Design Narratives

The initial meetings, discussions, and analysis have generated a program of spaces and we have prepared a program block diagram to reflect those initial space sizes. The narratives contained herein further explain the concepts and assumptions on which the project is currently based, and will continue to be updated as the project progresses.

1. General Expectations

a. Forensic science operations generally occur during normal business hours. Medical examiner's forensic investigators are on call all day every day, and are deemed essential employees.
b. Protection of staff and evidence must be maintained at all times. Security and environmental conditions cannot be compromised by natural disasters. Facility design shall support maintenance of chain of custody, keeping evidence in authorized areas with authorized personnel.
c. Processing of evidence already underway shall be maintained during loss of power.
d. Forensic science operations must be well understood and carefully translated into physical room sizes, arrangement, and adjacencies. Vehicular movements of public should be clearly separated from private. Withing private vehicle circulation areas, funeral homes, building deliveries, law enforcement (LE), forensic investigators, and other staff circulation and parking shall be clearly defined.
e. Design shall accommodate space for indicated functions for current needs and future staff levels through at least 20 years of date of completion. Variation of future needs should be allowed for to the greatest extent possible. Future addition for 50% increase in area for each unit shall be accommodated.
f. The facility shall comply with applicable codes, standards, laws and regulations. Refer performance requirements.

2. Space Needs Summary

a. Public Entry:
    i. The public entry will be located outside the secure perimeter of the site, adjacent to the public parking. It will be secured from the private portions of the facility by ballistic-resistant construction and an electronic security system controlled by the receptionist. The program includes an entry vestibule and lobby, gender neutral toilet rooms, and a waiting area. It will provide access to the medical examiner sub-lobby, as well as serve as prefunction for the community room.
b. Community Room:
    i. The community room will be sized to accommodate 100 occupants utilizing moveable tables and chairs. A kitchenette will be provided for catered events. Storage/AV rooms will allow storage of all tables and chairs, and hold AV equipment. The room will facilitate a range of public uses from public meetings, training seminars, press conferences, and DFS programs. For flexibility of uses, it will be divided into three rooms with operable partitions,

and be accessible from the public lobby on one side and the private side on the other, with access control.

c. Administration:
    i. DFS operations are under the supervision of the Director, presently John Evans. Offices will be provided for the Director, Deputy Director, and Quality Assurance Manager, along with Management Analyst, Records Management Analyst, and visiting scientists. Support spaces include an executive conference room and work room. The Administration suite shall be located near the public lobby, but still conveniently accessible to the lab units.
d. Medical Examiner and Forensic Science:
    i. Refer to narrative by MWL for details on the Medical Examiner, DNA, Forensic/Drug Chemistry, Toxicology, and Forensic Evidence Units.
e. Shared Spaces:
    i. Gender-neutral toilet facilities will be provided throughout the facility, to better serve the predominantly female staff as well as provide non-discriminatory environment for all State employees and visitors.
    ii. A lactation room will be provided, including sink, mini-fridge, and counter.
    iii. Laundry facilities will be provided at a central location for washing of lab coats by DNA and for "clean" use by other Units. A separate laundry facility will be provided for "dirty" use by Medical Examiner.
    iv. A loading dock will be provided. Large instruments and equipment as well as bulk building supplies will be received and stored. Facility-wide hazardous waste will be stored and removed. Gas cylinder delivery will be received and a facility wide gas system provided. A separate loading dock will be provided at Medical Examiner sally port, for receiving the Unit's supplies and to accommodate refrigerator trucks in a mass casualty event.
    v. Elevators will be provided in several locations. The historic building will have a new 3500# stretcher-compliant passenger elevator, with new 2-hour rated shaft. In the new laboratory addition, a 3500# stretcher-compliant elevator will be provided for general staff use, as well as a 5000# freight elevator for moving large equipment and instruments.
f. Maintenance Facility for Division of Facilities Management New Castle County:
    i. Storage for spare parts and material on high-bay shelving, pallets, and on-slab
    ii. Offices for managers, and open office area for maintenance personnel.
    iii. Conference room for 8 at table, and additional seating along walls.
    iv. Kitchenette and toilet facilities for staff working in-office and in field.

3. Site / Civil

a. Site planning includes two aspects – technical and operational.
b. Technically physical site issues, such as drainage, grading, utilities, pavements, stormwater management, and site ingress / egress will be addressed. These will be systematically addressed in a way that respects the various site plan requirements and review / approval schedules.
c. Operationally, separation of public, private, and decedent drop-off and pickup is paramount. Forensic Investigator vehicles, as well as general private personnel access into the facility will be

protected behind a secured perimeter. Access to the secure area will be gained using several devices including magnetic cards, manual keypads and radio. The secure area will include parking, building access for forensic investigator vehicles carrying the decedent, law enforcement dropping off and receiving evidence, and building support systems, such as drop-off of bulk storage and pickup of waste/hazards.

d. The parking requirements will be evaluated in accordance with County requirements, but BMG will evaluate a variance to avoid unnecessary overdevelopment. Accessible parking will be provided in proportion to total parking spaces. Loading spaces will also be provided, as required. Based on programming meetings, it is anticipated the functionally desired parking count will fall below the requirements of the county, and we intend to request a variance to reduce the impervious area.

4. Building / Structural – *Narrative by Morabito Consultants, Inc.*

a. Refer to Morabito's BOD narrative for additional information.

5. Building / Architectural

a. The DFS facility has the following public-to-private personnel relationships: public to attend an event in the public meeting spaces, interaction between Medical Examiner personnel and the public (connected to a decedent), DFS personnel and law enforcement for the contribution of evidence, and DFS personnel and back-of-house delivery and pickup.

b. The general public must feel comfortable and safe visiting the facility whether they are a public visitor or a relative/connected to the decedent. The DFS Admin personnel must have easy access to the public yet must be protected from public threat.

c. Daily activities in the facility include the processing and testing of evidence and conducting forensic and pathology examinations. Other activities may include visits connected to the decedent, lectures/events in the public meeting spaces, and building tours for medical students.

d. DFM Maintenance facility is primarily used by maintenance staff. Additionally, receiving of materials, parts, and equipment will take place from third-party vendors.

6. Building / Furniture

a. The new facility will incorporate new furniture and new/existing equipment. These elements will be coordinated during design to ensure that the new facility meets the requirements of the end-user.

7. Building / Mechanical, Electrical, Plumbing, and Fire Protection – *Narrative by CMTA, Inc.*

a. Refer to CMTA's design narratives for additional information.

202324600-03-1 design narrative.docx

NARRATIVE OF PROPOSED STRUCTURAL SYSTEMS
STATE OF DELAWARE – DIVISION OF FORENSIC SCIENCES
EMILY P. BISSELL HOPSITAL
NEWARK, DELAWARE
MC JOB No. 24139
Prepared by
Morabito Consultants, Inc.

Introduction

Morabito Consultants is collaborating with Becker Morgan Group in the design of the renovation and additions for the Emily P. Bissell Hospital for a new laboratory facility. The existing original hospital is to remain (basement thru third floor). A new 4 addition will be constructed as part of this renovation. The total building area will be 115,000± SF. The proposed structural systems and materials for the proposed new building are described in this structural narrative. This narrative is based on meetings and discussions with the Project Team.

