



CERTIFICATION STUDY GUIDE

**BUILDING ENERGY MODELING PROFESSIONAL
(BEMP)**



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CONTENTS

INTRODUCTION	7
How to Use This Study Guide.....	8
BEMP Exam Preparation Resources.....	11
SECTION 1.1: DOMAIN I, ESTABLISHING THE MODELING SCOPE; SUBDOMAINS A AND B	12
Overview.....	12
Quick Quiz, Domain I, Subdomains A and B.....	14
Self-assessment.....	15
SECTION 1.2: DOMAIN I, ESTABLISHING THE MODELING SCOPE; SUBDOMAINS C and D.....	17
Overview.....	17
Quick Quiz, Domain I, Subdomains C and D.....	18
Self-assessment.....	19
DOMAIN I: ESTABLISHING THE MODELING SCOPE PRACTICE EXAM QUESTIONS	21
SECTION 2.1: DOMAIN II, COMPONENTS OF BUILDING AND ENERGY SYSTEMS; SUBDOMAINS A and B	26
Overview.....	26
Quick Quiz, Domain II, Subdomains A and B.....	27
Self-assessment.....	28
SECTION 2.2: DOMAIN II, COMPONENTS OF BUILDING AND ENERGY SYSTEMS; SUBDOMAIN C.....	30
Overview.....	30
Quick Quiz, Domain II, Subdomain C.....	31
Self-assessment.....	32
SECTION 2.3: DOMAIN II, COMPONENTS OF BUILDING AND ENERGY SYSTEMS; SUBDOMAINS D and E	33
Overview.....	33
Quick Quiz, Domain II, Subdomains D and E.....	34
Self-assessment.....	35
SECTION 2.4: DOMAIN II, COMPONENTS OF BUILDING AND ENERGY SYSTEMS; SUBDOMAINS F and G	36
Overview.....	36
Quick Quiz, Domain II, Subdomains F and G.....	37
Self-assessment.....	38
SECTION 2.5: DOMAIN II, COMPONENTS OF BUILDING AND ENERGY SYSTEMS; SUBDOMAIN H.....	39
Overview.....	39



Quick Quiz, Domain II, Subdomain H	40
Self-assessment	41
DOMAIN II: COMPONENTS OF BUILDING AND ENERGY SYSTEMS PRACTICE EXAM QUESTIONS	43
SECTION 3.1: DOMAIN III, APPLICATIONS OF ENERGY MODELS FOR BUILDINGS; SUBDOMAINS A and B	55
Overview	55
Quick Quiz, Domain III, Subdomains A and B	56
Self-assessment	57
SECTION 3.2: DOMAIN III, APPLICATIONS OF ENERGY MODELS FOR BUILDINGS; SUBDOMAINS C and D	58
Overview	58
Quick Quiz, Domain III, Subdomains C and D	59
Self-assessment	60
DOMAIN III: APPLICATIONS OF ENERGY MODELS FOR BUILDINGS PRACTICE EXAM QUESTIONS	61
SECTION 4.1: DOMAIN IV, INTERPRETATIONS OF ENERGY MODEL RESULTS; SUBDOMAINS A AND B	68
Overview	68
Quick Quiz, Domain IV, Subdomains A and B	69
Self-assessment	70
SECTION 4.2: DOMAIN IV, INTERPRETATIONS OF ENERGY MODEL RESULTS; SUBDOMAINS C, D, and E	72
Overview	72
Quick Quiz, Domain IV, Subdomains C, D, and E	73
Self-assessment	74
DOMAIN IV: INTERPRETATIONS OF ENERGY MODEL RESULTS PRACTICE EXAM QUESTIONS	76
MY BEMP CERTIFICATION EXAM STUDY MAP	84
Task Notes	84
Study Plan	92
PRACTICE EXAM QUESTIONS: ANSWER KEY	93
Domain I: Establishing the Modeling Scope	93
Domain II: Components of Building and Energy Systems	94
Domain III: Applications of Energy Models for Buildings	98
Domain IV: Interpretations of Energy Model Results	100
APPENDIX	102
Common Energy Modeling Formulas	102
GLOSSARY	113



INTRODUCTION

ASHRAE is an international membership society committed to the advancement of the arts and sciences of heating, ventilation, **air-conditioning**, and refrigeration to serve humanity and promote a sustainable world. The Building Energy Modeling Professional (BEMP) certification program supports this mission by validating job competency as understood in internationally recognized technical information, reflecting the best practices that lead our industry.

