles installed in all exterior and interior damp/wet locations will be of the GFCI type and provided with in-use weatherproof covers.

11) Switches

a) Switches will be heavy-duty, specification grade 125V, 20A and rated for 120/277 volts. Switches will have quiet action toggle type mechanism and silver alloy contacts for longevity.

b) Switches in secure areas shall have stainless steel wall plates with detention fasteners.

c) Switches installed in all exterior and interior damp/wet locations shall be of the weatherproof type.

12) Disconnects

a) Enclosure shall be steel NEMA Type 1 for interior dry locations; NEMA Type 3R for exterior wet locations; NEMA Type 4X fiberglass for interior corrosive areas; and NEMA 4X stainless steel for exterior corrosive areas.

b) Fusible and non-fusible switches shall be heavy duty, single throw, 240V and 600V, 1200A and smaller.

c) Fusible and non-fusible switches shall be capable of being locked in the open position.

d) Fusible and non-fusible switches shall be provided with an equipment ground kit, neutral kit, auxiliary contact kit ((2) NO/NC form “C” contacts) and compression type lugs.

13) Controllers

a) Enclosure shall be steel NEMA Type 1 for interior dry locations; NEMA Type 3R for exterior wet locations; NEMA Type 4X fiberglass for interior corrosive areas; and NEMA 4X stainless steel for exterior corrosive areas.

b) Accessories (Hand-Off-Auto, LED pilot lights, auxiliary contacts, etc.) shall be provided as required.

c) Manual controllers shall be general purpose, Class A, with "quick-make, quick-break" toggle action, marked to show whether unit is "Off," "On," or "Tripped."

d) Magnetic controllers shall be Class A, full voltage, non-reversing, across the line unless noted otherwise

6. Lighting System

a. System Description

1) All light fixtures will utilize LED technology unless noted otherwise.

2) LED modules will be rated for a minimum of L70 light level. LED modules will have a minimum CRI of 85, will generally be provided with a color temperature of 4000K and will utilize lenses activity areas to shield diodes to reduce unwanted glare.

3) Lighting system is comprised of fixtures, controls, and emergency lighting equipment. This basis of design covers support and back-of-house lighting only. All front-of-house lighting and detention area will be as selected by the lighting designer.

4) Light fixtures within all detention areas and all security ceiling spaces will be maximum security detention grade-rated fixtures

5) Emergency exit signage and egress lighting will be provided in accordance with NFPA 101 and local codes.

6) Normal and emergency lighting control will be provided to meet applicable codes and standards.

7. Fire Alarm System

a. System Description

1) The fire alarm system will comply with requirements of IBC, NFPA 72 and applicable Life Safety Codes

2) Fire alarm system is comprised of the fire alarm control panel, remote annunciator, initiating appliances, notification appliances, and connections to ancillary systems as required.

3) The fire alarm system will be digital, addressable, and will include emergency voice/alarm communication and fire department communications systems.

4) A smoke control system will be required for the overall facility.

5) The FACP and firefighters' smoke control station is to be located in the fire command center. Fire Command Center components and functions will be provided to meet applicable codes and coordinated with the AHJ.

6) Fire alarm detection and notification appliances will be designed to meet the requirements of NFPA 72.

7) Fire alarm emergency power will be achieved through battery backup and connection to the generator.

8) Initiating devices will include manual pull stations, smoke detectors, duct smoke detectors, heat detectors, flow switches, and tamper switches.

9) Notification devices will include visual, audio, and combination devices. Notification devices shall be red if wall-mounted and white if ceiling-mounted. Speaker/strobes will be provided throughout the new and existing facilities.

10) Wiring will be survivable and installed in conduit.

11) Emergency control function interfaces will include elevator recall and shutdown, HVAC systems and associated digital control system(s).

12) Emergency communication systems required by applicable codes will be provided to meet program requirements.