Basis of Design

Design Load	2021 International Building Code (As Amended by New Castle County)	
Building Classification	Risk Category III	
Live Loads		
	Offices	50 psf
	Corridors	80 psf
	Lobbies	100 psf
	Common Areas	100 psf
	Stairs	100 psf
	Storage	125 psf
	Partitions	15 psf (live loads of 100 psf or less only)
	Roof	30 psf
Wind Load	128 mph, exposure B	
Snow	Ground Snow Load	P_g = 25 psf
	Flat Roof Snow Load	P_f = 21 psf + snow drift
	Snow Load importance Factor	I_s = 1.1

Seismic	Site Class D I_E = 1.25		
Earth Pressures	Active Earth Pressure	42H	
	Passive Earth Pressure	440H	
	At-Rest Earth Pressure	64H	
	Coefficient of Friction	.55	
Deflection Limitations	(Floors/Roofs and Exterior Walls)		
	Live Load Deflection:		L/480
	Total Deflection:		L/240
	Exterior Walls:		L/240
	Birck Veneer:		L/600
Vibration Requirements	Laboratory and Operating Rooms:		4,000 micro-inches/second

Outline Specification

Concrete	3000 psi	(Footings)
	4000 psi	(Topping Slab)
	4500 psi	(Exterior Concrete)

All concrete exposed to the weather shall have 5% ± 1% entrained air

All concrete shall be normal weight concrete with a maximum weight of 145 pounds per cubic foot maximum density

Structural Steel	Wide-flange Shapes: ASTM A992, Grade 50 Tube Shapes: ASTM A500, Grade C
Concrete Reinforcing	Reinforcing bars shall conform to ASTM A 615, Grade 60 Welded wire fabric shall conforming to ASTM A 185, Grade 65

A. PROPOSED FOUNDATION SYSTEM

The foundation system for this building shall consist of spread footings placed on earth capable of supporting a minimum bearing capacity of 3,000 psf. Exterior footings shall be placed at a minimum 2'-6" below finished grade around the entire building perimeter. All compacted fill shall be placed in 8" thick loose lifts compacted to 95% of maximum dry density per ASTM D-698. Foundation walls shall be 12" reinforced masonry reinforced with vertical rebar and filled solid with 3000 psi grout. All foundation walls will be designed to resist the lateral earth pressure from any difference in grading.

B. PROPOSED BASEMENT FLOOR SYSTEM

The lowest level of the building shall consist of a 5" concrete slab on grade (f'c = 3000 psi) reinforced with a 6" x 6" – W2.9 / W2.9 welded wire fabric poured over 4" of porous gravel fill over compacted fill. To control the cracking of the slab on grade, 1 1/4" deep saw cut control joints shall be installed at 12"-0" o/c maximum throughout the new slab on grade footprint.

C. PROPOSED FLOOR SYSTEM (FIRST, SECOND, THIRD, PENTHOUSE)

The framed first, second, and third floors at the new addition shall consist of 4 1/2" normal weight concrete slab (f'c= 4000 psi) reinforced with 4" x 4"- W4.0 / W4.0 welded wire fabric poured over 3" x 18 gauge galvanized composite metal deck, resulting in a total slab thickness of 7 1/2". This composite slab shall be supported by composite steel beams which shall be spaced at 10'- 0"± on center and supported by composite steel wide flange girders and steel wide-flange columns, spaced at 30'-0"± on center, at the exterior and interior of the building.

D. PROPOSED ROOF SYSTEM

The roof at the new addition shall consists of 1 1/2" x 20-gauge type "B" galvanized metal roof deck which shall span 6'-0" on center maximum between steel beams / bar joists that are supported at the exterior and interior of the building by wide flange steel beams and steel wide-flange columns, spaced at 30'-0"± on center. The roof will be designed to support snow drift and all proposed roof top units.

E. EXTERIOR WALL CONSTRUCTION

The exterior walls of this building shall consist of 6" metal stud framing with brick veneer and punched windows. The metal studs shall span from floor to roof and shall have multiple studs at the jambs and heads of the wall openings. The brick veneer shall be supported by galvanized steel lintels over all doors and windows.

F. PROPOSED LATERAL FORCE RESISTING SYSTEM

The lateral force resisting system for this building shall consist of masonry shear walls and steel moment frames. The masonry towers at the elevator and stairs will be utilized in the design of the lateral system. The masonry walls will be reinforced with vertical rebar and filled solid with 3000 psi grout. Steel moment frames will supplement the masonry towers as needed. A 2” expansion joint will be provided between the existing hospital and the new addition to ensure that no additional lateral loads are imposed on the existing structure.

G. EXISTING BUILDING MODIFICATIONS

EXISTING BUILDING EVALUATION: MC will need to review, and field verify the existing floor framing to ensure the existing building can support the current design loads. MC will need to provide supplement reinforcing, framing and foundations to strengthen the existing building as required. The full scope of this work will be further developed as the design process continues.

EXISTING STONE FOUNDATION: Based on photos of the existing stone foundation wall, the existing foundation wall shows some signs of structural degradation. MC will need to conduct a site visit during the next design phase to review the existing conditions to understand the full scope. The full scope of this work will be further developed as the design process continues.

NEW ROOF: The existing roof will be removed as part of this renovation. A new roof will be 1 1/2" x 20-gauge type "B" galvanized metal roof deck which shall span 5’-0” on center maximum between new metal stud trusses.

April 1, 2025

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DFS Bissell Campus Medical Examiner and Forensic Science Facility Basis of Design Guidelines

Preface

In this document, MWL has identified key laboratory design standards, planning principles and general design guidelines for the DFS Bissell Campus Medical Examiner and Forensic Science Laboratory.

While this information will likely influence the engineering design, the subsequent project engineer will be responsible for all engineering design and related engineering design criteria. MWL, an architectural firm, will not be involved in designing the engineering systems or establishing fundamental engineering design criteria for laboratory HVAC, plumbing, electrical, controls systems, etc.

Laboratory Design Standards

Building Codes:

- Life safety codes
- Local and national building codes
- National Fire Protection Association

Laboratory Design Standards and Regulations:

- United States Department of Commerce, National Institute of Standards and Technology, *Forensic Science Laboratories: Handbook for Facility Planning, Design, Construction, and Relocation*
- NAME: National Association of Medical Examiners
- ABFT: American Board of Forensic Toxicologists
- ISO / IEC 17025
- EPA: Environmental Protection Agency (4844 Facility, Safety, Health and Environmental Management Manual)
- National Institute of Health (NIH) design standards
- Scientific Equipment & Furniture Association (SEFA) standards
- Americans with Disabilities Act (ADA) requirements
- American National Standards Institute (ANSI) (Codes regarding

emergency eye wash and shower facilities)

- National Institute for Occupational Safety and Health (NIOSH) regulations
- Occupational Safety and Health Administration (OSHA): standards for Air Quality and Personnel Handling of Hazardous Materials and Blood Borne Pathogens
- Centers for Disease Control (CDC): Standards for bio-safety
- National Sanitation Foundation Document NSF 49 for design, exhaust requirements, and certification of Class II biological safety cabinets
- Occupational Safety and Health regulations: 29 CFR 1910.1048(d)(1) for exposure to formaldehyde; 29 CFR1910.151(c) workers exposed to possible serious eye or skin injuries from prolonged exposure to harmful or corrosive materials
- NFPA 45 Standard on Fire Protection for Laboratories Using Chemicals

Flexibility & Expandability

Laboratories are evolving at a rapid rate. The development of new laboratory procedures, changes in crime trends and political considerations all tend to influence the type of laboratory work and quantities of evidence and samples being processed in the laboratory. As a result, laboratories frequently experience the need for growth and change over their life span. Over the course of time, new labs benefit greatly from incorporating design flexibility that makes change possible with greater ease and less cost. In addition, the building organizational concept also must provide expandability to accommodate the growth of laboratory programs, staff increases, and addition of new programs and equipment.

Examples of design flexibility include the following:

- A repetitive planning module will be incorporated into the laboratory design at both large and small scales to achieve an efficient and flexible organizational pattern. A large, 22-foot structural and planning module works optimally in conjunction with the design of the laboratory facility. This large scale module is based on multiples of a smaller basic planning module of 11-feet x 11-feet. The basic 11-foot planning module is based on the width of laboratory casework on two walls separated by a 5-foot to 6-foot wide aisle. All other systems, including lighting, service distributions, HVAC grille locations, sprinklers, etc., can be organized on this planning pattern as well. This modular planning approach permits achievement of a highly flexible and adaptable laboratory environment while maximizing the integration of all building systems.
- Table Based Lab Furniture: Where a high degree of flexibility is needed table-based lab furniture can be used. This approach enables tables to be moved easily and rearranged to adapt to changing needs and enable the formation of larger work

surfaces where and when the need arises.

- Overhead Lab Services: Where table based systems are used, overhead lab gas, power, data and task exhaust services placed on a regular grid will enable staff to have access to these services wherever tables are placed.
- Mobile Furniture: Cabinets and tables on wheels can be used to provide additional flexibility in adapting work environments to meet changing needs of staff.
- A movable wall between two similar spaces enables the conversion to a larger space when needed.
- Future Expansion: The building should be designed for future expansion beyond the design program. Future expansion should be considered not only in the architectural design but also in the building HVAC, plumbing, electrical and data systems.

