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DIVISION 5: PROJECT DEVELOPMENT & DOCUMENTATION

DIVISION 6: CONSTRUCTION & EVALUATION

CODES AND STANDARDS USED IN THIS BOOK

ACI 318: *Building Code Requirements for Structural Concrete*, 2014. American Concrete Institute, Farmington Hills, MI.

ADA Standards: *2010 Americans with Disabilities Act (ADA) Standards for Accessible Design*, U.S. Department of Justice, Washington, DC.

AIA: Contract Documents, 2007. American Institute of Architects, Washington, DC.

AISC: *Steel Construction Manual*, 14th ed, 2011. American Institute of Steel Construction, Chicago, IL.

ANSI/ASHRAE 62.1: *Ventilation for Acceptable Indoor Air Quality*, 2016. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Atlanta, GA.

ANSI/ASHRAE 62.2: *Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings*, 2016. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Atlanta, GA.

ANSI/ASHRAE/IESNA 90.1: *Energy Standard for Buildings Except Low-Rise Residential Buildings*, 2013. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Atlanta, GA.

ANSI/BOMA Z65.1: *Office Buildings: Standard Methods of Measurement*, 2010. Building Owners and Managers Association, Washington, DC.

ASCE/SEI7: *Minimum Design Loads for Buildings and Other Structures*, 2010. American Society of Civil Engineers, Reston, VA.

CSI: MasterFormat, 2016. Construction Specifications Institute, Alexandria, VA.

CSI: SectionFormat, 2009. Construction Specifications Institute, Alexandria, VA.

IBC: *International Building Code*, 2015. International Code Council, Washington, DC.

ICC/ANSI A117.1: *Accessible and Usable Buildings and Facilities*, 2009. International Code Council. Washington, DC.

IECC: *International Energy Conservation Code*, 2015. International Code Council, Washington, DC.

IgCC: *International Green Construction Code*, 2015. International Code Council, Washington, DC.

IMC: *International Mechanical Code*, 2015. International Code Council, Washington, DC.

IPC: *International Plumbing Code*, 2015. International Code Council, Washington, DC.

IRC: *International Residential Code*, 2015. International Code Council, Washington, DC.

LEED: Leadership in Energy and Environmental Design (LEED) 2013 Green Building Rating System for New Construction. U.S. Green Building Council, Washington, DC.

NDS: *National Design Specification (NDS) for Wood Construction*, 15th ed., 2015. American Wood Council, Leesburg, VA.

NEC (NFPA 70): *National Electrical Code*, 2014. National Fire Protection Association, Quincy, MA.

NFPA 101: *Life Safety Code*, 2015. National Fire Protection Association, Quincy, MA.

The Secretary of the Interior's *Standards for Rehabilitation*, 2010. *Code of Federal Regulations*, Title 36, Part 67.

11. JLT Architects is developing a project schedule for Mountain College's review. Some of the information that should be included in this schedule remains incomplete in the draft shown.

anticipated schedule

month	task
month 1 (*weeks 1–4*)	initial client meetings and confirm programmatic requirements
month 2 (*weeks 5–8*)	schematic design phase
month 3 (*weeks 9–12*)	↓
month 4 (*weeks 13–16*)	design development phase
month 5 (*weeks 17–20*)	↓
month 6 (*weeks 21–24*)	construction documents phase
month 7 (*weeks 25–28*)	↓
month 8 (*weeks 29–32*)	↓
month 9 (*weeks 33–36*)	↓
month 10 (*weeks 37–40*)	bidding and notification of award
month 11 (*weeks 41–44*)	↓
month 12 (*weeks 45–48*)	
months 13–29	construction period (16 months)
month 30	

Using the information given in the RFP, which of the following statements are true? (Choose the three that apply.)

(A) Commissioning of the mechanical and electrical systems must be complete before a certificate of substantial completion is issued.

(B) Contractors must begin work on the site within one week of notification of award.

(C) JLT's schedule should include time for code review and approval before the documents are released for bid.

(D) The schematic design phase is expected to comprise more than than 25% of the total time allotted for design.

(E) The bidding period will be one month.

(F) The architecture firm plans to complete the design development phase in three months.

12. Considering the information given in the case study about JLT Architects' employees and capabilities and the responsibilities outlined in the RFP, which of the following services must be provided by consultants to the architecture firm? (Choose the four that apply.)