17 Security Electronics Systems

A. Overview

1. The Security Electronic system controls, monitors and provides a record of security movement into, out of and throughout the Dane County Jail Facility. The security systems are designed to extend human capabilities using technology. The design seeks to align itself with the institutions policies and procedures. In doing so, the system should become transparent to daily operations and be an effective tool in helping the Department of Corrections achieve their mission of ensuring public safety by effectively managing Offenders. The system also provides support for the safety and security of staff, public and Offenders by viewing secure areas and monitoring life safety and alarm systems

B. Design Criteria

1. The following applicable Codes, Standards and Guidelines are intended to be used to determine acceptable design criteria.

    a) Regulatory Codes: City, state and federal
    b) NFPA 70-2017 National Electric Code (NEC)
    c) NFPA 101 Life Safety Code
    d) Wisconsin Administrative Code DOC 350-Jails
    e) International Building Code 2015

C. Systems Descriptions

1. Door Control and Monitoring System

    a) Provide touch screen controls interfaced to non-proprietary industrial PLC processor through the use of mechanical relays.
    b) Equip existing electronic equipment closet with emergency power and centralized UPS backup. Equip main security electronics closet with CRAC unit to condition and humidify the space in order to extend the useful life of the electronic components within.
    c) A centralized building UPS system tied to an emergency generator is recommended to maintaining building security during a power outage, while providing “clean power” to extend the life of low voltage security electronic components.
    d) Equip entire door control system with history logging capabilities for reporting and recording of every action on the system with both time and date stamp. The history logging feature reduces County liability by creating accurate incident reports. The history logging computer will begin to overwrite data after a period of 120 days.

History logging capabilities are used to enhance incident reporting.

e) Provide 32” wide flat screen touch screen workstations equipped with the latest version of existing system graphic user interface software. Provide three (3) quadrants on the side of the touch screen workstation for automatic call-up of cameras for door control, intercom control and duress alarms. Provide proximity card reader stations at each touch screen workstation for officer log-in privileges.
f) Dual redundant touch screens should be provided in the Master Control rooms of the Jail.
g) A spare touch screen should be provided to swap out any touch screen at any officer workstation that fails. Spare to be equipped with “plug-and-play” features for easy setup and activation.
h) All detention locks can be controlled remotely from either Master Control or a Satellite control workstation. Consideration should be given to equip high frequency doors with local electric key switches or card readers to gain operational efficiencies.
i) Integrate local door control system with touch screens at Master Control for remote unlocking of doors in the event of an emergency.

2. Utility Control System

a) The utility control system consists of control of dayroom and cell lighting in the Jail. This system allows for the remote control of the following utilities:
    i) Inmate lighting
    ii) Convenience Receptacles used to power inmate TV’s
    iii) Remote water/flood control
        i. Limited water control capabilities for flood control in Medium and Maximum Security of the Jail. This would require the addition of 120v water solenoid control valves added to the hot water, cold water and hot water recirculation lines, controlled as a single point, servicing these areas. Current project at the Jail will increase the flood control capability

3. Card Access System

a) Card reader stations are distributed throughout the Jail to restrict public and unauthorized staff from access into administrative areas.
b) The card access system will be equipped with detention-grade reader stations in the Jail and commercial-grade HID reader stations in the Sheriff’s Department.
c) Consideration should be given in future upgrades to equip all IT closets with card readers for access by authorized maintenance and IT personnel only. Equipping IT closets with card readers would also provide a history/log of access into IT rooms.
d) Expand card access stations to several key areas of the Jail including Property Storage, Staff Entry and Breakroom.

e) Equip each officer workstation with a card reader station for log-in and identification privileges. The card reader station would connect to the touch screen workstation via a standard USB port.
f) Card access rights and privileges will be administered by Dane County Sheriff's Department.