Biological Hazards / Chemical Hazards

Regulatory requirements issued by the United States Occupational Safety and Health Administration (OSHA) mandate the need to provide protection for workers encountering biohazard materials. The forensic science laboratory investigates a relatively high number of cases that originate from the criminal community, known to carry a higher incidence of dangerous diseases and drugs. Primary risks to staff are posed by such dangerous pathogens as Hepatitis A, B, & C, Tuberculosis, HIV (AIDS), Aspergillus Fumigatis and the highly dangerous drug fentanyl; to name a few. High-risk materials also include all serological evidence (evidence saturated with body fluids or biological tissue). These materials must be treated with exceptional care.

- In view of the biologically and chemically-hazardous nature of the work in each laboratory unit, it is important that the laboratory staff be provided with separate office / report writing areas in a "clean" space outside of the laboratory.
- It is recommended that all air-ventilation systems serving laboratory spaces where biological or chemical agents are present, be served with independent air handling systems with once-through (100%) exhausted airflow.

Office Environments

All laboratory sections include separate report-writing workstation areas near their laboratory space. These areas should be designed as standard office space with access to the laboratory corridor and adjacent laboratory area through a laboratory vestibule. Each scientist's 'clean' furniture workstation will be standard-sized 8-feet x 8-feet, modular systems,

open office. This office space has some degree of visual access to the adjacent laboratory it serves if possible.

Laboratory Vestibules

Lab vestibules are provided at the entry points to laboratory areas to provide a physical and air (HVAC) separation between the biohazard zones and non-lab spaces. These vestibules minimize the potential transfer of airborne biological and chemical contaminants to clean areas such as main corridors and office areas. Vestibules also serve to isolate spaces having high potential for cross contamination such as DNA preamp and amp/post amp spaces. When leaving a biohazard or chemically hazardous zone, staff members are required by policy to remove laboratory coats and to clean up prior to moving to the office area. Similarly, when moving from the clean office zone to the biohazards area, staff members are required to put on protective laboratory clothing.

- This space will contain a hand-washing sink with hands-free controls, coat hanging rack or coat hooks, and storage cabinets.
- Other special features in the vestibule include spill kits, a fire extinguisher cabinet, safety kits, electrical power panel, UPS power panel, and a plumbing systems control panel (hot water, cold water, compressed air or gases) for the lab section the vestibule serves.
- The vestibule must be maintained under negative pressure relative to the outer clean areas, and positive pressure relative to the biohazards area in order to maintain a cascading flow of clean air from the clean office environment to the potentially biohazardous lab zone. This containment strategy greatly reduces the risk of odors and airborne contaminants escaping from the laboratory areas.

Doors

- Oversized doors are required from corridors to major laboratory spaces. A minimum of 42” wide doors will enable large equipment to be moved into lab spaces. If a larger opening is required, double doors are required.
- Doors within areas of gurney travel are recommended to be sliding doors with a **minimum clear opening of 5’-0”**.
- Provide stainless-steel doors and door frames, and window frames in the Autopsy and Morgue areas. This includes sliding as well as swinging doors. This is due to the

demanding cleaning requirements in this area, and the fact that any chips or scratches in the finish make it harder to clean.

- Door lites are required in all doors, except where a darkened room is required or in doors leading to evidence storage rooms.
- Gasketed doors may be needed where required by the mechanical engineer for maintaining room pressurization.

Facility Tours

The facility is to be designed so that guided tours of the laboratory can be conducted at the option and discretion of the laboratory.

- Tour groups are not to be allowed any closer to the autopsy or laboratory spaces than the outside corridors and observation areas serving these spaces.
- Viewing windows can be installed in the corridor walls to facilitate viewing of certain laboratory areas.
- Display cases can be used to illustrate graphically the functions of each laboratory section in order to further educate tour groups. These are placed next to the viewing windows to enhance the learning experience.

"Essential" Facilities

The Forensic Science Laboratory is **NOT** required to be classified as an "essential" facility by Building Codes. The Medical Examiner portion of the building is **NOT** required to be classified as an "essential" facility.

Serving Americans with Disabilities

Federal Legislation mandates that spaces of "public accommodation" must be accessible to all Americans. Specific items recommended to achieve ADA compliance in laboratories include the following (typical in each laboratory section, as a minimum):

- Designation of one accessible workstation with a 34" high counter.
- One accessible fume hood, in close proximity to the accessible workstation.
- Unless waived by the Owner, accessible sinks in the laboratory vestibules and in one other location in each laboratory section near the accessible workstation.
- Accessible emergency shower / eyewash units.
- The use of adaptable laboratory casework enhances the ability to make additional

modifications to suit handicapped individuals in the future.

Safety Features

- Viewing between laboratory spaces: As a general safety feature, it is desirable that laboratory staff members be able to maintain visual connection between adjacent laboratory spaces and between labs and corridors. Maximizing the use of interior windows between laboratory spaces not only enhances safety, but also enhances the overall laboratory environment and improves light penetration to interior rooms. Such visibility provides a degree of safety should lab staff require emergency assistance or there is a chemical spill.
- Aisle width: Provide a minimum of 5-foot aisles to enable safe passage of 2 persons between lab benches.
- Proper placement of fume hoods, biological safety cabinets and other equipment is important to maximize safety of occupants.
- Ease of access for transport of biological waste and chemical waste to respective holding rooms.

Emergency Eyewash and Shower Units

- Provide combination emergency eyewash and shower units no more than 10 seconds walk from any point in the laboratory in accordance with ANSI Z358.1-1998 regulations. Utilize manufactured products, not site-built units, and assure ADA compliance. Provide a hard plumbed waste connection from the eyewash basin only. MWL does not recommend a floor drain below the shower assembly for two primary reasons. 1) Events requiring a shower may wash unknown contaminants down the floor drain. 2) The drain must be mechanically primed to prevent drying out allowing sewer gas and odor into the lab.
- At each laboratory sink, provide a deck-mounted drench hose emergency eyewash for added safety. Such eyewash units are common practice and are expected by most laboratory staff.

Pressurization in Lab Spaces

- Autopsy / Morgue areas and Labs are generally to be under negative pressure relative to adjacent office and corridor areas. This is to ensure that airborne contaminants and fumes stay in the lab areas. Flow of air should always be from clean areas (i.e. offices and corridors) to lab areas.

- Avoid excess negative pressurization to the exterior envelope to prevent infiltration of moisture and exterior dust. This issue needs to be carefully reviewed by the building architect and mechanical engineer relative to the design of the exterior envelope of the building. It is recommended to use an air-barrier membrane on the outboard side of the exterior wall, beneath the exterior finish, with all joints taped and sealed. Additionally, the air barrier is to be taped and sealed to all window units, doors and other items that penetrate the exterior wall assembly.

Low Velocity Airflow

- Rooms where low velocity airflow is needed will be identified in Room Data Sheets. Low velocity airflow is needed in these spaces to avoid disturbing small evidential particles such as hairs and fibers. This can be achieved by means of larger ducts, special diffusers, strategic placement of diffusers and greater numbers of diffusers.

Fume Hoods

- All fume hoods will be Class A, chemical fume hoods for either a variable air volume (VAV) or constant volume (CV) system, as recommended by the mechanical engineer.
- Install all fume hood exhaust fans in a rooftop enclosure and isolate them from the building structure and laboratory spaces.
- Equip all chemical fume hoods with GFCI fume hood power outlets and explosion-resistant light fixtures.
- Wet services in fume hoods shall be mounted remotely from GFCI electrical outlets.
- Make available plumbing options that include compressed air, water, and other gases.
- Provide all fume hoods with a UL listing label.
- All piped services in fume hoods are to be pre-plumbed and pre-piped, meaning that only one connection is required for each of the services. Each fume hood would have services per the Owner's requirements.
- Skirts will stop 1" short of ceiling and the ceiling is to be continuous overhead with escutcheons around ducts and other penetrations (for pressurization control).
- The mechanical engineer will need to advise if occupancy sensors are required and any special sash requirements to achieve certain energy usage requirements.
- Face velocity monitors will need to be provided and installed under Division 23, and installed under Division 11. Monitors to be alarmed locally.

