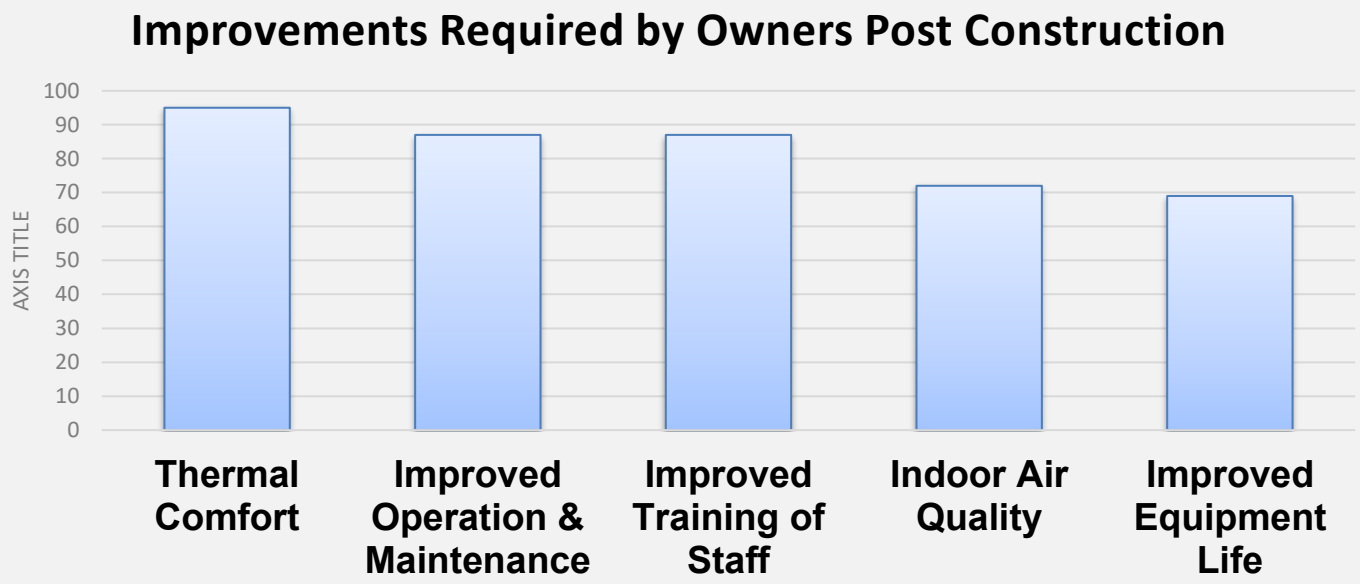
National Institutes of Health
Office of Management

Assessment of New Laboratories – Rollout of the NIH BaseLINE Program

Derek Newcomer, DrPH, CIH, CSP
Roy Deitchman, SM, JD, CIH

Office of Research Services
National Institutes of Health
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

BaseLINE Introduction: Value Added



2018 BUILDING COMMISSIONING ASSOCIATION
HTTPS://WWW.BCXA.ORG/WP-CONTENT/UPLOADS/2019/07/CX-MARKET-SURVEY-REPORT-FINAL-2019.07.16-V.3..PDF