(A) geotechnical engineering

(B) landscape architecture

(C) security consulting

(D) commissioning

(E) lighting design

(F) mechanical engineering

13. The mechanical engineer is reviewing the contract proposed by the architecture firm and has a question about the term "prime agreement." To which of the following American Institute of Architects (AIA) documents does the term "prime agreement" refer?

(A) AIA Document C401, *Standard Form of Agreement Between Architect and Consultant*

(B) AIA Document C422, *Service Order for use with Master Agreement Between Architect and Consultant*

(C) AIA Document A101, *Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum*

(D) AIA Document B101, *Standard Form of Agreement Between Owner and Architect*

14. Which of the following are examples of scope creep? (Choose the three that apply.)

(A) revising the interior finish selections because the original choices do not meet the life expectancy requirement

(B) developing an additional scheme for the preschool rooms because this year's class is exceptionally large

(C) revising the interior finish selections because one of the teachers does not like the colors that were chosen

(D) changing the custom cabinetry specification so that prefabricated cabinets may be used instead to minimize installation time and accommodate the contractor's schedule

(E) reviewing structural steel shop drawings

(F) developing the hardware schedule

Upon receipt of the consultant's notification, the architect can discuss the issue with the owner and determine how the owner wishes to proceed. The owner may choose to hire an independent consultant or may request that the design team perform these services. The architect would then determine which of the consultants would most appropriately be assigned this task and issue an amendment to that contract authorizing the additional work.

The answer is (A).

10. A Gantt chart is a bar chart that graphically illustrates a project schedule. This scheduling tool ties activities to their beginning and completion dates, and it can be used to project how long each required activity will take to achieve.

The answer is (B).

11. The RFP states that the college allows contractors one month between the notification of award and the start of construction for mobilization. This information has not yet been incorporated into the schedule, but this should take place in month 12. The commissioning of the mechanical and electrical systems must be completed before the building is opened to the public.

The draft schedule does not currently include time for code review and approval before the documents are released, which is necessary to protect the firm from liability.

The schematic design phase should comprise more than 25% of the total time allotted for design.

The bidding period will be more than one month, and the construction documents phase will be more than three months.

The answer is (A), (C), and (D).

12. The RFP provides the design firms with general information about the owner's requirements and how the project will be structured, including which responsibilities the architecture firm will assume and which tasks will be managed by the owner.

The security equipment specified for this project must be compatible with the security systems used at other campus facilities. The RFP states that security system design services will be provided under the college's existing open-end contract with SafetySecurity Corporation, so it is not necessary for the firm to provide security consulting services. The RFP also states that the owner will provide commissioning services.

American Institute of Architects (AIA) Document B101, *Standard Form of Agreement Between Owner and Architect*, Subparagraph 5.5, states that the owner will provide geotechnical services. In this case, however, the RFP assigns this responsibility to the architect. The project description calls for an outdoor play area landscaped with non-toxic plant materials. None of the firm's employees have the skills necessary to select appropriate play area materials, so a consulting landscape architect should be hired. The architecture firm will also need to hire consultants to provide lighting design and mechanical engineering services.

The answer is (A), (B), (E), and (F).

13. The AIA offers standard forms and documents that may be used in drafting contracts, service orders, etc. A consultant's contract with the architect references the prime agreement to ensure that the consultant's responsibilities to the architect align with the architect's responsibilities to the owner.

The prime agreement is the contract between the owner and the architect. In this case, the prime agreement is AIA Document B101. If another type of agreement is used, the architect should ensure that both the owner-architect and architect-consultant agreements include similar language to ensure that the rights and responsibilities defined in the two contracts are aligned.

The answer is (D).

14. The revision of the finish specifications so that the selected products meet the life expectancy requirements is not an example of scope creep. The original project scope requires that the finishes be designed to last at least seven years, so the architect is obligated to make this change to fulfill the contract requirements. Reviewing structural steel shop drawings and preparing hardware schedules are also part of basic design services.

Scope creep occurs when tasks not originally included in the project scope are added into the project, typically without additional compensation or additional time allowed for the designer. These requests may seem small individually, but when many pile up, they can be the difference between meeting the project's budget and schedule and losing money on the job. As the scope expands, it requires the architect to assume responsibility and accept liability for the extra services that are provided.

