NCARB

# ARE 4.0 EXAM GUIDE

## Programming, Planning & Practice



*This document,* ***effective July 2011*** *supersedes all previous editions of the* ARE 4.0 Exam Guide: Programming, Planning & Practice Division. *Please check NCARB's web site, www.ncarb.org, regularly for updates to the* ARE 4.0 Exam Guides *and for the most current information regarding the ARE.*

# Programming, Planning & Practice



## OVERVIEW

### DIVISION STATEMENT

Apply project development knowledge and skills to architectural programming; environmental, social, and economic issues; building codes and regulations; project and practice management.

### Content Areas

1. **PROGRAMMING & ANALYSIS**
   (24-30 percent of scored items)
2. **ENVIRONMENTAL SOCIAL & ECONOMIC ISSUES**
   (23-29 percent of scored items)
3. **CODES & REGULATIONS**
   (10-13 percent of scored items)
4. **PROJECT & PRACTICE MANAGEMENT**
   (33-39 percent of scored items)

### Vignette

**SITE ZONING**

Delineate areas suitable for the construction of buildings and other site improvements responding to regulatory restrictions and programmatic requirements. Define a site profile and maximum buildable envelope based on zoning regulations and environmental constraints.

# Programming, Planning & Practice





## KNOWLEDGE / SKILLS

The division has been broken down into a listing of knowledge and skills for each major content area.

### 1. PROGRAMMING & ANALYSIS

(24-30 percent of scored items)

**A.** Determine client needs and requirements to develop a project plan and program. Content areas include design objectives, site characteristics, spatial and functional relationships, and building systems considerations. Based on client needs and professional knowledge establish a preliminary project scope, phasing, budget, and schedule.

1. **Architectural Programming**
   Assess client needs using meetings, surveys, and interviews to determine functional relationships, adjacencies, flexibility, and phasing requirements. Review this information and ascertain an overall scope, budget, and project.

2. **Interpreting Existing Site/Environmental Conditions and Data**
   Determine existing site/environmental conditions by compiling data from geotechnical investigations, site surveys, rights-of-ways, roadways, topographic features, utilities, easements, covenants, encroachments, existing buildings, wetlands, archaeological sites, property descriptions and other features as required for a complete site analysis. Analyze the information provided and visit site to ascertain suitability and establish site design and master planning objectives.

3. **Adaptive Reuse of Buildings and/or Materials**
   Determine whether an existing building should remain, receive an addition, or be remodeled by reviewing existing plans (if available) and performing field documentation as required by the project program. Assess field information and documentation against the program to determine the potential for adaptive reuse, the suitability of existing features and systems, the condition and integrity of the structure, the value of finishes and systems, and any potential code concerns.

4. **Space Planning and Facility Planning/Management**
   Review the architectural program, site, and existing buildings (if any) and develop recommendations for facility planning and management. Recommendations should include at least spatial and functional relationships, phasing and staging, and building system consideration.

5. **Fixtures, Furniture, Equipment, and Finishes**
   Ascertain and document the client's special needs regarding fixtures, furniture, equipment, special systems, and finishes considering impact on space requirements, functional relationships, acoustics, building volume, budget, scheduling, utility requirements, and other programming issues.

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## KNOWLEDGE / SKILLS

### 2. ENVIRONMENTAL SOCIAL & ECONOMIC ISSUES

(23-29 percent of scored items)

**A.** Obtain and review site and building surveys, assess physical, environmental, social, and economic issues on project, and develop design concepts. Design concepts should draw upon basic design principles and historic precedent while responding to sustainable principles and new material technologies.

1. **Regional Impact on Project**
   Determine the impact of regional climactic, ecological, geotechnical conditions, transportation systems, economics, public facilities, governmental services, pollution (light, air, and noise), and issues related to the project's conceptualization and delivery.

2. **Community-Based Awareness**
   Determine and consider local demographics, values and traditions, future objectives, community fabric, future growth pressures and other social issues that affect the proposed project.

3. **Hazardous Conditions and Materials**
   Assess the existing condition of the site and evaluate the potential impact for hazardous materials by reviewing hazardous materials surveys and remediation/mediation recommendations. Consider the potential impact of hazardous materials on the program, scope, and budget of the project. Determine the suitability of the existing site and structures for development, additions, remodeling, or reuse, based on hazardous material issues.