BaseLINE Program Outline

Part 1 – Basic BaseLINE Approach

Part 2 – Industrial Hygiene and LEED Factors in the LINE

Part 3 – Safety Assessment in the Base

Part 4 - BaseLINE Timing

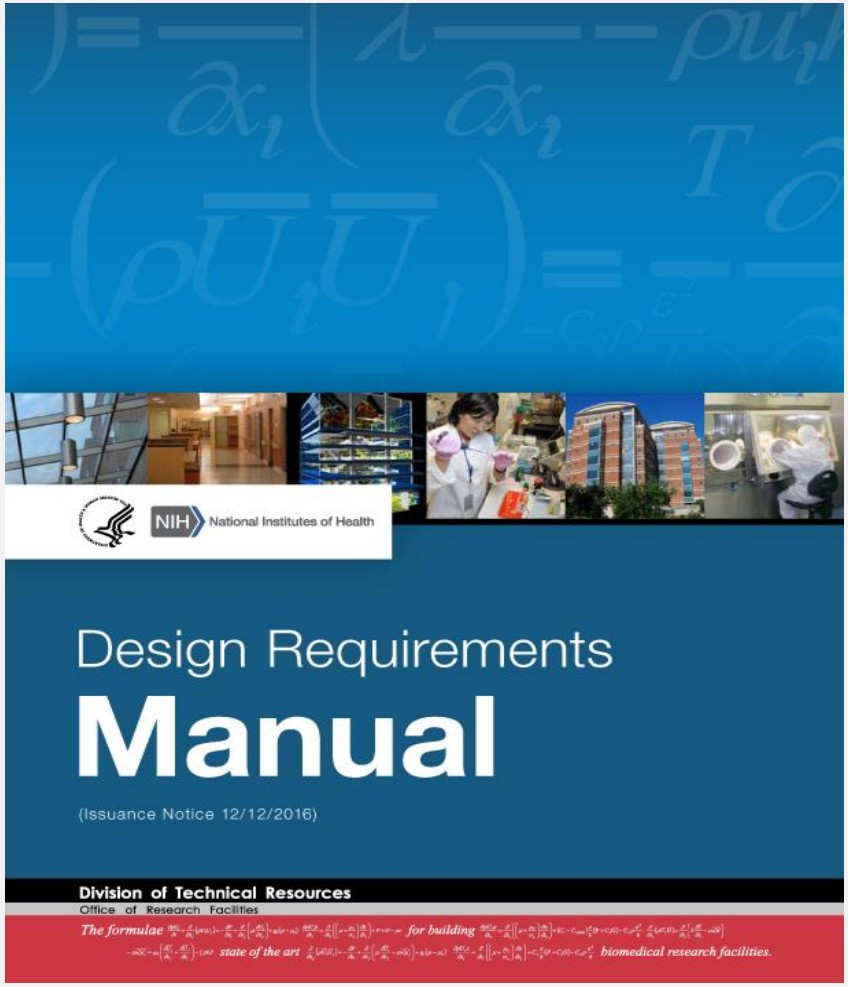
BaseLINE Program Outline

Part 1. Basic BaseLINE Approach

What?

- **The BaseLINE Program is an industrial hygiene and safety assessment prior to building occupancy (Base=Building Assessment of Safety Elements and LINE=Lighting, IAQ, Noise, Ergonomics)**
- **Verifies NIH safety requirements including from the NIH Design Requirements Manual (DRM)**
- **Checks on safety-related equipment used in facility operations**
- **Provides IAQ data and additional industrial hygiene data including if certification (LEED) is to be achieved**
- **Uses OSHA and national consensus standards (NFPA; ANSI) and other regulations as a safety guide**

NIH Design Requirements Manual (DRM)



Available at:
https://orf.od.nih.gov/TechnicalResources/Documents/DRM/DRM1.503262020.pdf

Who?

- **Industrial Hygienist**
- **Safety Engineer**
- **Institute (Department) Project Manager**
- **Construction Manager**

Why?

- **Check critical operations prior to use**
  -minimize risk of injuries

- **Establish a baseline of safety operating conditions**
- **Make sure operational requirements will be met – initial set of parameters evaluated to prevent future concerns or complaints**
- **Check on compliance with federal regulatory agency and NIH requirements including Executive Order 14057 and sustainable federal buildings – over 25,000 gross square feet**
- **Increased user (occupant) acceptance / happier occupants and a healthy workplace**

How?

