SAND2013-4253P

Course:

Programming & Pre-design

Design Document

Sandia National Laboratories

International

BIOLOGICAL THREAT REDUCTION

BEP

CBEP

Cooperative Biological Engagement Program

Part I: Course Overview

Course Description

Overview

Programming and Pre-design is intended to offer an understanding of the activities that should be carried out prior to the commencement of the design process for a laboratory facility. It is intended for architects, designers and bio-safety professionals. Through guided discussion and interactive exercises, students will learn the basic concepts of; conducting user interviews, setting goals for the project, recording program information, diagramming important relationships, and establishing the facility criteria that will form the basis for the design and budget of a laboratory facility.

Scope

The goal of this course is to help students develop an understanding of; the types of discussions that should be conducted prior to commencement of design, who to involve in the process and the type of questions to ask and the types of documents and diagrams that should be developed in order to help ensure a successful design process.

Learning Level based on Bloom's taxonomy

- ✓ knowledge
- ✓ comprehension
- ✓ application
- synthesis
- evaluation

Length of Course

4 hours

Course Objectives

At the end of this Course, Students will be able to:

Organizational Objectives

- To better understand the programming and pre-design process as it applies to laboratory facilities.
- Understand critical information that must be gathered prior to the development of a laboratory facility design.
- Understand of how to assemble and synthesize pre-design information appropriate to the development of a laboratory facility.

Instructional Objectives

- To define programming and pre-design processes.
- To emphasize the importance of gathering information from a well rounded group of people before beginning design work.
- To illustrate the types of documents that should be developed during the programming & pre-design phase of a project.
- To communicate the importance of developing detailed design criteria for design and for budgeting.

Personal Objectives

Know

- The definitions of programming and pre-design.
- The range of 'stakeholders' that influence the programming process.
- Key questions to ask when programming for a laboratory.
- Important documents to produce for a building program.
- Important pre-design criteria to record prior to embarking upon the design process.

Feel

- Able to conduct stakeholder meetings to gather pertinent information for a laboratory design.
- Able to organize program information into diagrams, charts and lists that will help to inform a laboratory design.
- Able to organize pre-design criteria into drawings, diagrams and descriptions that will help to inform a laboratory design & budget.

Do

- Develop a list of stakeholders who will influence a laboratory design project.
- Develop and ask questions that help to gather stakeholder's input for a laboratory project.
- Develop diagrams that summarize key organizational principles for a laboratory project.

Key Messages

1. Programming is recording information about the needs, wants and aspirations of all parties involved in a construction or renovation project, balancing these with budget, codes and regulations.
2. Pre-Design is organizing criteria for design into diagrams, drawings and charts that will help to give shape to the project.
3. Programming requires input from a well rounded group of stakeholders including building users, safety officers, security personnel, administrators, O&M personnel, owners, regulatory authorities and members of the community.
4. A well developed program should include clearly stated goals for the project, a list of the types and numbers of occupants, charts showing how the people and departments are organized, a functional space program or space list, a list of applicable codes and regulations and a project budget.
5. Establishing detailed pre-design criteria results in more functional designs, saves time in the design process and allows for more accurate cost estimating.

Evaluation Strategy

Level 1 (satisfaction):	Students will complete a satisfaction survey about their experience with the course.
Level 2 (learning):	Students will complete a "learning contract" for the next steps needed to begin implementation of the programming and pre-design strategies learned.
Level 3 (behavior):	Desired behavior is for students to participate in additional learning opportunities related to laboratory design & pre-design – this behavior will be evaluated three to six months post-training and may encompass additional courses.
Level 4 (organizational change):	A repeat of the training needs assessment will be performed at least annually – this annual assessment can be compared to the baseline assessment to determine improvements in programming and pre-design competency.