Scope creep can be the fault of either the owner or the designer. Sometimes it can be attributed to a lack of understanding of the project scope, which is why it is important for all members of the team to be familiar with the contract requirements and frequently check that the tasks being performed are in agreement with this description.

It is the architect's responsibility to understand the agreed upon scope of work and to recognize when requests fall outside of the original parameters. The architect may take on these additional tasks but should notify the owner that this work is an additional service. The owner and architect

27 Moisture Protection and Thermal Insulation

1. Many problems associated with exterior insulation and finish systems (EIFS) can be solved using which of the following design techniques?

(A) Design the wall using the rain screen principle.

(B) Use expansion joints at a maximum spacing of 10 ft 0 in.

(C) Increase the thickness of the finish coat.

(D) Provide extra flashing at window and door joints.

2. Which of the following materials provides the highest insulation value (R-value)?

(A) expanded perlite

(B) expanded polystyrene

(C) fiberglass

(D) polyisocyanurate

3. Heat loss in a building can be minimized by selecting wall materials with high

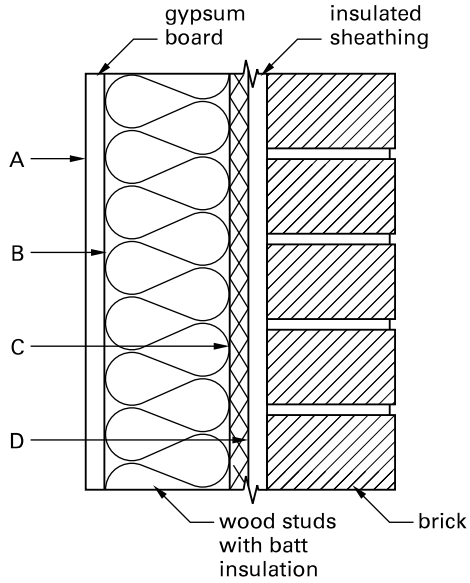
(A) conductance

(B) enthalpy

(C) permeability

(D) resistance

4. The sketch shown is of a wall in a cold climate. Where should the vapor barrier be located?



5. The greatest degree of protection from cold winter winds can be achieved with

(A) airlocks

(B) earth sheltering

(C) green roofs

(D) landscaping

Solutions

1. A standard EIFS is designed as a barrier against moisture. The level of moisture prevention depends on the finish and the proper construction of joints and details. An EIFS can experience problems if water leaks behind the finish and insulation and becomes trapped, damaging framing and other building components. Some proprietary systems are available that incorporate the rain screen principle by using a mesh or some other means of allowing pressure to equalize outside and inside of the system. Any water that does leak through is drained to the outside through weep holes.

The other common problem with a standard polymer-based (PB) EIFS is puncturing or denting. This can be addressed by using a polymer-modified system (PM) or by using a high-impact PB system with fiberglass mesh and an extra layer of base coat.

The answer is (A).

2. Polyisocyanurate has the highest R-value. For a 1 in thickness, its R-value ranges from 6.25 ft^2-hr-°F/Btu to 7.20 ft^2-hr-°F/Btu. Polystyrene has the next highest value, at 5.00 ft^2-hr-°F/Btu.

The answer is (D).

3. Resistance is the number of hours needed for 1 Btu to pass through 1 ft^2 of a material of a given thickness when the temperature differential is 1°F. A higher resistance means that heat takes longer to pass through, and thus the material has greater insulation value.

Conductance is the reciprocal of resistance and is the rate of heat loss measured in Btu/hr through 1 ft^2 of a material of a given thickness when the temperature differential is 1°F. Enthalpy is the total heat in a substance, including latent heat and sensible heat. Permeability is the property of a porous material that permits the passage of water vapor through it.

The answer is (D).

4. Vapor barriers always should be located on the warm side of insulation (area B) to prevent moisture from condensing when it cools and reaches the dew point. Moisture penetrating the insulation can reduce the insulation's effectiveness and damage other materials.

The answer is (B).

5. Earth sheltering would offer the greatest degree of protection from cold winter winds. Airlocks only protect door openings. Green roofs are primarily used to protect against solar radiation and to reduce runoff. Landscaping can reduce the negative effects of wind, but not as well as solid earth.

The answer is (B).