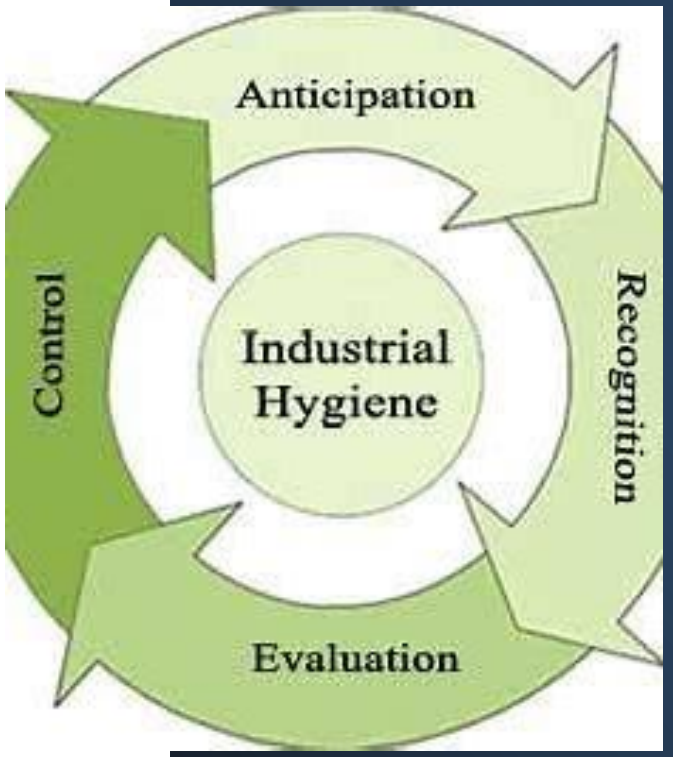
- **Use of a standardized safety checklist**
- **Use of industrial hygiene standards based on LEED criteria and consensus standards**
- **Initial set of parameters developed to evaluate future concerns or complaints**
- **Detailed on-site evaluation**
- **Discussion with Project Manager**

Opposite of this picture:

clear technical checklist

BaseLINE Program Outline (cont.)

Part 2. Industrial Hygiene and LEED Factors in the LINE



How? Industrial Hygiene Parameters to Review Include:

- Lighting Levels
- Indoor Air Quality
- Noise Level
- Ergonomics – basics

LEED Criteria

Leadership in Energy and Environmental Design (LEED)

Points Needed for Certification

- Certified 40-49 points
- Silver 50-59 points
- Gold 60-79 points
- Platinum 80+ points

Indoor Environmental Quality (IEQ)

IEQ – up to 16 points

- lower emitting materials
- enhanced IAQ strategies
- daylight

Enhanced IAQ strategies

- naturally vented spaces
- improved filtration
- CO2 monitoring

LEED Related IAQ Parameters

- Carbon Monoxide
- Carbon Dioxide
- Total Volatile Organic Compounds (TVOCs)
- Formaldehyde
- Particulate Matter

IH Sampling Instruments Used

- **Gray Wolf Direct Sense meter**
  carbon dioxide, carbon monoxide, total volatile organic compounds, formaldehyde (detection limit at 15 ppb)
- Sound Level Meter
- TSI Dust Trax
  Particulate meter
- Light meter

Total Volatile Organic Compounds (TVOCS)

TVOC sources include new office equipment and remodeling including carpet, wall partitions, wall board, caulk, paint, cleaning materials

- **No specific OSHA Permissible Exposure Limit (PEL) for TVOC.**

- **LEED recommends a concentration below 500ug/m3 of TVOC**

  - plus consideration for organics on the California Chronic Reference Exposure Levels (CREL)

Formaldehyde

Materials containing formaldehyde include building materials, furnishings and some consumer materials

- **Off-gassing concerns: Formaldehyde has a pungent odor**
- **LEED recommended level is to be below 27 parts per billion (ppb)**

IAQ Data Sheet

Parameter	Sample ID	Equipment Make and Model	Serial Number (Circle One)	Measured Concentration Start End Average	Start Time	End Time	Concentration Goal
CH_2O		Gray Wolf Direct Sense II	09-2532 09-2537				Less than 27 ppb
CO2		Gray Wolf Direct Sense II	09-2532 09-2537				LEED limit 1000 ppm
TVOCs		Gray Wolf Direct Sense II	09-2532 09-2537				Less than 325 ppb*
CO		Gray Wolf Direct Sense II	09-2532 09-2537				Less than 9 ppm
PM 10		TSI DustTrak DRX					Less than 50 ug/m3

LEED: Acoustics, Lighting, Thermal Comfort Requirements

Acoustics

Office Space: 35-55 dBA

Laboratory Space: 50-65 dBA

(measured with only facility related mechanical equipment operating in office and laboratory spaces)

Lighting

Office Space: 40 fc

Laboratory: 75 fc

Thermal Comfort:

68 to 79 degrees F.

