

INTERIOR DESIGN REFERENCE MANUAL

EVERYTHING YOU NEED TO KNOW TO PASS THE NCIDQ® EXAM
FIFTH EDITION

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BARRIER-FREE DESIGN

Barrier-free design is an important part of the NCIDQ exam and a topic with which all interior designers should be familiar. The exam tests knowledge of barrier-free concepts and requirements in the multiple-choice sections and the candidate's ability to apply regulations in the design practicum section. Although many model codes, state laws, and federal laws set requirements for accessibility, and there are differences between them, the overriding regulation today is the Americans with Disabilities Act (ADA). This federal law requires, among other things, that all commercial and public accommodations be accessible to people with disabilities. Although the ADA is not a national building code and does not depend on inspection for its enforcement, building owners must comply with the requirements or be liable for civil lawsuits. Interior designers are likewise responsible for designing interior spaces that conform to ADA requirements.

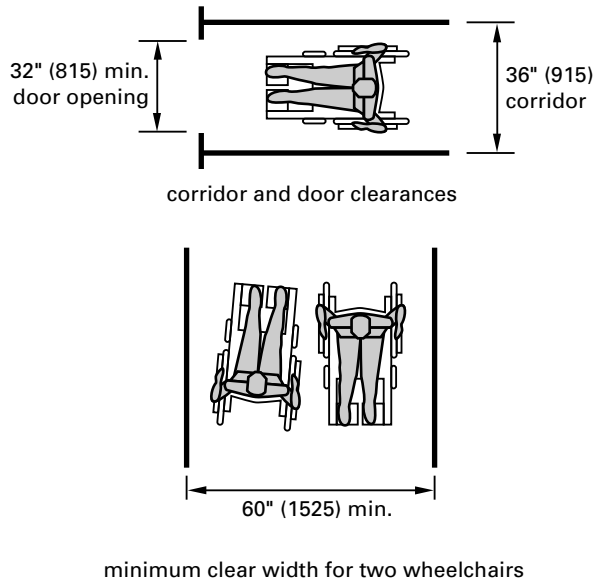
The ADA is a complex, four-title civil rights law. Title III, Public Accommodations and Commercial Facilities, is the part that most affects designers. The design requirements for construction are mainly found in the *ADA Accessibility Guidelines* (ADAAG),

which is technically Appendix A to 28 CFR 36, the *Code of Federal Regulations* rule that implements Title III of the Act. When designers refer to the ADA, they are usually referring to the design criteria contained in the ADAAG.

Other local and federal laws and regulations also govern accessibility. For example, the ADA does not cover single- or multifamily housing. Multifamily housing is regulated mainly by the federal Fair Housing Act and by state laws. In some cases, for federal buildings, the *Uniform Federal Accessibility Standards* govern. Although there are differences among these regulations, they all follow most of the standards set forth in ICC/ANSI A117.1-2003, *Accessible and Usable Buildings and Facilities*, or the older version, CABO/ANSI A117.1, *American National Standard for Buildings and Facilities Providing Accessibility and Usability for Physically Handicapped People*.

The differences among the standards primarily address scoping provisions and some details. *Scoping provisions* are requirements that dictate how many accessible elements must be provided. For example, scoping provisions tell the designer how many seats in a

Figure 3.1
Wheelchair
Clearance



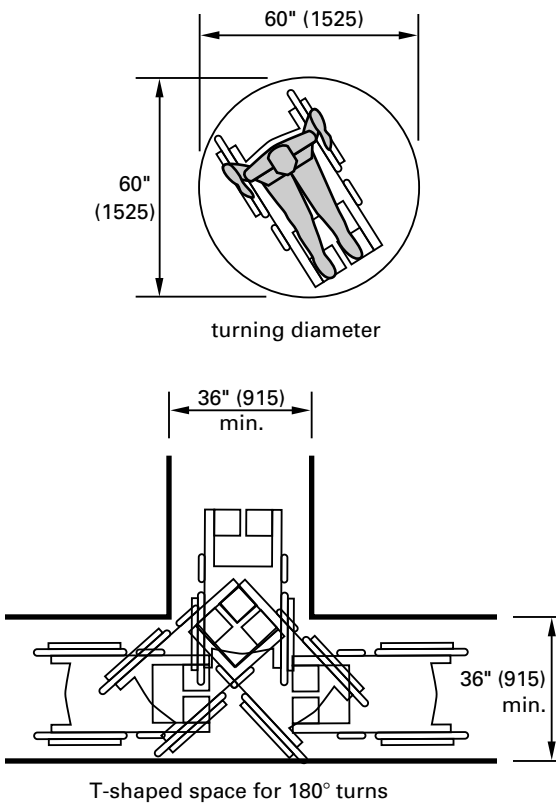
restaurant must allow for wheelchair access or how many housing units in a complex must be accessible.