Biological Safety Cabinets (BSC)

Biological safety cabinets are used instead of fume hoods when two additional requirements must be met which cannot be achieved with fume hoods:
1) Additional user protection is required from biological agents. This added protection is achieved by means of a lowered sash height and use of the sash as a splashguard.
2) Evidential material and biological samples in the hood must be maintained free of contamination from the air which passes over it. Biological safety cabinets deliver a supply of HEPA filtered air over the samples contained within to avoid contamination.

The control interfaces and HVAC requirements are quite different from fume hoods. The HVAC engineer will need to review pertinent sections of the biological safety cabinet specification, relating to interfacing between the HVAC systems design and the hood sash controls, monitors, etc.

- All Biological safety cabinets shall be UL-listed Class II Type A2, complying with NSF-49; equip cabinets with GFI power outlets and light fixtures. Lighting can include an ultraviolet disinfectant light if required by the laboratory staff. Plumbing options include vacuum, compressed air, and other gases.

Articulating Arm / Task Exhaust Units (Snorkels)

Task exhaust units will be located selectively where local exhaust would be advantageous to laboratory staff for small desk-top procedures involving odoriferous evidence or procedures, instrument exhaust, or removal of heat from instruments. Task exhaust units should never be used in place of a fume hood or biological safety cabinet.

- Each task exhaust unit to have the User damper removed. This is because the exhaust air drawn through task exhausts is an integral part of the overall laboratory exhaust.
- Task exhausts will be specified by MWL. The building exhaust system driving the snorkels will be designed and specified by the mechanical engineer.

Laboratory Work Surfaces

- At laboratory bench surfaces where chemicals and acids will be used or biological hazards are present, utilize epoxy resin countertops.
- In all autopsy / morgue areas, use type 316 stainless steel countertops, due to their high exposure to water and cleaning chemicals.
- Work surfaces in non-laboratory areas, such as offices, administration, and clerical

areas can be standard plastic laminate or solid surface material.

Laboratory Sinks

- Provide drop-in epoxy resin sinks in all epoxy resin countertops, except where stainless steel sinks are requested by the Owner.
- Provide type 316 stainless steel sinks in all stainless steel countertops.
- Provide deck-mounted eyewash units where shown at laboratory sinks.
- Provide hands free (foot pedal) operation or infrared operated faucets at selected laboratory sinks. At ADA-compliant sinks, always provide infrared-operated sink controls. Infrared operated faucets will require an electrical receptacle to be located below the sink cabinet.
- Provide hands-free infrared operated faucets at all autopsy / morgue sinks. Infrared operated faucets will require an electrical receptacle to be located below the sink cabinet.

Purified Water

Purified water will be provided from individual point of use water polisher units or will be purchased in packaged form by the Owner (as determined during design.) If the Owner elects to utilize point of use water polishers, these units will provide ASTM type III (1 mega-ohm) or ASTM type I (18 mega-ohm) purified water at selected lab sinks.

- Type III water will need to be provided to all under counter lab glassware washers.
- Point of use water polishers will be specified in the lab fixture package and installed by the pure water contractor.

Chemical Resistant (Acid Waste) Plumbing

Equip sinks throughout the laboratory with chemical resistant waste lines to handle the disposal of chemicals and corrosive acids. Supplement this with a dilution system, neutralizing filters, or holding vessels if required. Install such acid waste systems in all laboratory sections where chemicals or acids are used. The plumbing engineer will select the material and type of chemical resistant waste lines.

Chemical Storage Rooms, Chemical Storage Cabinets, Chemical and Biological Waste Holding Rooms

- Design chemical storage rooms to align with building code control areas.
- In chemical storage rooms and chemical waste holding rooms, provide electrical design classification of class 1, division 2 (chemicals always in closed containers, no dispensing.)
- All chemical storage will be in approved fire resistant chemical storage cabinets with internal spill containment.
- Chemical storage rooms should be well ventilated (at least 12 air changes per hour) and as directed by the mechanical engineer. Provide exhaust from both low elevation and high elevations in the room to properly exhaust both lighter than air and heavier than air vapors.
- Acid storage cabinets will need to be exhausted with a recommended minimum of 12-15 air changes per hour from the cabinet and as directed by the mechanical engineer. Acid storage cabinets located beneath fume hoods shall be tied into the fume hood exhaust duct by the mechanical engineer. Tall stand-alone acid storage cabinets shall be ducted and tied to the exhaust system where prescribed by the mechanical engineer, with appropriate controls to maintain flow rates.
- Flammable chemical storage cabinets: Generally, the ventilation of flammable chemical storage cabinets is not recommended by NFPA 30, unless there is a compelling reason to, for health or safety reasons. (The ventilation of flammable cabinets could compromise the ability of the cabinet to protect its contents adequately from involvement in a fire. The UL listing of these cabinets is based on fire testing of cabinets with vent outlets plugged; this means that if the cabinets are ventilated then the UL listing is compromised.) Therefore, only identified flammable chemical cabinets are ventilated in cases where out-gassing cannot be eliminated by the container the chemical is stored in. In such cases where the cabinets must be ventilated, this must be done directly to the outdoors in such a manner that it will not compromise the specified performance of the cabinet and in a manner that is acceptable to the authority having jurisdiction. At ventilated flammable chemical storage cabinets, the supply and exhaust ductwork will need to be designed by the mechanical engineer to be fire resistant, in accordance with NFPA.

Screening / Exam / ALS rooms

- Exam rooms require a 10’- 6” high ceiling for installation (present or future) of ceiling-mounted photo / light track systems.

- The exam room ceilings should be gypsum board.
- Exam rooms should be designed with low velocity air flow to avoid disturbance of small evidential particles.
- Provide down-flow air in exam rooms. The air flow in exam rooms should be supplied from the ceiling and exhausted from wall exhaust grilles located 12" above the floor. This provides a directional flow of air from high to low, minimizing contamination of evidence at the exam table level.
- Provide dimmable lighting for procedures involving alternate light sources (ALS).
- Room black-out shades are needed at all windows and at door lites.

Evidence Storage

Securely construct the evidence storage rooms in order to uphold the chain-of-custody while the evidence is in the jurisdiction of the forensic laboratory. Secure wall construction will consist of heavy-gauge, hardened, steel security mesh applied to the perimeter of stud walls, or the use of concrete masonry wall construction. The prime architect would specify the security mesh during the design phase. Extend the wall assembly to the structural deck above or to a security ceiling.

- Lay out lighting at high-density storage areas perpendicular to the row lengths so lighting is provided at all rows. If lighting is parallel to rows, some will be lit and some will not.
- Provide a security system motion detector in the evidence storage room.
- Penetrations in the walls shall be limited to less than 12”. If ductwork pass through the walls larger than 12” in either direction install security bars.
- Well-ventilate the evidence storage spaces with 100% exhaust to remove odors.
- Ventilation is important in all evidence areas. Provide a minimum of 15 air changes per hour in the main evidence storage area and 20 air changes per hour in areas where drugs and marijuana are stored.
- Provide a vented chemical storage cabinet for chemical samples such as those received from an arson case.

Instrument Rooms

Requirements for instrumentation rooms are as follows:

- Supplemental cooling: Instruments in these rooms will produce excess heat. Therefore, equip these rooms with a cooling system designed accordingly.

- Instrument Exhaust: To minimize supplemental cooling requirements, local task exhausts units are required at certain instrument workstations to exhaust heat or chemical fumes. Additionally, an exhaust port is required in each vented base cabinet where the roughing pumps will be housed. Local exhaust of excess heat from instruments can greatly decrease the need for supplemental cooling of the instrument room.
- Ultra-pure Laboratory Gases: Various instruments in these rooms will consume nitrogen, hydrogen, helium, and lab grade air, which must be plumbed to ultra-pure laboratory gas fittings located on the laboratory instrument benches. Pipe all ultra-pure gases through a stainless-steel laboratory gas distribution system having a purity level of 99.999% (5 nines purity) or as otherwise noted. The stainless-steel piping should be delivered to the job site capped and bagged to maintain this level of purity from the factory. The entire ultra-pure gas distribution system should be designed by the lab plumbing engineer based on gas usage capacities for each instrument. The ultra-pure gas distribution system must be constructed and installed by a specialty gas contractor who is highly experienced in this kind of work. The following general list of UHP gases are limited to the instrument rooms and where noted in Room Data sheets and will be located on subsequent lab plans. Generators providing Nitrogen and Lab Grade Air require compressed air.