PURPOSE OF THE BEMP CERTIFICATION

The BEMP certification program validates competency of the building energy modeling professional to do the following:

Model new and existing buildings and systems with the full range of physics; and evaluate, select, use, calibrate and interpret the results of energy modeling software where applied to building and systems energy performance and economics.

This Study Guide provides a framework and tools to help you self-assess your knowledge in building energy modeling and create a customized, self-paced study plan for the BEMP exam. ASHRAE offers numerous resources in the field. The Study Guide will help you target which resources are most beneficial based on your own professional development needs.

In this Study Guide, you, the candidate, are expected to evaluate your personal skills and qualifications against numerous Tasks broken down into individual Domains.

Depending on your experience level, some of these Tasks may be daunting and unfamiliar. If that is the case, consider it an opportunity for growth and devote extra attention to these matters. David Underwood, P. Eng., 2015-2016 ASHRAE President, once said that “we in the engineering community are in the solutions industry.” Based on this statement, it is your job to identify problems and produce solutions. The Tasks included in Domains 1-4 represent the knowledge, skills, and abilities necessary to model new and existing buildings and systems, and produce solutions for optimal building and systems energy performance, and this Study Guide represents your opportunity to fill gaps in your knowledge or experience base.

Using navigation buttons at top of screen: The buttons located at the top of each page allow you to navigate through this document. Click on these buttons to take you Back to view the last page you were on or to the First Page, Previous Page, Next Page, or Last Page. The Glossary button provides a direct link to the full glossary.



More information about the BEMP credential and eligibility criteria can be found on the [ASHRAE website](#) and in the [BEMP Candidate Guidebook](#).



THE OVERARCHING GOALS OF THE STUDY GUIDE ARE TO:

- Provide a framework and tools for customized, self-paced exam preparation
- Focus your review on key elements of recommended exam preparation resources
- Review knowledge needed to model new and existing buildings and systems
- Build knowledge and skills across the four (4) Domains of the BEMP exam, which are:

I Domain I: Establishing the Modeling Scope

II Domain II: Components of Building and Energy Systems

III Domain III: Applications of Energy Models for Buildings

IV Domain IV: Interpretations of Energy Model Results

- Identify key terms and concepts used by building energy modeling professionals
- Provide the opportunity for you to test your acumen and readiness for the BEMP exam
- Help you assess your own individual core content strengths and weaknesses, and build a study map customized for your needs

How to Use This Study Guide

This Study Guide is designed as a workbook that contains tools you can use to assess what you need to focus on as you prepare to take the exam.

The Study Guide is organized by Domains, Subdomains, and Tasks. There are four Domains total, all of which have numerous Subdomains and Tasks, so we've broken them down into segments. The BEMP certification exam was developed to assess your competence to perform each of these Tasks as organized under each Domain, so this is a great way to organize your study leading up to the exam and to also build and validate your knowledge, skills, and abilities as a building energy modeling professional.

ASHRAE offers numerous resources to help you study for the BEMP certification exam; however, which resources do you need to review to prepare for the exam? The tools in this Study Guide link the Domains and Tasks with the resources available from ASHRAE to help you review and study the content. The tools will also help you determine which Tasks you need to focus on. So, for example, if through the Self-assessment and Quick Quiz contained herein you discover that you have limited knowledge of Domain 1: Establishing the Modeling Scope, Task I.B.2: "Evaluate mathematical modeling methods for building components," the Study Guide will direct you to the 2021 *Fundamentals Handbook, Ch. 19, Section 1.1*.