Student Description (for Course design purposes)

Number of Students:

10 to 25; small groups of 5 people each

Management Role:

- ✓ Architects
- ✓ Designers
- ✓ Biorisk Management Advisors/Advocates
- ✓ Scientific/Lab Management

Audience Assumptions:

(assumed range is indicated by shaded cells)

		Novice		Practitioner		Expert
Education	Scientific /Design	1	2	3	4	5
	PPD	1	2	3	4	5
Expertise	Scientific /Design	1	2	3	4	5
	PPD	1	2	3	4	5
Competence	Scientific /Design	1	2	3	4	5
	PPD	1	2	3	4	5
PPD = "Programming and Pre-design". See definitions for terms in resources section						

Language of instruction; translation or interpretation anticipated:

English (for design purposes)

Prerequisites

Orientation to biorisk management

Pre- or post-work required for completion

None

Certificates or documents of completion:

Certificates of completion will be provided

Preparation for future coursework

None

Anticipated next steps

Students will participate in the Laboratory Design Best Practices, Laboratory Design Process, and Engineering Systems courses as well as other learning tracks, as defined by the local training needs assessment and other subject matter expert (SME) recommendations.

Instructional Environment

Number of Instructors/Staff required:	TBD depending on number of Students – optimal ratio is 1 Instructor per no more than 12 Students
Instructor Qualifications:	Instructors should be experienced laboratory architects or designers and must have completed the Global Biorisk Management Curriculum (GBRMC) orientation, including this course, and be enrolled in the GBRMC training network.

Learning Environment

Media:	Instructor-led course.
Exercises & Activities	
Experience (Activists)	Students will be asked to consider their experiences related to the interactive process of developing programming and pre-design documents, and/or participating in the operation of laboratory facilities.
Reflection (Reflectors)	Students will be asked to reflect on those experiences and the course information provided to develop means of gathering information and producing key programming and pre-design documents.
Models (Theorists)	Students will be introduced to the interactive process of programming and pre-design for a science and technology project, and apply this model to the development of a facility program.
Practice (Pragmatists)	Students will be given the opportunity to develop and ask questions utilized for information gathering, to analyze a functional space program and to develop diagrams that record the pre-design criteria required for the commencement of a laboratory design.

On-Site Specifics

Location	TBD
Room organization	Clusters of tables to facilitate small group (no more than 5 Students per group
Dress code and/or important cultural considerations	TBD

Instructional Materials

Equipment & Supplies	Large flip charts Markers (enough for up to 5 groups plus instructor(s)) 6 x 8 inch Post-it notes (no lines) Student binders (1" or less) and tabs Pens

Calculator (1 per group)
Tracing paper (1 large roll per group)
Laptop computer with powerpoint files loaded
Projector
Easels and large format paper (1 per group)
Name tags/lanyards or Tent Cards
Certificates
Notepads

Student Handouts

Course agenda and schedule
Student Guide
Glossary
CWA 15793

Resources

Dependencies

Authorities

References

CWA 15793
WHO Laboratory Biosafety Manual
Laboratory Biosecurity Handbook
Biosafety in Microbiological and Biomedical Laboratories
Guide for the Care and Use of Laboratory Animals
Whole building design guide (website)
Problem Seeking
Glossary of terms

Terms used in this document

- Knowledge – remembering the material in the same form as it was taught
- Comprehension – student's ability to understand the material by (for example) explaining or summarizing key messages
- Application – ability to use the material in a new or given situation
- Synthesis – ability to put together learning material in a new whole entirety. For example, using the material to create a new program or plan.
- Evaluation – ability to judge the value of the material presented as a peer (to be able to critically advise or judge others on their application and synthesis of this learning material).
- Novice – a person who is new to the circumstances, work, etc. in which s/he is placed; beginner
- Practitioner – a person engaged in the practice of a profession; a person who practices something specified
- Expert – a person who has special skill or knowledge in some particular field; specialist; authority; trained by practice
- Education – the act of acquiring particular knowledge or skills, as for a profession
- Expertise – the process of personally observing, encountering or

undergoing something; knowledge or practical wisdom gained from what one has observed, encountered, or undergone

- Competence – Possession of a suitable or sufficient skill, knowledge, experience, etc. for some specified purpose; properly qualified
- Stakeholders - all parties who have an interest in or will be affected by a project.