  UHP Helium: 99.999% purity (5 nines), cylinder fed
  UHP Nitrogen: 99.999% purity (5 nines), cylinder fed/generator fed
  UHP Nitrogen: 99.9% purity (4 nines), cylinder fed/generator fed
  UHP Nitrogen 95% purity, cylinder fed/generator fed
  UHP Hydrogen: 99.999% purity (5 nines), generator fed
  UHP Argon: 99.999% purity (5 nines), cylinder fed
  UHP spare instrument gas: 99.999% purity (5 nines), future – cylinder fed
  UHP Lab Grade Air: 99.999% purity (5 nines), generator fed

- UHP gases will be plumbed to ultra-pure quick disconnect gas fittings located on the lab benches. The bench top fittings and the lab gas distribution system will be designed and specified by the plumbing engineer. Keep in mind the lab gas piping system (including bench top fittings) must be installed by a specialty gas contractor, who should be pre-qualified.
- Gas flow rates and pressures for each instrument for each gas need to be verified with the lab staff.

- There should be a recessed gas annunciator panel in the instrument room containing the annunciator device to alert staff when one of the manifolded cylinders is empty. Additional gas dryers and filters may be installed in line by the lab staff at the instruments.
- The new and empty gas cylinders will be located in the gas cylinder room at the ground floor loading area or in local cylinder rooms with manifolds near laboratory units as determined during design. The gas cylinders should be manifolded in pairs, with an automatic, switch-over device. The dual manifolded system enables the gas system to deliver uninterrupted gas when one cylinder goes dry. The lab gas distribution system also should have a two-stage regulation system, which first decreases the 2,000 psi cylinder pressure to a lower level, which is manageable by the lab gas piping system. The second stage of pressure regulation occurs at or near the instrument room, stepping the pressure down to a level that the instrument can tolerate, generally approximately 100 psi.
- Power: Instrumentation consumes large amounts of power and requires dedicated circuits, emergency power, and uninterruptable power system (UPS). UPS will be provided through a centralized UPS. In the instrument rooms, provide a two-compartment electrical raceway with 8 power receptacles for each 8 feet of instrument bench. Provide a minimum of 2 dedicated, 110v, and 20 amp circuits at each 8 feet of instrument bench. Provide computer network connections spaced as required for the instrumentation, but no less than 4 foot on center. As some instruments require 208 volts as well, provide one 208v receptacle for each 8 feet of instrument bench. The exact 208v NEMA configuration will be identified in the design phase. Roughing pumps will be located in ventilated cabinets below the counter. These cabinets will be exhausted and will need to have a duplex power receptacle for the pumps under the counter.

Body Coolers

To control humidity, a desiccant dryer system is required as part of the cooler design and construction. The dehumidifier will draw air from the cooler through a charcoal filter for odor control, dehumidify the air and return it to the cooler. Reactivation air will be exhausted.

- Provide a redundant cooling system sized to maintain operation of all coolers and freezer at the required temperatures and humidity level should one system malfunction.
- Provide floor drain(s) in body coolers for cleaning purposes.
- Provide condensate drains outside of all coolers in a visible location.

Compressed Air System

A compressed air system delivering clean, dry and oil-free air will need to be designed by the plumbing engineer. System shall be capable of delivering a minimum of 110 psi of pressure to the bench top lab gas fittings. This may be piped to the fume hoods and bench air outlets.

- A centralized compressed air system is required and will be located in a mechanical room, preferably the ground floor mechanical room.
- The compressed air system is to be an oil-free system with dryer and filter assemblies.

Vibration Design Considerations

Laboratory areas of the building, in particular the DNA, instrumentation, and microscope labs must be designed to provide a vibration environment consistent with the criteria specified for the equipment to be used in these labs**.**

The following are some general conceptual level comments related to vibration:

- Building layout: The layout of the rooms is important insofar as the placement of major mechanical systems relative to the vibration-sensitive areas is concerned. Other layout considerations may emerge when the design is developed.
- Laboratory module layout: Location of laboratories within the building, and with respect to vibration sources outside the building, influences the vibration environment achievable in the lab. Achieving an ideal location is the most cost-effective way (and sometimes the only way) to achieve a good vibration environment. The most sensitive labs, such as the SEM room, should be located as far as possible from internal sources of vibration such as mechanical and electrical equipment, elevators, major corridors, loading docks, etc. Position with respect to external sources, such as the adjacent streets, should also be considered.
- Mechanical equipment: Mechanical rooms should be located in a manner as not to influence vibration on an adjacent laboratory. It is important that all major items of equipment be designed and installed in such a way that the vibration they transmit to the building structure is controlled. Carefully consider the location of reciprocating mechanical equipment (compressors, chillers, pumps, etc.) due to the vibration produced by this type of equipment. Such equipment should not be located on suspended floor slabs, but rather in a ground floor mechanical room, as the slab on-grade and ground ‘sink’ will be an effective absorber of vibration. Slabs of mechanical

rooms should be isolated around the perimeter of the room. Piping and associated pumps should not be hung from supported floors as these can also transmit vibration to the structural systems.

- Pipes and ducts: Vibration control must also encompass mechanical systems such as ductwork and piping since these systems also can generate and transmit vibration via turbulent flow. It is most important to limit fluid flow velocities in pipes and ducts since turbulence associated with fluid flow can be a substantial vibration source. For this reason, airflow velocities should be limited to 1800 ft. / min. and liquid flow velocities limited to 7 ft. / sec. Major pipes and ducts (in excess of 4 inches in diameter and 20 inches in diameter, respectively) located under suspended highly vibration-sensitive floors should be supported from the columns or the floor and not directly from the vibration-sensitive floor, even with vibration isolation hangers.
- Inertia bases: Inertia bases should be used for major equipment that produces vibration, all liquid pumps and, depending on the equipment specifications, for certain exhaust and make-up air fans. The structural design must take these loads into account.
- Vibration criteria: A vibration criterion is usually expressed in terms of root-mean-square (rms) velocity for one-third octave frequencies between 8 and 100 Hz. The specified limits are intended to apply to vertical and horizontal (in two axes) vibration as measured on the structural floor. They do not apply to bench tops.
- General vibration design criteria: Generic laboratories should be designed to a minimum vibration velocity of 2000 micro-inches / second. This criterion may be relaxed once details for specific equipment are known. In general, laboratories with bench-top, medium-power, optical microscopes (20X to 100X), and related equipment with magnifications up to 100X, can be designed to 4000 micro-inches / second, while 2000 micro-inches / second is usually adequate for laboratories with microscopes between 100X to 400X. Laboratories with high-power, optical microscopes (up to 1000X) should be designed to 1000 micro-inches / second.
- Footfall impact: One prevalent source of vibration affecting performance of microscopes is that caused by persons walking on the floor. Dampening of the floor structure is required to minimize footfall impact. Limiting walker response to the above-given general vibration design criteria levels requires the following floor dampening levels, measured in kips / in-seconds (Kf Product):
  - For 4,000 micro-inches / second, use Kf of 2,000 (medium damping) or Kf of 1,000 (high damping).
  - For 2,000 micro-inches / second, use Kf of 4,000 (medium damping) or Kf of 2,000

(high damping).
- Specific Vibration control criteria for the SEM will be identified in the Equipment Data Book.

Acoustical Design Considerations

Noise can affect both personnel and equipment within the building and if it emanates to the exterior it can impact neighboring buildings. Control of HVAC noise and the careful selection of relevant architectural details can improve communications, speech privacy, and the general condition of work environments. Proper noise control design can also reduce long-term, work-related hearing damage, fatigue, and general annoyance. It is best to consider noise control during the design stage rather than retrofit potentially more-costly noise control measures later.