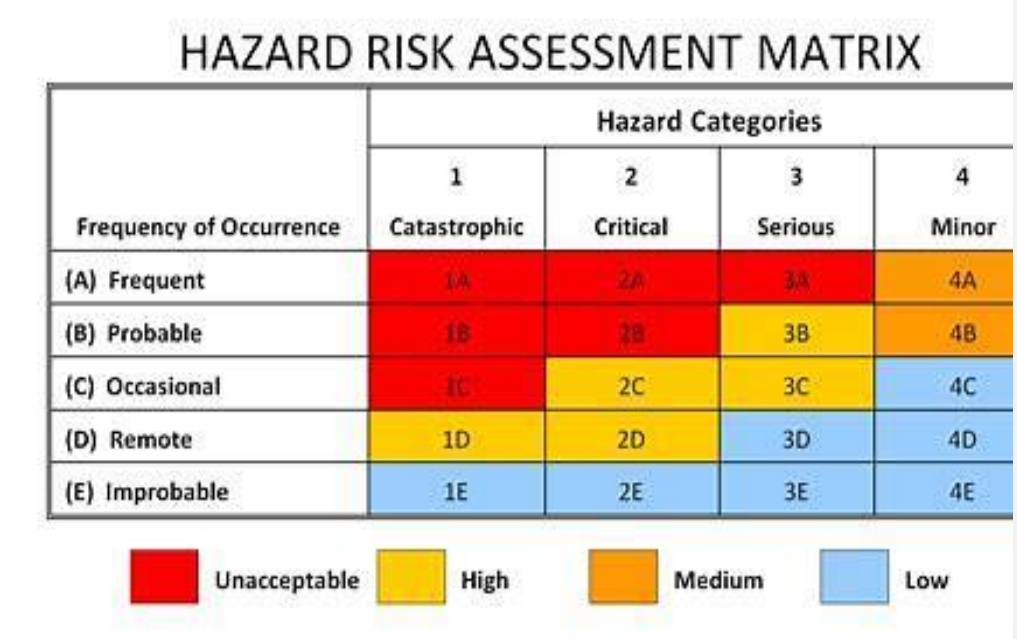
Ergonomics

Basic ergonomics assessment: Laboratory

1. Adjustable chair
2. Keyboard tray
3. Space to accommodate adjustable keyboard tray
4. Adjustable desk/workbench
5. Leg room and space for footrest directly under workbench

BaseLINE Program Outline (cont.)

Part 3. Safety Assessment in the Base



HAZARD RISK ASSESSMENT MATRIX

Frequency of Occurrence	Hazard Categories 1 Catastrophic	2 Critical	3 Serious	4 Minor
(A) Frequent	1A	2A	3A	4A
(B) Probable	1B	2B	3B	4B
(C) Occasional	1C	2C	3C	4C
(D) Remote	1D	2D	3D	4D
(E) Improbable	1E	2E	3E	4E

Unacceptable | High | Medium | Low

BaseLINE Building Safety Assessment

The Safety Assessment Checklist consists of a series of questions supplemented with a guidance document providing background information for each question.

The guidance document contains requirements and rationale from the NIH Design Requirements Manual (DRM), government regulations and consensus standards.

It also provides a clear explanation for the references used for the questions in the safety Checklist.

BaseLINE Building Safety Assessment (cont.)