4. Intercom and Paging System

a) Intercom calls are integrated with door control system for automatic camera call-up. When intercom calls are annunciated, a camera will automatically call-up to a spot monitor located at the touch screen workstation.
b) The digital intercom system can isolate intercom calls should nuisance calls become an issue. The lock out feature can also be programmed for a specific period of time before intercoms are re-enabled.
c) Digital door control intercom systems also allow for a supervising officer to do an audio tour of intercoms from their workstation sequentially opening cell intercom voice paths for remote audio surveillance.
d) All intercom calls will be recorded to the history logging computer anytime a voice path is opened. Audio recording will have the capability of being stored for a minimum of 120 days.
e) The door control intercom system is capable of being integrated with the existing IP-based administrative phone system to allow facility administrators to make calls to specific cells during periods of lock down.

5. Local Intercom System

a) The local intercom system for non-contact visitation booths will consist of hardwired intercom handsets leased through the existing inmate phone service provider.
b) Areas requiring a local intercom system include:

i) Non-contact visitation booths
ii) Sheriff's Department public entrance
iii) Jail entrance
iv) Bond vestibule

i. Visits by the public are recorded. Visits by clergy and attorneys are not recorded.

6. Duress Alarm System

a) The Dane County Jail will have a hard-wired duress alarms in the vehicle sallyport and nurses' station. Pod Control will be equipped with a hard-wired duress alarm for

annunciation at Jail Master Control.

b) Recommend installing under-counter flip-down type duress alarm switches at all satellite touch screen workstations. Activation of duress alarm to automatically shut down local touch screen, annunciate a duress condition, and transfer controls to Master Control.

c) The duress alarm system should be expanded to classrooms, program areas, and nurses' stations for use by non-correctional staff.

d) Areas requiring duress alarms include:

   i) Program Rooms
   ii) Nurses Station
   iii) Contact Visitation
   iv) Interview Rooms
   v) Officer Workstations
   vi) Consideration should be given whether to provide duress alarms in the Kitchen and Classrooms of the Jail.

7. Video Surveillance System

   a) Provide camera coverage in all dayrooms and areas of remote door control. Integrate video surveillance system with door control intercom system for automatic camera call-up upon activation of intercom call.

   b) The video surveillance system should be of quality to provide the following minimum system performance:

      i) 1080p display resolution
      ii) Seamless live video streaming at 30fps
      iii) 90 days of network storage capacity (per camera) at 15fps
      iv) Instantaneous camera call-up
      v) Consideration should be given to drive the video surveillance system on its own parallel security network. An independent security network will provide a point of demarcation to improve overall system performance and maintainability.

         i. There is more liability for detention facilities in modern corrections. In today's current marketplace, a greater emphasis is placed on the effectiveness of the video surveillance system to protect the County from incidents that occur during normal operation. Modern detention facilities deploy a multitude of cameras (with superior image quality) to provide a digital record of incidents as they occur.

c) Microphones should be added to cameras at the Intoxylizer station, dayrooms and booking areas.
d) 42” wall-mounted flat-screen monitors for remote video surveillance should be added to the following areas:
    i) Jail Administrator’s Office
    ii) Jail Sheriff’s Office
        i. These monitors will provide facility administrators the ability to have a live view of key areas of the facility when working from their respective offices, as well as at the beginning and end of each workday.

e) The video storage system is to be located in the main server room of the Security Electronics Room. A dedicated single-mode fiber connection will be added to this project in order to meet this requirement. Space will need to be allocated for 2 to 3 new free-standing 19” racks.
f) Sensitive video will be burned to DVD by authorized representatives of Dane County Sheriff’s Department for long-term storage.
g) All cameras should be installed with new CAT6 cabling. Cabling can be run free-air over non-accessible secured ceilings. Cabling shall be run in conduit when exposed to public or inmates.

8. Video Interrogation System

a) The video interrogation system utilizes digital recording audio/video software. It is independent from any other video surveillance system used on site.
b) Consideration should be given to expand the video interrogation system to the Intoxylizer station in the Jail.
c) Is important that video interrogation equipment be well maintained and extremely reliable. Video interrogation equipment should be checked regularly to confirm that all components are working properly so that no sensitive audio/video material is lost or needs to be re-created.