The following are some general conceptual level comments related to acoustics:
- HVAC design: HVAC layouts must be consistent with the noise requirements. Whenever possible, large ducts should not run above noise sensitive spaces. No duct shafts or plumbing chases should be common with walls of noise sensitive spaces. The need for additional noise control in the form of duct lining, duct silencers, etc., will be determined as the mechanical design progresses. Duct penetrations through sound walls must be sealed appropriately.
- Air volume control devices: Terminal units, VAV boxes, and diffusers must be selected so that the noise they generate is consistent with the recommended Noise Criterion (NC) levels of the rooms they serve. The equipment manufacturer's NC rating may not apply to many rooms within a laboratory facility, as these ratings are usually computed for rooms with a great deal more sound absorption than is found in a typical laboratory. Terminal units shall be selected on the basis of the manufacturer's certified laboratory octave band, sound power levels. Diffusers should be selected for an NC requirement, 5 points lower than the stated room design criterion to account for the impact of multiple diffusers.
- Noise from lab instruments (GC, GCMS, etc.), in particular roughing pumps, will be dampened by use of acoustically insulated pump cabinets.
- Breakout noise: HVAC breakout noise is the noise that is transmitted into a space through the walls of the ducts. This is most commonly a problem when a particular system has large ducts that pass over an acoustically sensitive space on the way to a space with a much-less-stringent design criterion. Using round ducts may reduce

breakout noise.

- General acoustic design criteria: Most laboratories, corridors, and lobbies can be designed to a Noise Criterion of NC-45, while private offices should be designed to NC-35. NC-30 would be appropriate for executive offices and conference rooms. These criteria are intended to apply to building systems noise sources only. On occasion, they may be applied to other sources, such as the room noise level resulting from external noise sources (aircraft, traffic, etc.), or attributed to known equipment in the room.

Lighting (Artificial and Daylighting)

Lighting of the laboratory environment is critical to the work that goes on within. Provide light conditions as follows:

- LED lighting to be used throughout lab areas, except where other specialized lighting not achievable with LEDs is necessary.
- Maximize the use of natural lighting to all occupied lab spaces. Natural lighting provides for superior color rendition over artificial, color-corrected lighting. Daylighting into lab spaces will be maximized by minimizing opaque barriers to light penetration. Locate transparent rooms on the exterior and opaque rooms such as evidence storage rooms, in interior zones. Utilize interior windows to take advantage of borrowed light from adjoining rooms on the exterior side.
- Avoid tinted window glazing in lab spaces, as the tinting alters the color spectrum and the rendition of subtle colors and detail in evidential materials. Clear, high-performance glazing is preferred. This type of glazing also has superior thermal characteristics.
- Color rendition is important. Light fixtures should have a high color rendition index (CRI) of around .90, to maximize color rendition.
- In laboratory areas, provide a general lighting level of 100 foot-candles of illumination, 3' above the floor. Alternatively, a lower lighting level will be studied if task lighting is incorporated into the overall lighting scheme.
- Provide dimmable lighting up to a level of 300 foot-candles, 3' above the floor in all autopsy rooms and 100 foot-candles of illumination, 3' above the floor, at all other autopsy / morgue spaces.
- Indirect lighting is preferred. Suspended, indirect lighting fixtures are preferred over recessed fixtures to give more even light throughout the room. Position light fixtures over the laboratory benches to maximize the effectiveness of the lighting. Recessed,

sealed fixtures are recommended in exam rooms where biological contaminants and odors are present.
- Locations of dimmable lighting will be identified in the Room Data Sheets.
- Dual-level controls and sensor-operated lighting controls default to the electrical engineer. Labs where sensor-operated lighting is not desired for functional or safety reasons are noted in the Room Data Sheets.

Electrical Power and Data Cabling Distribution

- Raceways: At perimeter wall areas, provide a two-compartment aluminum electrical raceway. One compartment is for electrical wiring while the other is for data cabling. At walls, top of the raceway is to be mounted just above the backsplash 47” above the floor. In raceways at general lab bench areas, space duplex receptacles 4’- 0” on center and space duplex data outlets at 8’- 0” on center. The exception will be special areas such as in the instrument rooms and other locations having equipment intensity where noted on the plans, e.g. at instrument benches. At instrument benches space duplex power receptacles 2 feet on center, and data outlets at 4 feet on center.
- If building wide UPS is provided, incorporate secondary power into this raceway system as well.
- Provide a wall-mounted data port behind each refrigerator and freezer for connection to the BAS for temperature range monitoring.
- Pedestal Boxes: Each to have three outlets and one 2-port data outlet.
- Cable Trays: Cable trays should be exposed type, to be specified by the electrical engineer.
- Overhead Recessed Cord Reels: All overhead cord reels are to be specified by the electrical engineer. Cord reels shall be contained within a recessed enclosure to achieve a flush ceiling mount and meet codes. The recessed cord reel will be similar to the models manufactured by Hospital Systems, Inc. (HSI). The exact model will be selected by MWL for visual and functional compatibility with the lab functions. Refer to the Equipment Data Book.

Overhead Umbilicals

Ceiling mounted lab services will be used over table-based lab furniture systems. These services will include outlets for power, data, lab gases and task exhaust, which can be accessed and modified over time, avoiding the need to rework walls, lab casework and

ceilings.

- Overhead ceiling mounted lab services will be incorporated into metal plates designed to fit into the suspended ceiling system. Each lab service will be securely anchored to the metal plate. Each metal plate will be securely anchored independently of the suspended ceiling system.
- Overhead power plugs to have NEMA twist-lock blades. All other overhead services to have twist-lock connections as well.

Security Electronics

Equip the facility throughout with a monitored, proximity-access security system. Provide access devices at doors to all laboratory sections and exterior entry doors. The system should have the capability of printing a status report with card access ID, date of access, and time of authorized entry, as well as unauthorized entries. Monitor key areas of the building and site by closed-circuit television with time lapse-video capture.

- Determine the quantity of CCTV cameras by management policy as part of the overall security strategy. As a minimum, the types of locations covered by CCTV cameras for the facility might include, but are not limited to, the following:
    - Locate fixed and pan / zoom / tilt cameras to view all exterior sides and entries of the building, including vehicle bay areas, receiving and service areas, parking areas, and vehicle entries to the site. At entries these cameras should view the backs of visitors as they approach the entry (visitors with hostile intent may try to carry a weapon behind them).
    - Cover the main interior circulation paths throughout the facility and main entry lobbies, including the evidence receiving room with cameras.
- Include motion detection in evidence storage spaces.
- Provide door-status monitors at all security access doors, interior and exterior, using infrared-room, occupancy monitors / indicators.
- Doors should be electronically monitored and alarmed remotely to a central security location.

Communications (Voice, Data, Digital)

Give consideration to the following design features:

- Design voice and data systems in accordance with the Owner's standards.
- Computer data ports: Provide computer data ports at key points in the laboratory and office areas to permit staff to link computers to their local area network (LAN) or

laboratory information management system (LIMS). Locate data ports at all designated workstations, functional work areas, office spaces, and in all designated laboratory workstations.

- Consider special grounding, compatible with the Owner's communication systems, to minimize effects of lightning strikes.
- Cable television: During recent disasters and periods of civil unrest, emergency response coordination was aided greatly by continuous reports by television news media. As a result, it is beneficial to provide cable television monitors in key areas, such as the conference room, classroom areas, and key staff offices.
- Provide teleconferencing in the conference rooms.

Emergency Power

The client requires the ability to operate selected aspects of the facility during a power outage. The 'emergency' power system is code-required to serve only emergency loads. The 'standby' system is connected to the same generator via separate transfer switches and distribution panels. Standby power locations for equipment items are generally identified below. The exact equipment that will be on the standby power system will be determined in subsequent phases.

Serve the following loads from the standby power system:

- Computer servers (IT, CODIS, AFIS, etc.)
- Security system
- All stand-alone refrigerators and freezers containing evidence.
- Any walk-in refrigerators or freezers.
- Building automation system remote panels
- Selected building lighting
- Selected building and special purpose receptacles
- Selected laboratory equipment per the Owner's requirements
- Fume hood exhaust systems & supply air systems

HVAC Air Intakes

Consider security precautions in the air intakes placement.

- Locate air intakes in such a place that the general public cannot gain access or provide visual security.

- Provide enough vertical, screened, above-grade inlets that it would not be possible to throw a teargas canister into the inlet.
- Fit air intakes with security bars to prevent unauthorized entry of persons or objects via air ducts.
- Place air intakes to avoid re-entrainment of laboratory exhaust.