4. **Design Principles**
   Apply concepts such as form, scale, color, texture, lighting, universal design, spatial organization, and acoustics as well as theories of social interaction, human behavior and visual perception to achieve programmatic design goals.

5. **Alternative Energy Systems, New Technologies, and Sustainable Design**
   Incorporate concepts of sustainability and alternative energy systems to minimize the environmental impact of the project. Assess the impact of these concepts on the program, budget, project schedule, and subsequent service phases.

6. **Architectural History and Theory**
   Assess local or regional historic context through precedents of building types, preservation, stylistic forms, scale, settlement patterns, materials, and other historical issues to determine the effect on proposed project.

### 3. CODES & REGULATIONS

(10-13 percent of scored items)

**A.** Manage the regulatory approval process by identifying, analyzing, and incorporating building codes, specialty codes, zoning, and other regulatory requirements.

1. **Government and Regulatory Requirements and Permit Processes**
   Identify regional and local planning issues, design reviews, zoning, building codes, and local ordinances that affect the proposed project. Using these constraints determine the conditions, restraints, and approval processes that impact the project program, schedule, and schematic design.

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## KNOWLEDGE / SKILLS

2. **Adaptive Reuse of Buildings and/or Materials**
   Identify the codes, restoration standards, and regulations that apply to the project program and schematic design when reusing buildings or materials.

3. **Specialty Codes and Regulations including Accessibility Laws, Codes and Guidelines**
   Assess the impact of codes and regulations such as the Americans with Disabilities Act, seismic codes, life-safety codes, Fair Housing Act, etc. on the project program and schematic design.

### 4. PROJECT & PRACTICE MANAGEMENT

(33-39 percent of scored items)

**A.** Develop scope of services and project delivery method by assessing project budget and financing, identifying project team members including consultants, managing project schedule and design process, assisting with construction procurement, and managing legal issues relating to practice including fees, insurance, and professional services contracts.

1. **Project Delivery Methods**
   Determine effective project delivery method by exploring qualification-based selections, partnering, multiple primes, and other arrangements to assemble the appropriate project team (architects, engineers, specialty consultants, etc.).

2. **Project Budget Management**
   Manage the project budget based on program requirements by applying principles of life-cycle costing, value engineering, and other budgetary considerations that affect the project.

3. **Project Schedule Management**
   Manage the design team's ability to execute the project by developing a schedule that accounts for staffing requirements, consultant capabilities, etc.

4. **Contracts for Professional Services and Contract Negotiation**
   Determine, negotiate, execute and manage the appropriate professional services agreements, as well as all interdisciplinary agreements.

5. **Construction Procurement Processes**
   Evaluate the affects of applying various procurement processes (e.g. design/bid, design/build, negotiated) to the project and their impact on the program, budget, and schedule.

6. **Risk Management and Legal Issues Pertaining to Practice and Contracts**
   Manage potential risk and legal issues pertaining to practice and contracts. Analyze professional and general liability and establish appropriate risk management procedures such as quality control, client selection, insurance, conflict resolution, staff training, etc.

# Programming, Planning & Practice



## SAMPLE MULTIPLE-CHOICE QUESTIONS

Go to page 10 for answers

**1.** After the contract for construction has been awarded, the contractor shall next prepare which of the following for the architect's review?

- ☐ A request for payment
- ☐ A list of materials
- ☐ A schedule of construction
- ☐ A lien release

**2.** According to AIA Document C141-1997 [NPP 9], the consultant's services should be performed in a coordinated sequence with the

- ☐ owner
- ☐ contractor
- ☐ architect
- ☐ construction manager

**3.** Which of the following consultant engineers typically consumes the greatest percentage of project fees on school projects?

- ☐ Civil
- ☐ Electrical
- ☐ Mechanical
- ☐ Structural

**4.** According to the U.S. Environmental Protection Agency, which of the following is true about lead-based paints in an existing building that is being renovated as housing for the elderly?