Safety question and answer process: Example

Question: **Is the lab free of any open to structure ceiling spaces?**

Answer: **Usually not permitted. Open ceilings may be used in mechanical spaces without a finished ceiling – only if ducts, pipes and other dust collecting elements are minimized.**

BaseLINE Building Safety Assessment (cont.)

Answer (continued)

Open ceilings may be acceptable

-if the ceiling is concrete

-acoustics are not factor

-use and function of the laboratory is consistent with an open ceiling

Rationale: **Open ceilings- create harborage for bacteria, dust or other contamination. It makes it difficult to decontaminate and clean due to open piping, duct work and structural elements,**

BaseLINE Building Safety Assessment (cont.)

Categories of Building Safety Elements

A- Laboratory architectural finishes and functional requirements

B- Mechanical (airflow/pressurization requirements)

C- Hood requirements (BSCs and fume hoods)

D- Emergency fixtures and chemical storage

E- General safety and occupational health

F- Specific room types requirements

Building Safety Elements

A- Laboratory Architectural Finishes and Functional Requirements

- Is the space free of any sliding or pocket doors?
- Are the doors self-closing?
- Is the lab free of any open structure ceiling spaces (open to structure ceilings are not recommended)?
- Are lab finishes appropriate?
- Is the secondary biocontainment boundary appropriate?
- Is the lab free of any penetrations (pest management concerns?

Building Safety Elements (cont.)

B- Mechanical (Airflow/Pressurization) Requirements

Are minimum ACH requirements met?

Is room pressurization appropriate? Negative for labs, restrooms, janitors and break rooms/ kitchens/ cooking areas, and positive for office and corridors?

Is the ductwork for hazard resistant product? Made of stainless steel or coated with a corrosion resistant product?

Is directional airflow in compliance with risk assessment (from low hazard to high hazard areas)?

Building Safety Elements (cont.)

C- Hood Requirements - Biosafety Cabinets (BSC) and Fume Hoods

Are airflows into and around BSCs and fume hoods in compliance with regulatory requirements?

Do BSCs and fume hoods meet horizontal and vertical clearance requirements?

Are utilities connected to BSCs and fume hoods appropriate?

Are additional requirements specific to "ducted" BSCs (Type B1 or B2) achieved?

Building Safety Elements (cont.)

D- Emergency Fixtures and Chemical Storage

Is an emergency eyewash/shower accessible from all locations in each laboratory?

Do emergency eyewash and showers meet plumbing safety requirements (i.e. tempered, domestic water)?

Are flammable liquid storage cabinets and corrosive chemical storage cabinets appropriate (placement, type, size, venting)?

Are handwashing sinks located near exit doors?

Emergency Eyewash Detailed Questions

- Eyewash and eye/face wash controlled, low velocity flow rinses both eyes and is not injurious to user. Water flow is sufficiently high to allow user to hold eyes open while rinsing

- Plumbed eye/face wash delivers at least 3.0 gallons of water per minute at 30 pounds per square inch pressure for 15 minutes

- Water flow pattern is positioned between 33 and 53 inches from the surface on which the user stands and at least 6- inches from the wall or nearest obstruction

- Unit washes both eyes simultaneously and covers area indicated on test gauge at no more than 8 inches above spray heads

Building Safety Elements (cont.)

E- General Safety and Occupational Health

Are auxiliary valves for gas and vacuum lines located outside the laboratory?

Is a force of 5 pounds sufficient to move vertically or horizontally doors and sashes?

Are laboratory hoods provided with a means to contain small spills?

Does the storage of cylinders greater than 26 inches tall have a restraint system?

Building Safety Elements (cont.)