Uninterruptable Power System (UPS)

As determined during design, the forensic lab will be powered by either a centralized UPS or point of use UPS units provided by the Owner. Room Data Sheets identify generally where UPS power is needed. If a centralized UPS system is utilized, specific UPS receptacles will be further identified and located in the design phase. Centralized UPS will be further identified in the engineering narratives and designed by the electrical engineer in the design phases. If point of use UPS units are utilized, Owner shall provide the sizes and power requirements of these units to be incorporated into the design.

Typical Laboratory Finishes

Flooring:

- Sally Port: Sealed Concrete
- Autopsy and Morgue areas: Epoxy Terrazzo
- Epoxy Cove base transition: Transition from terrazzo floor 2” up wall using epoxy paste product. Paint Epoxy wall system over epoxy paste material.
- Laboratories: Chemically resistant, heat-welded, homogeneous in color, seamless, vinyl flooring in most laboratory spaces.
- Provide 6” concrete curbs where stainless steel tall cabinets are located in areas with heavy washdown.

Walls:

- Lab Areas: Paint walls with low VOC paint on gypsum board surfaces and epoxy paint over CMU or concrete surfaces. Architects to confirm applied coatings match local air quality requirements. Refer to Room Data Sheets.
- Autopsy and Morgue Areas: Epoxy Resin Wall System
- Transition from epoxy resin wall system to cove base using epoxy paste product.
- Support Areas: Paint walls with low VOC paint on gypsum board surfaces and epoxy paint over CMU or concrete surfaces.

Ceilings:

- Autopsy and Morgue Areas: Gypsum board with epoxy coating
- Use acoustical lay-in ceilings in most laboratory spaces. Lab acoustical ceilings should be similar to Armstrong Ultima with NRC of .7 and reflectance of .9.
- Run ceilings over the top of fume hoods, as the skirt will stop 1" short of ceiling. Provide escutcheon around ducts.
- All exam room ceilings should be gypsum-board for better environmental control.
- In special applications, provide vinyl-coated, lay-in ceilings in laboratories. At labs where vinyl-coated ceilings are needed, use a clean room ceiling, with a high NRC and high light reflectance.
- Refer to Room Data Sheets.

Floor Drains and Sinks

- Provide floor drains at all drying cabinets.
- All floor drains need to have the floor sloped to them. This is critical in autopsy areas. Water must not pool.

Fixtures Specified by MWL (with General Engineering Coordination Noted)

During design phases, a lab fixture package will be prepared by the lab planner and forwarded to the project engineers. This package will include lab sinks, emergency shower / eyewash units, deck mounted eyewashes, sink faucets, pure water faucets, UHP lab gas fittings, pedestal housing, snorkels, and fume hoods. The following lab fixtures and components will be specified by MWL:

- Lab sinks and associated fittings in lab counters. Vacuum breakers at all lab faucets are required to be included in the lab specifications. The plumbing engineer shall design and specify all related plumbing systems. The engineer is to show the plumbing diagram of the foot pedal faucet arrangement or infrared operated faucets. Specify flip-up, cabinet-mounted foot pedals. Plumbing engineer to specify all thermostatic mixing valves as needed.
- Emergency shower & eyewash units in lab spaces will be specified by MWL. The plumbing engineer shall design and specify all related plumbing systems, including the tempered water system and any required thermostatic mixing valves. Only the eye wash drain outlet will be hard plumbed into the building drainage system.
- Deck mounted eyewash units: Drench hose, deck-mounted eyewashes will be specified by MWL. The plumbing engineer will need to comply with any code

requirements for vacuum breakers at the eyewash units.

- Fume hoods: The fume hood specification will be prepared by MWL during the design phase. The mechanical engineer must review pertinent sections of this specification, relating to interfacing between the HVAC systems design and the fume hood sash controls, monitors, etc. The engineer will need to advise if occupancy sensors are required and special sash requirements to achieve certain energy usage requirements. Face velocity monitors will need to be provided under Division 23, and installed under Division 11. Monitors to be alarmed locally.
- Task Exhausts in lab spaces and vehicle exam bays will be specified under Division 11 and installed under Division 23.
- The ultra-pure gas fittings will be included in the lab specifications, but they must be installed per the direction of the plumbing engineer as part of the overall ultra-pure gas system. The complete installation of the ultrapure gas distribution system will be designed and specified by the plumbing engineer.

Fixtures Specified by the Plumbing and Electrical Engineers

- The plumbing engineer will specify all wall-mounted sinks, sinks in non-laboratory casework, hose reels, floor drains, and other non-lab fixtures.
- The electrical engineer will specify all wall or ceiling mounted electrical cord reels.

Site Requirements

Vehicle parking security:
It is recommended that the site design provide for three levels of site security:

- Level 1, unsecured site area: The level 1 unsecured site area, located outside the facility security compound, accommodates general visitor parking and allows these visitors to enter and leave the parking area through a securable barrier. This barrier may be closed during special events.
- Level 2, secured site area: Staff and evidence contributor parking will pass through a controlled access gate to this secure site and parking area. From this secured site area, staff has access to dedicated entry points. The level 2 area is secured 24 hours a day, surrounded by a perimeter security fence; it is accessible by use of proximity access devices.

Site access:

Design the site in such a way that access is provided from at least two directions. This is required in order to ensure access to the site despite traffic accidents, street work, and acts of sabotage, and also to maximize the free flow of traffic to and from the site.

Site lighting:
Include site lighting that is comparable to that of a college campus offering night classes. Although the facility will not be open after normal working hours and the site will be secured with perimeter fencing, adequate lighting is required in order to deter vandalism and help maintain security. Provide the following light conditions

- Provide excellent lighting to all areas of the site, not just the parking areas.
- Avoid wall washer lighting fixtures, which illuminate the building walls. Instead, direct site lighting to illuminate the ground plane, which surrounds the building and areas of possible intrusion.
- Provide path lighting.

Landscaping:

- Avoid dense shrubbery within 10 feet of the building.
- Throughout the site, avoid large clusters of high shrubbery and tall evergreens with branches lower than 5 feet above grade.
- Design landscaping to deter anyone from hiding on the site after dark or planting explosives near the building.

End of Basis of Design Guidelines

FIRE PROTECTION DESIGN NARRATIVE (DN)

The fire protection system(s) shall be designed and installed in accordance with all local, state, and federal regulations. Refer to BOD narrative for more information.

Fire Suppression System(s):

- Existing fire sprinkler service entrance(s) will be removed by this project.
- A new 8”Ø fire sprinkler service entrance shall be provided in the ground floor of the new laboratory addition building and will serve the entire project scope.
- A new 8”Ø double check detector assembly (DCDA) shall be provided as a backflow protection device to protect the municipal water supply.
- The building(s) will be served by a new electric fire pump system capable of providing water for sprinklers and automatic standpipes.
- Building shall be fully covered/sprinklered by a wet-pipe sprinkler system unless otherwise noted.
- The following areas shall have clean agent fire suppression systems as an Add Alternate:
    - 00 – X-Ray room
    - 00 – Slide and Block
    - 00 – DNA Card and Bone Storage
    - 01 – Drug Evidence
    - 01 – DNA Evidence
    - 01 – Tox Walk-In
    - 01 – Drug Instrument Lab
    - 01 – Fire Instrument
    - 03 – Tox Instrument Labs

Fire Alarm System(s)

- Refer to *Electrical*.

PLUMBING DESIGN NARRATIVE (DN)

The fire protection system(s) shall be designed and installed in accordance with all local, state, and federal regulations. Refer to BOD narrative for more information.

Site Utilities:

- Plumbing site utilities shall be provided by the site contractor to within 5'-0" of the building.
- Fire protection service shall be a minimum 6"Ø.
- Domestic water service to the building shall be a minimum 3"Ø and 2"Ø to the Maintenance Building.
- Exterior perimeter storm drainage piping shall connect to downspouts with downspout boots, wherever installed, and connected to site storm water piping. Downspout boots shall be a minimum of 12" above grade and include a solid brass threaded cleanout plug.