- ☐ The lead content concern is less for buildings constructed after 1960.
- ☐ Occupant health risks are less of a concern if no children will be living in the facility.
- ☐ The lead paint must be completely removed in areas being renovated.
- ☐ Contractor health risks are a concern only if the lead paint is sawed, ground, or sandblasted.

**5.** According to the Americans with Disabilities Act (ADA) [CSA-B651-04] Accessibility Guidelines, curb ramp slopes shall NOT exceed which of the following ratios?

- ☐ 1:10
- ☐ 1:12
- ☐ 1:20
- ☐ 1:24

**6.** Which of the following creates the majority of indoor air quality problems?

- ☐ Inside contamination
- ☐ Inadequate ventilation
- ☐ Construction materials
- ☐ Contamination from the outside

# Programming, Planning & Practice



## SAMPLE MULTIPLE-CHOICE QUESTIONS

Go to page 10 for answers

**7.** Which of the following types of estimates is the most accurate?
- ☐ Order of magnitude
- ☐ Square foot and cubic foot
- ☐ Assemblies system
- ☐ Unit price takeoff

**8.** Two professional design firms join together for a project in which both firms are parties to the contract with the owner. This arrangement is known as
- ☐ an associated firm
- ☐ a joint venture
- ☐ partnering
- ☐ a multiple prime

**9.** When the architect is analyzing the choice between renovating an existing library or demolishing it and constructing a new library, the architect should first recommend that
- ☐ a feasibility study be prepared
- ☐ renovation costs be compared with costs for new construction
- ☐ the owner obtain community input
- ☐ the local historical society be consulted

**10.** Outline specifications written during the programming phase of a project are generally broken down by
- ☐ rooms
- ☐ divisions
- ☐ costs
- ☐ products

**11.** Which of the following client categories most often requires the architect to transfer ownership of the architect's construction documents to the owner/client?
- ☐ Corporate
- ☐ Health care
- ☐ Commercial
- ☐ Governmental

**12.** Bid alternates to choose between concrete block and clay masonry, wood and plastic windows, and slate and asphalt shingles are most likely the architect's attempt to
- ☐ incorporate energy-saving options
- ☐ control construction costs
- ☐ anticipate neighborhood covenants
- ☐ accommodate various climatic conditions

**13.** According to *The Architect's Handbook of Professional Practice*, a project manager's first key challenge is to
- ☐ meet profitability goals
- ☐ meet contractual obligations
- ☐ clearly identify the client's expectations
- ☐ manage the team members' judgments and creativity

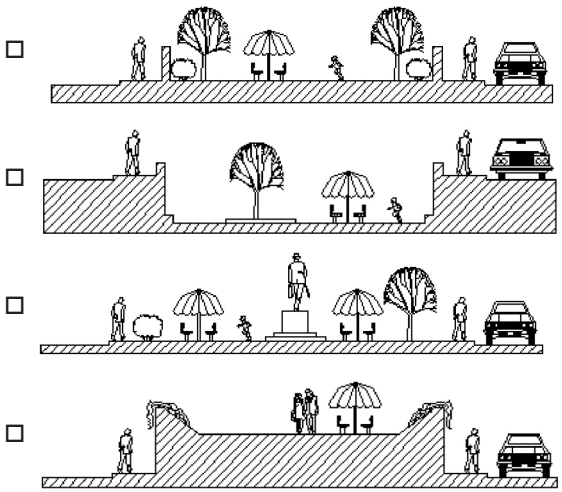
# Programming, Planning & Practice



## SAMPLE MULTIPLE-CHOICE QUESTIONS

Go to page 10 for answers

**14.** Which of the following plazas in identical urban settings would encourage active public use?



**15.** The threshold for sound levels that cause fatigue after prolonged exposure is approximately
- ☐ 20 db
- ☐ 50 db
- ☐ 80 db
- ☐ 110 db

**16.** Geotechnical observation reports are usually paid for by the
- ☐ structural engineer
- ☐ contractor
- ☐ architect
- ☐ owner

**17.** An architect is asked to design a county courthouse and government center. The architect should advise the client that a detailed program for this project is likely to result in
- ☐ a more aesthetically pleasing building
- ☐ a more efficient building
- ☐ a longer construction duration
- ☐ higher life-cycle building costs