ASHRAE [Resources](#) are listed in this [Study Guide](#) and are available in the [ASHRAE Bookstore](#)



Study Tools

In this Study Guide you will find the following tools for each Domain that will help you assess what you already know, and importantly, what you don't know, step by step:

- Quick Quiz
- Self-assessment, including the Task-by-Task Resource Guide, which will direct you to resources you can use to study, including deep-dive resources in some instances you can use to delve deeper into that topic
- Practice Exam Questions
- Study Map

Used together, the tools in the Study Guide and ASHRAE's resources will help you create a targeted, customized study plan based on your own needs. You will note that we have broken some Domains into multiple sections to help you pace yourself through the material.

You will start each section by taking a Quick Quiz, which will help you test your knowledge of key terms and concepts for that section. Next, you will complete a Self-assessment to capture the areas you need to focus on as you study for your certification exam. These tools will help you assess your knowledge and organize your study of the content.

You'll find instructions for how to use each tool throughout this Study Guide, but here's an overview:

Using the Study Guide and ASHRAE Resources Together

We recommend using the study tools for each Domain to guide your course of study and help you prepare for the BEMP exam:

STEP 1

Read the Overview and take the Quick Quiz and Self-assessment for each section of the Study Guide, starting with Domain I, Subdomains A and B.

STEP 2

Review the ASHRAE Resources for each Task as outlined in the Task-by-Task Resource Guide included in the Self-assessment, focusing your initial review on Tasks you marked as "somewhat" or "not very" confident. Record notes about the topics you need to spend time studying.

STEP 3

When you have completed your first full review of all four domains and the study tools for each one, return to the Study Guide to complete your [Study Map](#). This final study tool will help you map out your course of study leading up to the certification exam.



Practice Exam Questions

The Study Guide also includes Practice Exam Questions, organized by Domain. You can use these in several ways:

- As a pre-test to check your baseline knowledge
- As a post-test after completing your review to see how you might do on the exam
- As a study and practice tool leading up to the exam, to help check your progress

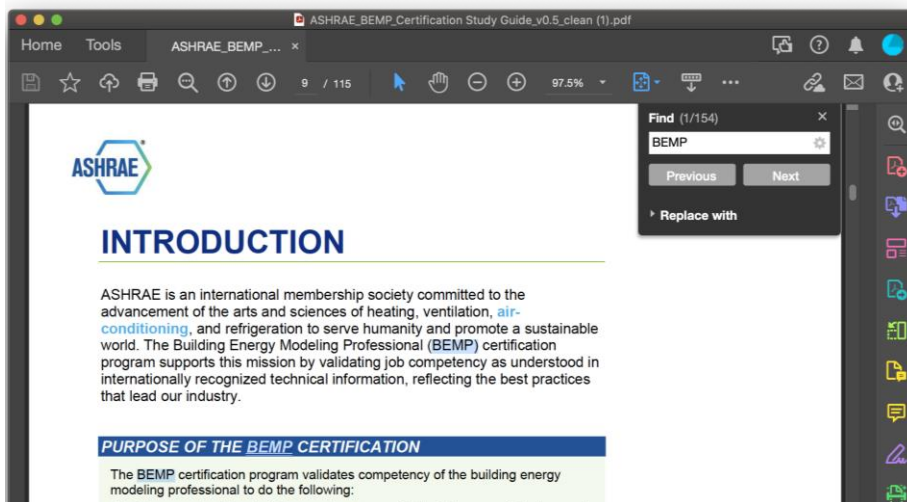
The answer key in the back of the Study Guide includes feedback with the Domain and Task number to help you go back and revisit the content as needed. Remember, you can find the right resource for each Task in the Self-assessments, which include a Task-by-Task guide to the ASHRAE Resources.

Glossary and Search

Glossary terms are defined within the text. Click any **bolded, blue term** to see its definition. You can also access all of the terms at any time by navigating to the glossary by clicking this button.



At any time you can search the Study Guide to find terms or concepts you want to study or review by clicking here.



Evaluation

We want to hear from you! Please click this [link](#) to complete an evaluation of this Study Guide when you have completed it.