18 Technology Systems

A. Overview

1. The overall technology philosophy proposed for the addition to the Dane County Public Safety Building (PSB) facility demands that the infrastructure have the technical flexibility to allow the facility the capability to deliver the highest quality technology today and in the future. These guidelines address pathways, spaces and cabling designs necessary to sustain various information transport systems, including an administrative telephone system for voice and voice grade services, local area network (LAN) and wide area network (WAN) systems, wireless systems, video distribution, audio distribution, and the like.

B. Base Design Criteria

1. The following applicable Codes, Standards and Guidelines are intended to be used to determine acceptable design criteria.

   Regulatory Codes: City, state and federal

   NFPA 70-2017 National Electric Code (NEC)

   Wisconsin Administrative Code, DOC 350 Jails

   International Building Code 2015

   TIA 568.1-D Commercial Building Telecommunications Cabling Standard

   TIA 568.2-D Balanced Twisted-Pair Telecommunications Cabling and Components Standard

   TIA 568.3-D Optical Fiber Cabling Components Standard

   TIA 568.4-D Broadband Coaxial Cabling and Components Standard

   TIA-569-E Commercial Building Standards for Telecommunications Pathways and Spaces

   TIA-606-A Administration Standard for Commercial Telecommunications Infrastructure

   TIA-607-C Commercial Building Grounding and Bonding Requirements for Telecommunications

   BICSI TDMM BICSI Telecommunications Distribution Methods Manual

C. Systems Descriptions

1. Technology Spaces

   a) EF – A new Entrance Facility will be created in the Sub-Basement of the new addition to thePublic Safety Building. The EF will serve as an entrance point for a redundant fiber path into the building fed from West Wilson Street. A cable pathway from the EF to the exiting MTR will be created to extend the redundant fiber path to the customer network.

i. One new 144 Strand Single Mode fiber optic connection will be installed from the City County Building Data Center Room 524 to the EF in the new addition of the PSB building. In addition, one new 48 Strand Single Mode Fiber will be installed from the MTR in the PSB to the GA2 Room in the City County Building.

b) MTR- The existing Main Telecommunications / Technology Room (labeled as MTR on plans) is currently located on the Basement level of the existing building. It currently serves as the telecommunications utility services entrance point and distribution point for all telecommunications backbone cabling to the existing building and other Technology and Security Equipment Rooms throughout the building.

i. The MTR room will be of sufficient size to contain the voice, data and TV equipment for various telecommunications service providers as well as the core, head-end distribution equipment for various communications and security systems throughout the facility.

ii. All walls in these rooms will be covered with 3/4" thick grade AC fire-rated void-free plywood.

iii. The rooms will be designed with adequate working clearances to facilitate the installation, use and maintenance of the equipment within the room and will include equipment racks / cabinets, wall termination space, copper termination patch panels, fiber optic termination panels (if applicable) and horizontal/vertical cable management for all cabling.

iv. Overhead ladder rack for distribution of cabling and equipment patch cords, vertical and horizontal cable management on equipment racks, and D-rings at wall-mounted equipment will be included in these rooms

v. Copper backbone cabling will be terminated on wall- or rack-mounted 110 patch panels, as applicable to the project. Fiber optic backbone cabling will be terminated in rack-mounted fiber optic termination cabinets.

vi. The MTR will be designed to current telecommunications industry standards and best practices and will have the necessary ventilation, cooling, lighting, fire protection and power.

vii. The MTR room will serve as the Telecommunications Room (TR) all work areas and telecommunications outlets (TOs) located within 275 cable feet of the MTR.

viii. The telecommunications grounding and bonding system will connect to a wall-mount bus bar located in the MTR, rack-mount bus bars on each equipment rack, bonding backbone conductors and equipment hardware, and device bonding conductors.

c) TR- Technology Rooms

i. New Technology Rooms will be created throughout the space to consolidate various systems.