**18.** Blocking and stacking within the programming process is most critical when considering
- ☐ space requirements
- ☐ special equipment
- ☐ site limitations
- ☐ building systems

**19.** STC ratings as applied to buildings represent the
- ☐ specified thermal comfort zone
- ☐ sound transmission class
- ☐ summer temperature conditions
- ☐ secure territory controls

**20.** In order to provide the most effective coordination of the engineering consultant's work during the construction documents phase of the work, the architect should
- ☐ call the consultant daily to make sure that progress is being made
- ☐ meet with the consultant at the beginning and the end of the work period
- ☐ hold regular weekly or monthly meetings to review the consultant's progress
- ☐ send memos of telephone conversations as needed

# Programming, Planning & Practice



## SAMPLE MULTIPLE-CHOICE QUESTIONS

Go to page 10 for answers

**21.** Which of the following is the most important consideration when the architect/owner contract is negotiated?
- ☐ Client background check
- ☐ Type of consultants
- ☐ Construction delivery method
- ☐ Scope of services

**22.** The object of the programming process is to establish
- ☐ aesthetics
- ☐ evaluation of materials
- ☐ realistic requirements
- ☐ project financing

**23.** A municipal impact fee [sewer development fee] assessed on a proposed project
- ☐ pays for the building permit
- ☐ offsets local infrastructure improvement costs
- ☐ is distributed to the owners of neighboring properties
- ☐ ensures speedy planning board review and approval

**24.** To resolve contractual disputes with clients, an architect should
- ☐ resign the contract
- ☐ refund the fees
- ☐ amend the contract
- ☐ consider mediation

**25.** According to standard owner/architect agreements, a presentation model for the client's promotional use is
- ☐ part of the design process
- ☐ standard practice
- ☐ not a basic service
- ☐ not reimbursable

**26.** Zoning ordinances [by-laws] are used by municipalities as a means of controlling all of the following EXCEPT
- ☐ density of development
- ☐ project costs
- ☐ flood impact
- ☐ land usage

**27.** The cost for asbestos removal in a building to be renovated must be borne by the
- ☐ local regulatory agency
- ☐ general contractor
- ☐ owner
- ☐ federal government

**28.** Which of the following is the most frequently used method of estimating construction cost when programming is completed?
- ☐ Unit-area cost
- ☐ Contractor estimate
- ☐ Construction loan value
- ☐ Capitalization ratio

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## SAMPLE MULTIPLE-CHOICE QUESTIONS

Go to page 10 for answers

**29.** The most appropriate strategy for predicting and preventing conflicts between architectural and engineering documents is to
- ☐ hold regular coordination meetings
- ☐ have the owner review drawings
- ☐ schedule peer review of documents
- ☐ use in-house engineers

**30.** Buildings in urban cores, which have been permitted to achieve floor area ratios and heights in excess of those permitted by zoning, may have been awarded these bonuses because they
- ☐ are clad in materials specified by the city
- ☐ have excess vertical transportation capacity
- ☐ include street-level functions that are regarded as public amenities
- ☐ are on sites that can take advantage of the potential for superior views

**31.** A deed restriction includes which of the following?
- ☐ Topography
- ☐ Utility locations
- ☐ Benchmarks
- ☐ Covenants

**32.** The architect for a new shopping center has been told that the city has a "ponding" requirement for the site. This means that the architect must provide
- ☐ a decorative water pond as part of the parking-lot landscaping
- ☐ a French-drain system in the parking areas to pond water
- ☐ an area where excess rainwater can be retained and discharged into a storm sewer
- ☐ a system for the underground collection and disposal of rainwater

**33.** Production management is an important element in the success of an architectural firm. Which of the following is a major ingredient for improvement of production?
- ☐ Employee benefits
- ☐ Communication with employees
- ☐ Office renovation
- ☐ Purchase of reproduction equipment

**34.** Which of the following is NOT normally governed by zoning regulations?
- ☐ Densities
- ☐ Setback and height requirements
- ☐ Parking requirements
- ☐ Life-safety requirements

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## SAMPLE MULTIPLE-CHOICE QUESTIONS

Go to page 10 for answers

**35.** The size and/or configuration of public rest room facilities is regulated by which of the following?

- ☐ Deed restrictions
- ☐ Building codes
- ☐ Zoning ordinances [bylaws]
- ☐ Life-safety codes