F- Specific Room Type Requirements

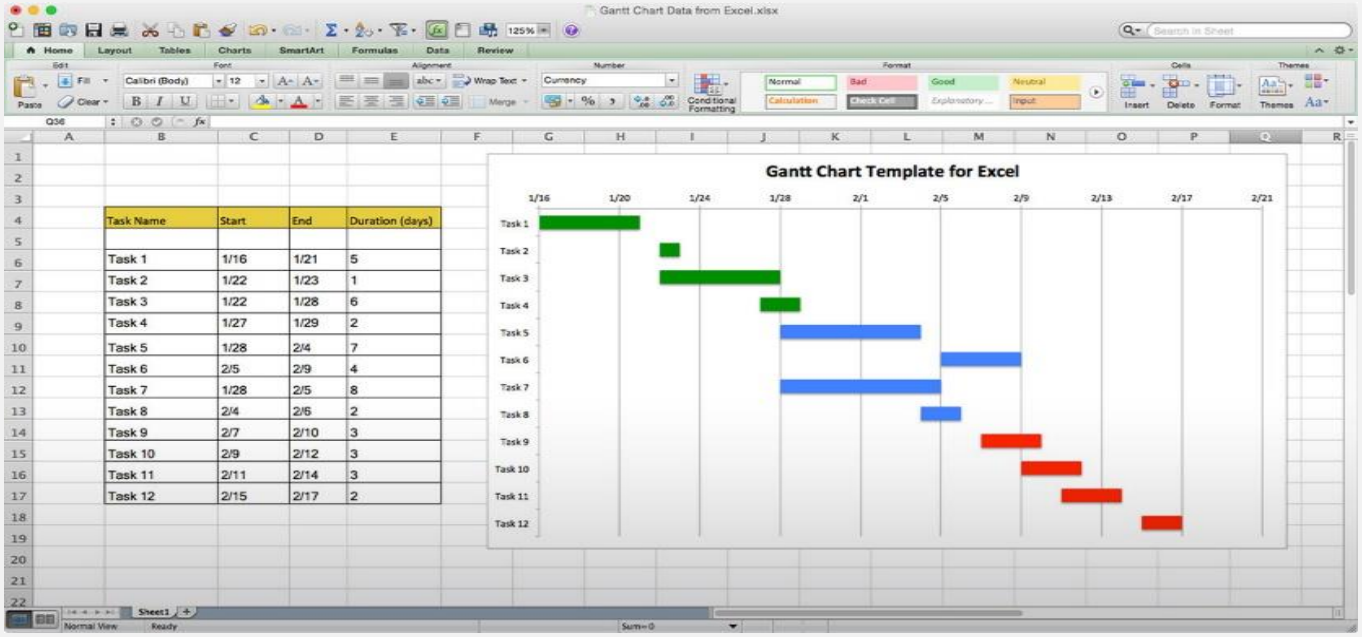
Chemical storage requirements: door sill berm and seal, flow alarms, high-flushing 30 gpm, hazardous material signage

Cold room door has an emergency release, proper seal?

Have proper administrative controls been implemented for offices within laboratories concerning food/drink and unescorted visitors?

BaseLINE Program Outline

Part 4. BaseLINE Timing



Task Name	Start	End	Duration (days)
Task 1	1/16	1/21	5
Task 2	1/22	1/23	1
Task 3	1/22	1/28	6
Task 4	1/27	1/29	2
Task 5	1/28	2/4	7
Task 6	2/5	2/9	4
Task 7	1/28	2/5	8
Task 8	2/4	2/6	2
Task 9	2/7	2/10	3
Task 10	2/9	2/12	3
Task 11	2/11	2/14	3
Task 12	2/15	2/17	2

When?

- **Assessment is dependent on time needed to evaluate the safety features with time to correct potential defects and open the facility on time**
- **Examples meeting NIH safety requirements:**
  - Safety showers and eyewashes – 1 to 2 months prior to occupancy – or post installation
  - BSC fume hoods – 1 to 2 months prior to occupancy
  - Minimum ACH – 1 to 2 months prior to occupancy
  - Air concentration compliance – 1 month prior to occupancy

When?

- **Final check when nearing project completion and prior to occupancy**
- **Safety performance assessment completed early to avoid occupancy delays**

Acknowledgements

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Email addresses:

Derek Newcomer: derek.newcomer@nih.gov

Roy Deitchman: roy.deitchman@nih.gov