- A new stack of Technology rooms will be centrally located near the existing elevator shaft in the existing PSB starting on the basement level and continuing up to the Fourth Level to serve the existing and newly remodeled space.

- In the PSB new addition, new Technology rooms will be created stacked near the southern stairwell on second through seventh floors.

ii. Each TR shall be connected to the MTR with a minimum of one (1) 50 pair Category 3 UTP copper voice cable, one (1) 24 strand OS2 Single Mode fiber optic cable, and one .500 inch coaxial cable.

iii. Each TR will be sized to accommodate additional communications and security equipment.

iv. The TRs will contain backbone cable terminations and connectivity, horizontal terminations and network equipment.

v. All walls in these rooms will be covered with 3/4" thick grade AC fire-rated void-free plywood.

vi. The rooms will be designed with adequate working clearances to facilitate the installation, use and maintenance of the equipment within the room and will include equipment racks / cabinets, wall termination space, copper termination patch panels, fiber optic termination panels (if applicable) and horizontal/vertical cable management for all cabling.

vii. The TR will be designed to current telecommunications industry standards and best practices and will have the necessary ventilation, cooling, lighting, fire protection and power.

viii. Overhead ladder rack for distribution of cabling and equipment patch cords, vertical and horizontal cable management on equipment racks, and D-rings at wall-mounted equipment will be included in these rooms

ix. Copper backbone cabling will be terminated on wall- or rack-mounted 110 patch panels, as applicable to the project. Fiber optic backbone cabling (if applicable) will be terminated in rack-mounted fiber optic termination cabinets.

x. The telecommunications grounding and bonding system will connect to a wall-mount bus bar located in the MTR, rack-mount bus bars on each equipment rack, bonding backbone conductors and equipment hardware, and device bonding conductors.

d) Cable Pathway

i. Cable pathways for all horizontal structured cabling will consist of conduit, J-hooks, and/or cable tray.

ii. Typical telecommunications outlet location rough-in will consist of a minimum of one (1) 4-11/16” square x 2-1/8” deep back box with single-gang plaster ring and

a minimum 1" EMT conduit routed up to a J-hook route or cable tray above the nearest accessible ceiling.

e) Telecommunications Outlet

i. Jack

i. Cables at the work station shall be terminated on a Category 6 rated RJ45 jack.

ii. Faceplate

i. Shall be suitable to accept 4 positions

ii. Color to match electrical outlets

iii. Blank inserts for any unused positions

iii. Telecommunications Outlet (TO) configuration(s) and locations will be determined by Owner's standards, equipment that requires structured cabling connection(s), and through direction from the Owner.

f) Wireless Access Points

i. Telecommunications outlet locations for Owner's wireless access points (APs) will be provided, spaced to provide AP coverage with a 30-foot radius to support 802.11ac connectivity throughout the project area.

ii. Provide plenum-rated AP enclosures in areas with plenum-rated accessible ceilings.

iii. Layout of AP locations will be confirmed by owner prior to issuance of bid documents.

2. Structured Cabling System

a) Structured cabling design and installation will adhere to applicable ANSI, TIA, and IEEE standards, BICSI guidelines and recommendations and industry standard installation practices to the greatest extent possible within the confines of the project.

b) Horizontal Cabling

i. Data cabling will consist of Category 6 UTP Plenum copper cabling

ii. All horizontal cabling shall be suitable for use for traditional analog/digital PBX-based voice, IP-based voice (VoIP) and data communications (Ethernet).

iii. All horizontal cabling shall be fed from the nearest TR or MTR and not exceed 275 cable feet in length.

iv. The structured cabling system shall be a certified cabling system. The manufacturer or manufacturers of the cable and termination components will qualify as a system and warranty the performance of the entire system.

v. Wireless Access Points cabling will consist of two plenum Cat 6A cables.

c) Coaxial Cabling

i. Television cabling shall be quad-shielded plenum RG-6 coaxial cabling and 'F'-type connectors.

ii. Coax cabling will be provided at various locations throughout the facility fed from the MTR

iii. The TV infrastructure shall be constructed so as to support Owner-contracted television services.