**36.** During the programming phase, building construction cost estimates are normally based on which of the following?

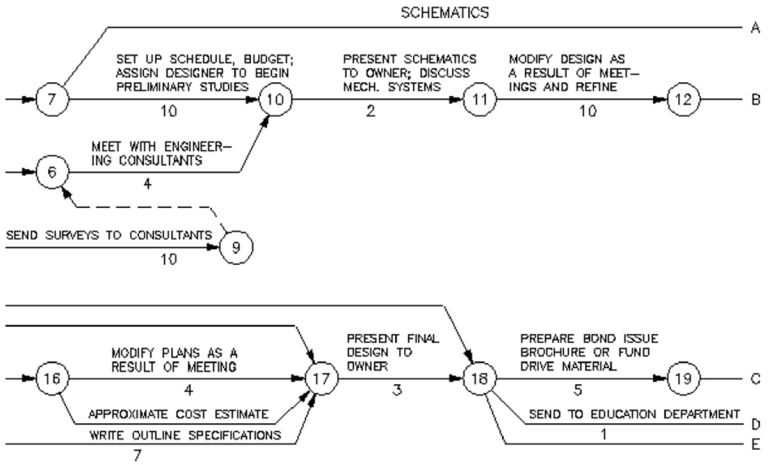
- ☐ Itemized materials takeoffs
- ☐ Operating proformas
- ☐ Cubic-foot [cubic-meter] costs of similar buildings
- ☐ Square-foot [square-meter] costs of similar buildings

**37.** Finding mold on pipe insulation is a sign that which of the following is present? **Check the three that apply.**

- ☐ A. Excess moisture
- ☐ B. Poor soils
- ☐ C. Improper ventilation
- ☐ D. High water table
- ☐ E. Organic feedstock
- ☐ F. Insufficient light levels

**38.** An architectural program should contain which of the following? **Check the four that apply.**

- ☐ A. Budget limitations
- ☐ B. Soils bearing capacity
- ☐ C. A statement of the owner's goals
- ☐ D. An inventory of spaces required
- ☐ E. Statements of functional relationships
- ☐ F. Determination of the structural system




From Scheduling and Control for Architects and Contractors, by David Haviland
Published by Center for Architectural Research, Rensselaer Polytechnic Institute © 1966 p 26-27

**39.** The diagram above is an example of a type of project scheduling known as the

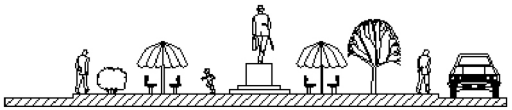
- ☐ critical path method (CPM)
- ☐ program evaluation and review technique (PERT)
- ☐ Gantt chart
- ☐ project cycle method (PCM)

**40.** Governmental bodies regulate the development of projects through which of the following? **Check the two that apply.**

- ☐ A. Regional master plans
- ☐ B. Zoning ordinances [bylaws]
- ☐ C. Enterprise zones
- ☐ D. Restrictive covenants
- ☐ E. Tax incentives
- ☐ F. Sewer permits

# Programming, Planning & Practice

## SAMPLE MULTIPLE-CHOICE ANSWERS

1. A schedule of construction
2. architect
3. Mechanical
4. Occupant health risks are less of a concern if no children will be living in the facility.
5. 1:12
6. Inadequate ventilation
7. Unit price takeoff
8. a joint venture
9. a feasibility study be prepared
10. divisions
11. Governmental
12. control construction costs
13. clearly identify the client's expectations
14. 
15. 80 db
16. owner
17. a more efficient building
18. site limitations
19. sound transmission class
20. hold regular weekly or monthly meetings to review the consultant's progress
21. Scope of services
22. realistic requirements
23. offsets local infrastructure improvement costs
24. consider mediation
25. not a basic service
26. project costs
27. owner
28. Unit-area cost
29. hold regular coordination meetings
30. include street-level functions that are regarded as public amenities
31. Covenants
32. an area where excess rainwater can be retained and discharged into a storm sewer
33. Communication with employees
34. Life-safety requirements
35. Building codes
36. Square-foot [square-meter] costs of similar buildings
37. A, C, E
38. A, C, D, E
39. critical path method (CPM)
40. A, B

# Programming, Planning & Practice

## SITE ZONING VIGNETTE

### Directions

On the work screen, you will see a site plan of an existing property that has been divided into two new lots. The tools available will allow you to outline the area suitable for the construction of surface improvements and the area suitable for construction of buildings only.