Sanitary, Waste, & Vent System(s):

- All sanitary, waste, and vent systems shall be installed in compliance with local, state, and federal codes and connected to all building plumbing fixtures, equipment, drains, etc. requiring SWV piping.
- All below grade piping shall be Schedule 40 PVC DWV piping & fittings. Foam core PVC piping is not allowed.
- All above grade piping shall be Schedule 40 cast iron DWV piping and fittings.

Storm Water System(s):

- All below grade piping shall be Schedule 40 PVC DWV piping & fittings. Foam core PVC piping is not allowed.
- All above grade piping shall be Schedule 40 cast iron DWV piping and fittings.
- All horizontal storm water piping shall be insulated.
- The building(s) shall have primary and secondary drainage systems. Primary systems shall be routed below grade and connect to the site storm water system(s). Secondary systems shall be routed to exterior walls and provided with downspout nozzles located in conspicuous spaces.

Domestic Water System(s):

- Domestic water system shall be piped throughout the building to all fixtures, equipment, etc. that require domestic cold and/or hot water.
- A booster pump with the ability to provide a minimum of 30 psi at the furthest fixture shall be provided.

- A dual temperature hot water system shall be provided. Hot water will be generated by water-source domestic water heat pumps connected to the geothermal/ground-source water system.
    - A 120°F hot water system complete with a dedicated return shall be provided for all general fixtures and equipment.
    - A 140°F hot water system will be provided for fixtures and equipment such as mop sinks, sterilizers, ware washers, etc.
- All domestic water piping shall be Type “L” copper with wrought fittings and be fully insulated.

Plumbing Fixtures:

- All fixtures shall be WaterSense, unless otherwise noted/specified.
- Water closets, urinals, and wall hung lavatories shall be provided with heavy-duty wall carriers.
- Wall-hung lavatories shall have code compliant shields.
- Flush valves for toilets shall be dual flush manual operated.
- Lavatories shall have hard-wired sensor activated faucets.
- Floor drains/sinks shall be installed in all toilet rooms, laboratories, mechanical rooms, sally port(s), evidence storage areas, and other areas as required for clean-up operations. All floor drains shall utilize trap primers, not trap seals.

Exterior Wall Hydrants:

- Wall hydrants shall be the non-freeze type, hose end threaded with integral vacuum breaker. Hydrants shall be key operated and installed on exterior walls. Hydrants shall be located around the perimeter of the building, and spaced approximately 50’-0” apart.

Special Systems:

- RO/DI water will be provided by at point of use for the DNA and Toxicology laboratories. Supply piping will provide high-purity water for lab functions.
- A laboratory air system will be provided to provide compressed air for laboratory functions. The system will be located in the basement mechanical room of the new laboratory addition building and piping risers will extend to the 3rd floor to provide compressed air for lab functions.

MECHANICAL DESIGN NARRATIVE (DN)

The HVAC systems must ensure continuous operation and maintain optimal conditions for forensic science activities. Systems should be resilient, energy-efficient, and capable of future expansion. Refer to BOD narrative for more information.

Central Plant – Hybrid Ground Source Well-field:

- The central heating/cooling plant will utilize a geothermal system with vertical wells located beneath parking lots. A closed-circuit cooling tower will supplement the well-field.
- Dedicated pumping systems will circulate water between the building and the well-field, decoupled from building loops.

Historic Building Administration Spaces:

- Ventilation will be decoupled from space conditioning, with dehumidification handled by an indoor ground-source dedicated outdoor air system (DOAS) with air-side energy recovery. The system will deliver neutral air temperatures directly to each ventilation zone. The DOAS unit will modulate based on CO2 readings and room occupancy sensors.
- Cooling and heating will be provided by unitary water-source heat pumps.

Laboratory Addition:

- Heat Pump Chiller: A modular six-pipe geothermal heat pump chiller with heat recovery will serve the chilled water loop and heating water loop. Heat of rejection will be used for terminal unit reheat coils.
- Air Handling Units: Variable volume one-pass AHUs with fan wall technology for the Laboratory Addition. An atomizing humidifier coil section will be placed in the air handling unit.
- The atomizing humidifier will utilize RO/DI water. A RO/DI conditioner skid will be located in the penthouse mechanical room in the building addition.
- Laboratories and Medical Examiner Unit spaces will use a variable air volume system with reheat, supplying 100% outside air and exhausting through a specialized lab exhaust fan system.
- Offices/corridors adjacent to the laboratories will conditioned with 4-pipe fan coil units located in accessible areas above the ceiling.
- Energy recovery will be achieved through runaround glycol loops between supply air AHUs and the exhaust stream. The energy recovery unit will also have a humidification coil, this additional coil allows more energy transfer in the cooling season. It also allows

the humidifier system to run regularly during the summer months to “exercise” the humidification system to reduce overall maintenance.

- Laboratory airflow control systems will use venturi air valves on the exhaust and supply side to ensure safe and comfortable working environments by preventing overexposure to airborne chemical hazards and meeting temperature and humidity requirements.
- Laboratory exhaust fans will use active sensing to monitor exhaust air stream and modulate bypass dampers to reduced fan motor energy.

Building Automation System (BAS):

- A new direct digital controls system (DDC) will be provided, utilizing BACnet communication for interoperability with smart equipment and third-party devices.
- The BAS will be fully programmable with a graphical front-end.

Snow Melt System

- A snow melt system shall serve selected walk-ways and drive-ways, ensuring safe and accessible pathways. The snow melt system will be connected to the central plant via a heat exchanger.

ELECTRICAL DESIGN NARRATIVE (DN)

The electrical systems are designed to support facility operations and provide robust and maintainable service for the life of the building. Systems should be resilient, energy-efficient, and capable of future expansion. Refer to BOD narrative for more information.

Utility Power Entrance:

- New electric service will be provided by underground secondary power delivery from the local utility company. A 3000A 480Y/277V service entrance switchboard will be installed in the Laboratory Addition. This new entrance will supply an 800A feeder to a distribution switchboard installed in the Historic Administration Building.
- Existing utility services for the historic building will be removed by this project.

Emergency Power System:

- A new exterior diesel generator will supply back-up power to the facility. This generator will be installed in a walk-in weathertight enclosure with a sub-base fuel storage tank capable of 96 hours of operation.
- Egress and exit lighting, fire alarm as well as select lab equipment, support equipment and mechanical systems will be provided with generator power. Multiple transfer switches will control load staging and isolate different load types.
- A central UPS system is provided in each building to provide power to critical equipment during generator startup.

Power Distribution – Historic Administration Building:

- Building A power distribution will be concentrated in the lower level and penthouse due to space constraints. Lower-level equipment will supply its floor and the floor above. Penthouse equipment will supply that level and the floor below. Panelboards will also be located in mechanical spaces to serve equipment therein.

Power Distribution – Laboratory Addition:

- Building B is provided with dedicated electrical rooms on each floor. These will house distribution panels, step down transformers and branch panelboards. Circuits for common areas will be supplied from panelboards in these rooms. Labs will have dedicated utility power and standby power panelboards as required for the loads. Panelboards will also be located in mechanical spaces to serve equipment therein.
- Branch circuit distribution to lab benches will be by two or three channel stainless steel Wiremold raceway mounted above the benches.

Lighting and Control:

- Building lighting will be provided to meet International Energy Conservation Code (IECC), Illuminating Engineering Society (IES) and DFM recommended illumination standards. All fixtures will be LED source. Fixture types will be selected to meet individual space needs and complement the building aesthetics.

- Exterior lighting fixtures will be LED pole type and "dark sky" compliant. Fixtures will generally be mounted on 30' aluminum poles for roadways and parking lots or 12' decorative poles for pedestrian areas.

- Lighting control will be provided by a low-voltage system interfaced with the Building Automation System. Common areas and exterior spaces will be managed by time-based scheduling, with local overrides. Individual spaces will be equipped with stand-alone occupancy-based control.

Lightning Protection System:

- A new UL780 compliant lightning protection system will be provided for both buildings. A UL Master Label certification will be provided.

Fire Alarm System:

- A new fully addressable fire alarm system will be provided for each building of this project. The Historic Administration renovation and Laboratory addition will be treated as separate buildings for alarm and reporting purposes.

- The system will provide all initiation and notification devices necessary for a complete installation compliant with NFPA 72 and ADAAG.