Part II: Course Outline/Schedule							
Day	**Segment time (min)**	**Time**	**Topic**	**Instructional Method**	**Slide #**	**KM #**	**T/F**
1	15 min	8:00	Welcome & Introductions	Introductions, review of action plan and key messages for course	1-4		
	5 min	8:15	Orientation to Biorisk Management Touchstone	Biorisk management briefly discussed as reminders of course intent	5-9		T
	10 min	8:20	What do we need to know before we design?	Students asked to share their thoughts on what needs to be known before embarking on a laboratory design, then Programming & Pre-Design are defined.	10-12	1,2	F
	10 min	8:30	Laboratory program types	Instructor to briefly define different laboratory types, ask students to reflect upon what might be unique requirements and risks of each.	13-14		T/F
	10 min	8:40	Stakeholders	Groups read exercise scenario and list all stakeholders.	15-16	3	F
	5 min	8:50	Stakeholders	Instructor will review lists and ensure all important stakeholders are noted on charts. Then groups pick the stakeholder they want to represent for the next exercise.	17	3	T

	15 min preparation 40 minutes mock meetings 10 minutes extra for setting up	8:55	Information gathering	Each group to develop a list of questions (as programmers) for another group as well as a list of concerns/needs of their own group, then carry out mock user meeting recording needs through lists/diagrams/key statements as necessary	18-22	3	F
	10 min	10:00	BREAK				
	5 minutes setup 15 min discussion	10:10	Organizing information	As a group summarize the information gathered in the programming meetings into needs, wants and aspirations	23-26	4	F
	5 min	10:30	Vision statement	Instructor to summarize aspirations in a vision statement or series of goals	27-28	4	T
	5 min	10:35	Programming Documents	Instructor to describe staffing assumptions, organizational charts, and functional space program	29-32	4	T
	15 min	10:40	Functional Space Program	Groups to analyze functional space program	33-36	4	F
	5 min	10:55	Balancing the Program	Instructor to briefly describe influence of budget, codes and regulations	37-39	4	T
	10 min	11:00	BREAK				
	5 min	11:10	Pre-Design Documents	Instructor to describe importance of drawing relationship diagrams & show example	40-42	5	T
	10 min	11:15	Primary relationships	Students individually develop diagrams representing critical relationships discussed during programming meetings	43	5	F
	20 min	11:25	Criteria for design	Instructor to present drawings that describe detailed pre-design information, gross up factors, describing the influence of these on design and budget	44-54	5	T
	15 min	11:45	Summary and wrap up	Instructor to summarize key messages	55-57		T
		12:00	End of class		58		
KM = key messages ; T/F = teaching versus facilitation (instructor-based versus student-based)							

Reference Materials for Further Study

A Design Guide for Energy Efficient Research Laboratories. Website. http://ateam.lbl.gov/Design-Guide/

ASHRAE Laboratory Design Guide. 2002. Ian B.D. McIntosh, Chad B. Dorgan, Charles E. Dorgan. American Society of Heating, Refrigerating and Air Conditioning Engineers.

Biosafety in Microbiological and Biomedical Laboratories (BMBL) 5th Edition, 2009. U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institutes of Health. Available online at: http://www.cdc.gov/biosafety/publications/bmbl5/

Building Type Basics for Research Laboratories. 2nd Edition, 2001. Daniel D. Watch, Stephen A. Kliment, Perkins & Will. John Wiley & Sons, Inc.

CWA 15793, CEN Workshop Agreement, Laboratory Biorisk Management. 2011. European Committee for Standardization. Available online at: ftp://ftp.cenorm.be/CEN/Sectors/TCandWorkshops/Workshops/CWA15793_September2011.pdf

Guide for the Care and Use of Laboratory Animals. 8th Edition, 2011. Institute for Laboratory Animal Research, National Research Council of the National Academies. The National Academies Press.

International Building Code. 2006 International Code Council. Available online at: http://publicecodes.cyberregs.com/icod/ibc/2006f2/index.htm

Laboratory Biosafety Manual. 3rd Edition, 2004. World Health Organization. Available in multiple languages online at: http://www.who.int/csr/resources/publications/biosafety/WHO_CDS_CSR_LYO_2004_11/en/

Laboratory Biosecurity Handbook. 2007. Reynolds Mathewson Salerno, Jennifer Marie Guadioso. CRC Press.

Laboratory Design Guide. 3rd Edition, 2005. Brian Griffin. Architectural Press, Elsevier.

NFPA 45: Standard on Fire Protection for Laboratories Using Chemicals. 2011. National Fire Protection Association. Available online at: http://www.nfpa.org/

Problem Seeking: An Architectural Programming Primer. 5th Edition, 2012. William M. Peña, Steven A. Parshall. John Wiley & Sons, Inc.

Whole Building Design Guide. Website. http://www.wbdg.org/