On the grid below the site plan, you are required to draw the profile of the existing grade and to draw the profile of the maximum building envelope for each lot.

Before beginning your solution, you should review the program that can be accessed through the Vignette Index screen and familiarize yourself with the site plan and the grid on the work screen.

Your completed work should conform to the program and the site conditions.

### Program

An existing property has been subdivided to create two new lots for the development of condominiums. You are required to show the buildable areas in plan and in section based on a variety of regulatory requirements and developmental constraints.

1. On the plan, show the portion of the site where surface improvements are allowed. (Use the Secondary Construction Area tool.)

2. On the plan, show the portion of the site where building construction is allowed. (Use the Buildable Area tool.)

3. On the grid, draw the profile of the existing grade at **Section A-A**. (Use the Grade tool.)

4. On the grid, draw the profile of the maximum building envelope for each lot at **Section A-A**. (Use the Building Profile tool.)

Observe all of the following restrictions:

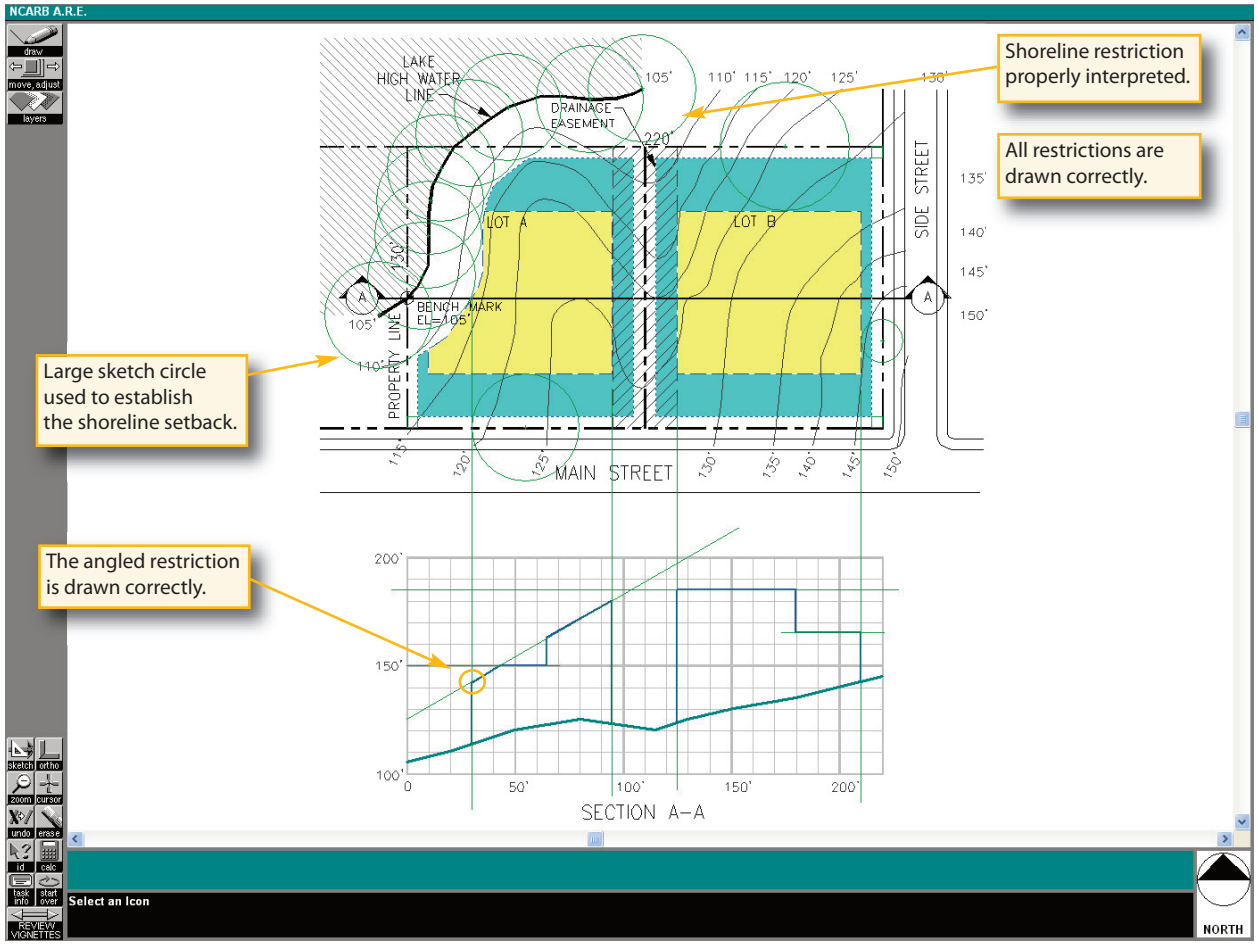
- Surface improvements are prohibited within 5 ft of any property line.
- Construction of buildings is prohibited within the following setbacks. (All setbacks are measured from the property lines of the two new lots.)
- Front yard setbacks shall be considered only from Main Street.