BEMP Exam Preparation Resources

BEMP RESOURCES

ASHRAE publications available to help you prepare for the BEMP examination may be purchased in the ASHRAE Bookstore: <https://www.techstreet.com/ashrae/index.html>.

Publications

Standards

- ANSI/ASHRAE Standard 55-2020 - Thermal Environmental Conditions for Human Occupancy
- ANSI/ASHRAE Standard 62.1-2019 - Ventilation for Acceptable Indoor Air Quality
- Standard 90.1- 2019 (SI) - Energy Standard for Buildings except Low-Rise Residential Buildings (ANSI Approved; IESNA Co-Sponsored)
- Standard 90.1- 2019 (I-P) - Energy Standard for Buildings except Low-Rise Residential Buildings (ANSI Approved; IESNA Co-Sponsored)
- User's Manual for ANSI/ASHRAE/IESNA Standard 90.1-2019
- ANSI/ASHRAE/IESNA Standard 100-2018 - Energy Conservation in Existing Buildings
- ANSI/ASHRAE Standard 140-2020 - Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs
- Standard 189.1-2020 - Standard for the Design of High-Performance Green Buildings (ANSI Approved; USGBC and IES Co-sponsored)
- ASHRAE Standard 209-2018 - Energy Simulation Aided Design for Buildings except Low-Rise Residential Buildings
- ASHRAE Standard 211-2018 – Standard for Commercial Building Energy Audits

Handbooks

- 2021 ASHRAE Handbook—Fundamentals
- 2020 ASHRAE Handbook—HVAC Systems & Equipment
- 2019 ASHRAE Handbook—HVAC Applications

Guidelines

- ASHRAE Guideline 14-2014 - Measurement of Energy and Demand Savings
- ASHRAE Guideline 36-2021 - High-Performance Sequences of Operation for HVAC Systems

ASHRAE Learning Institute (ALI) and eLearning Center Courses

- The ASHRAE Learning Institute (ALI, <https://www.ashrae.org/professional-development>) and ASHRAE eLearning On Demand (<https://www.ashrae.org/professional-development/elearning-on-demand>) offer a wide range of archived online courses (<https://www.techstreet.com/ashrae/subgroups/48292>), professional development seminars, and short courses on ASHRAE Standards and Guidelines. ASHRAE also offers training for companies or chapters.
- BEMP Practice Exam <https://store.lxr.com/product.aspx?id=1318>

Resources from Other Organizations

- Heat and Mass Transfer in Building Services Design
- IESNA Lighting Handbook
- Mechanical and Electrical Equipment for Buildings
- Solar Radiation and Daylight Models

SECTION 1.1: DOMAIN I, ESTABLISHING THE MODELING SCOPE; SUBDOMAINS A AND B

Overview

In Domain I, you will review the Subdomains and Tasks related to establishing an energy model and defining its objectives. At this stage, your collaboration with the ownership and design team begins with a focus on establishing goals and methodology for the modeling study.

The Tasks outlined in Domain I, Subdomains A and B are where you exercise your analytical skills. Competency in these skills is what distinguishes the experienced energy modeler.

Subdomains A and B will test your ability to define goals and objectives for the modeling study, and to identify the best modeling and analysis methodology aligned with the design intent of the building project and required deliverables.

This section also focuses on simplifying the energy model without compromising the energy modeling objectives, while addressing any deficiencies that could occur due to these simplifications. It tests your knowledge and skill in identifying techniques that can be used to manage time by importing architectural **building information models (BIMs)** directly into the energy modeling software.

How these concepts might apply day to day

Let's assume you are invited to join a project team for a 5-story office building as a building energy modeling (BEM) consultant and that the project is in the conceptual phase; you should be able to answer the following questions:

- Which energy modeling **approach** should be pursued? Simple-box or detailed?
- What are the project energy goals and **owner's project requirements (OPR)**?
- To what extent can the model be simplified without compromising the energy modeling objectives and results?
- Which building elements will have the greatest impact on the targeted energy goals?

By reviewing and understanding the OPR, you can identify those building elements that have the greatest impact on the building energy goals and should be the focus of the conceptual energy analysis.