3. AV Systems

a) Conference Rooms

i. Audio-Visual (AV) systems consisting of input ports, pathways, cabling and a flat-panel display(s) will be provided for the Conference Rooms on both the first and second floors.

ii. Each TV location will have adequate blocking to support a wall-mounted flat-panel display and a duplex power receptacle for the display

iii. This display will be configured for showing portable content (e.g. laptop or tablet) and either cable (CATV) or satellite TV content.

iv. All inputs will be HDMI.

v. No audio reinforcement is planned for these spaces

b) Flat-panel display (s) will be provided in the first floor Lobby to allow for Dane County-developed or Dane County-contracted content such as advertising or marketing.

c) Flat-panel displays will also be provided in the Fitness area for showing either cable (CATV) or satellite TV content.

d) Board Room/Gathering Space

i. AV systems will consist of input ports, pathways, cabling, projectors and motorized projection screens.

ii. Sound reinforcement including speakers, input ports, wireless microphone(s), an audio mixer and audio amplifiers will be included.

iii. Control of the AV systems (relative to the open/closed stated of the partition) will be manual.

e) Discussion with the Dane County management to further define the AV systems described above will be required during the DD phase of the design.

4. Inmate Television System
    a) Cable television signals are distributed through a series of flat screen monitors distributed to the various dayrooms throughout the facility.
    b) The inmate television system can be installed with standard RG6/U coaxial cable.
    c) Power to inmate television is controlled remotely through the existing membrane security control system.
    d) Inmates are able to adjust volume and change channels through the use of volume and channel-changing buttons located on each inmate TV.
    e) Consideration could be given to upgrade the existing inmate television system with digital technology while making effective reuse of the existing coaxial cable infrastructure.
    f) Integrate inmate televisions with security touch screen system for playback of pre-recorded video messages such as HIPPA, PREA and facility rules/regulations.
    g) Allow remote changing of channels from the touch screen workstations.
    h) Exact configuration of system to be developed with Dane County Sheriff's department during design phase.

5. Video Arraignment System
    a) Dane County will require a fully functional video arraignment system to allow them to interface with courtrooms facilities elsewhere across the country.
    b) Any type of trail activity requires inmates to be transported to the respective Courthouse where the trail is being held.
    c) Provide carpet for increased acoustics in video arraignment room in Jail.
    d) Exact configuration of system to be developed with Dane County Sheriff's department during design phase.

6. Video Visitation System
    a) The video visitation solution provides "Skype-Type" visitation capabilities as well as an ability for inmates to receive E-Mail and order commissary.
    b) The video visitation system should be capable of playing back video messages such as HIPPA, PREA and facility rules/regulations.
    c) Consideration should be given to provide cabling infrastructure necessary for future implementation of wireless inmate video visitation tablets. This would include the necessary conduit/cabling to rough-in locations for wireless access points (WAP's) in each of the inmate dayrooms.
    d) Video visitation tablets are charged through a bank of wall-mount or rolling cart-style charging stations.
    e) Video visitation tablets allow inmates to conduct visits wirelessly. They also keep inmates entertained through an ability to wirelessly watch movies or partake in video gaming.
    f) Exact configuration of system to be developed with Dane County Sheriff's

department during design phase.

i. May be Vendor supplied and consist of wiring and rough in only
    i. GTL, Securus

7. Other Technology Considerations

a) Pathways for Radio Systems Antenna Cabling between the radio location and the roof will be provided and shall be of sufficient size and quantity to allow the Owner's radio equipment provider to install the necessary cabling between the radio equipment and the antennas. Radio systems are not included in the Technology Systems scope of work for the project.