| | |
|---|---|
| Front yard setbacks from property line along Main Street: | 25 ft |
| Rear yard setbacks: | 30 ft |
| Side yard setbacks: | 10 ft |

- Construction of buildings and other surface improvements is prohibited within 25 ft of the lake high water line.
- Construction of buildings is prohibited within the existing drainage easement.
- The maximum building height limit within 65 ft of the west property line in Lot A shall be 45 ft above the benchmark elevation.
- The maximum building height limit between 0 ft and 40 ft of the east property line of Lot B shall be 20 ft above the grade at the property line.
- Maximum building height limit shall be 80 ft above the benchmark elevation.
- The maximum building envelope is restricted to an elevation defined by a 30-degree line rising eastward from a point at an elevation of 20 ft directly above the benchmark.

# Programming, Planning & Practice

## **SITE ZONING VIGNETTE** - Sample Passing Solution




While this layout has a few minor errors, none were serious enough to cause it to fail. Front, side and rear yard restrictions have been located correctly. The Shoreline setback and the Easement are shown to be more restrictive than the side yard and rear yard setbacks. The horizontal and vertical setbacks and limits are maintained. The angled line is measured 30 degrees from the horizontal and originates at the correct point. The easement in the middle of the site has been located properly and has been excluded from the construction envelope. The minor mistakes in this solution are in the depths of the Secondary Construction Area setbacks along the center property line. One side is measured at four feet and the other at six feet. There are tolerances built into the scoring programs, but it is advisable to try and create your solutions as accurately as possible. Use the "Zoom" tool often to locate elements more precisely.

### Procedural Tips

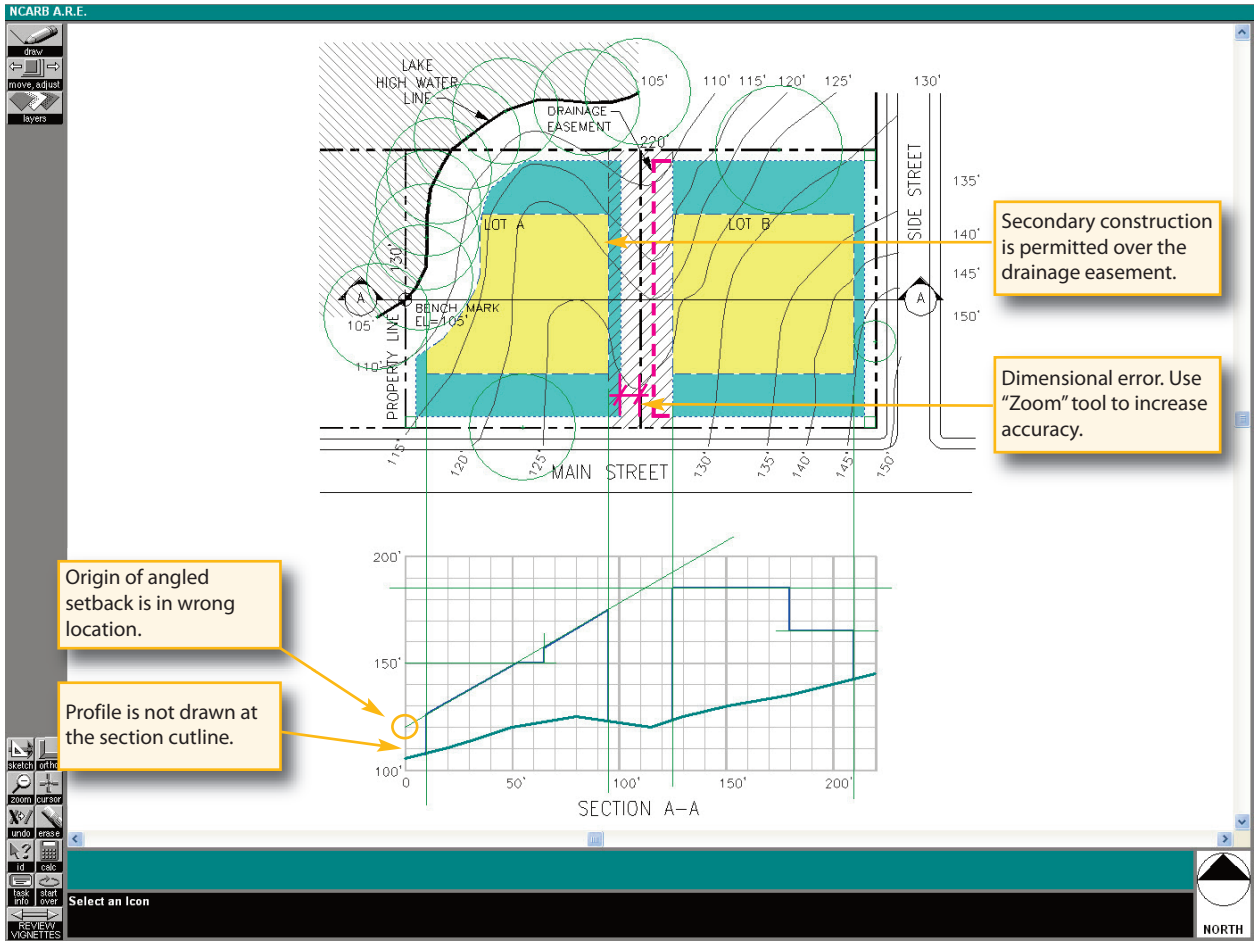
- You might want to use the **sketch** tools to lay out your solution first.
- Draw the Secondary Construction Area before you draw the Buildable Area.
- When elements overlap, you may have trouble selecting a particular element. If this happens, keep clicking (without moving the mouse) until the desired element highlights.
- **Sketch grid** tool as one way to measure setbacks

### Tools You Might Find Useful

- **Zoom** in quite closely to adjust elements.
- **Sketch** tools to measure setbacks
- **Ortho**

# Programming, Planning & Practice

## **SITE ZONING VIGNETTE** - Sample Failing Solution




The solution shows a good technique for measuring offsets (setbacks, easements, etc.) from a curved or angled line. The solution itself has a few problems, however. The candidate mistook the easement down the middle of the site as being restrictive of non-building surface improvements and did not allow the Secondary Construction Area to fall over the easement as permitted. Also, the angled solar access restriction has its beginning point located incorrectly. This creates a condition where the maximum building envelope, as drawn, is smaller than allowed (vertically) and is therefore unacceptable.

# Programming, Planning & Practice

## REFERENCES

**The following references are presented to assist candidates in preparation for the examination. This list represents texts that have content covered in this division of the examination. This is not intended to be an exhaustive list of all possible reference materials for the subject area. NCARB makes no guarantee that the various references are currently in print.**

*The Architect's Handbook of Professional Practice*
Joseph A. Demkin, AIA, Executive Editor
The American Institute of Architects
John Wiley & Sons, latest edition

*Architectural Graphic Standards*
Charles G. Ramsey and Harold R. Sleeper
The American Institute of Architects
John Wiley & Sons, latest edition

*Canadian Handbook of Practice for Architects*,
Committee of Canadian Architectural Councils and
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Canada, 2001