The standards discussed in this chapter include the basic requirements for accessibility related to interior design as defined in the ICC/ANSI standard and the requirements most likely to be tested on the NCIDQ exam. Being familiar with the basic concepts and requirements of accessibility is good preparation for the exam.

ACCESSIBLE ROUTES

An *accessible route* is a continuous, unobstructed path connecting all accessible elements and spaces in a building or facility. It includes corridors, doorways, floors, ramps, elevators, lifts, and clear floor space at fixtures. The standards for accessible routes are designed primarily to accommodate a person using a wheelchair, but they should accommodate people with other disabilities.

Figure 3.2
Maneuvering
Clearance



Accessible routes and other clearances are based on some basic dimensional requirements of wheelchairs. The minimum clear width for an accessible route is 36 in (915 mm) continuously and 32 in (815 mm) at a passage point such as a doorway. The passage point cannot be more than 24 in (610 mm) long. The minimum passage width for two wheelchairs is 60 in (1525 mm). If an accessible route is less than 60 in wide, then passing spaces at least 60 in × 60 in must be provided at intervals not to exceed 200 ft (61 m). These requirements are shown in Fig. 3.1.

The minimum clear floor space required to accommodate one stationary wheelchair is 30 in × 48 in (760 mm × 1220 mm). For maneuverability, a minimum 60 in (1525 mm) diameter circle is required for a wheelchair to make a 180° turn. In place of this, a T-shaped space may be provided, as shown in Fig. 3.2. When planning toilet rooms, make sure there is at least this 5 ft diameter clear space available. If turns in

Life-Cycle Assessment

A *life-cycle assessment* (LCA) provides the methodology to evaluate the environmental impact of using a particular material or product in a building. (Note that this is not the same as a life-cycle cost analysis, as described in Ch. 17.) There are commonly four phases to an LCA.

The first phase in the process is to determine the purpose and goals of doing the study. Limits of the study and the units for study must also be established so alternatives can be compared and the framework for data acquisition can be developed.

The second phase, inventory analysis, is often the most difficult part because it involves determining and quantifying all of the inputs and outputs of the product under study. These might include the energy required to obtain the raw materials and to process or manufacture them, the energy of transportation, the need for ancillary materials, and the pollution or waste disposal involved in the manufacturing, use, and disposal processes. The ability to recycle the material again is also considered. Some of the criteria used for evaluating building materials are given in the next section.

The impact assessment phase attempts to characterize the effects of the processes found in the inventory analysis in terms of their impacts on the environment. The analysis may include such things as resource depletion, generation of pollution, health impacts, or effects on social welfare. For example, the energy required to produce a product may necessitate the addition of electrical generating capacity, which in turn may produce both waterborne and airborne pollution.

Finally, the improvement analysis phase provides suggestions on how to reduce the environmental impact of all the raw materials, energy, and processing required for the product or construction activity.

There are four main stages of a product's life cycle. These include raw-material acquisition, manufacturing, use in the building, and disposal or reuse. The potential individual elements of each stage are as follows.

Raw-Material Acquisition

- acquisition of raw materials and energy from mining, drilling, or other activities
- processing of raw materials
- transportation of raw materials to processing points

Manufacturing

- conversion of processed raw materials into useful products
- manufacturing or fabrication of materials into the final product
- packaging of the product
- transportation of the finished product to the job site

Use and Maintenance

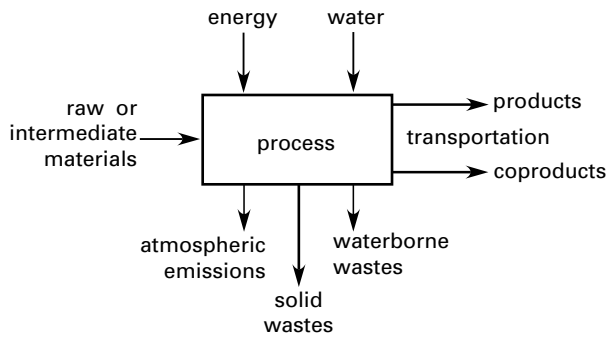
- installation or construction of the product into the building
- long-term use of the product throughout its life or the building's
- maintenance and repair of the product throughout its life

Disposal

- demolition of the product used in the building
- conversion of the waste into other useful products
- waste disposal of the product
- reuse or recycling of the product if not disposed of or converted

At any point in the life cycle (but most commonly during inventory analysis), consideration must be given to all the inputs and outputs of the system or product under study. These include the energy and other raw materials required to acquire, process, or use the product and emissions to the air,

Figure 4.1
Life-Cycle
Inventory Model



water, and land. A useful model for considering these factors is shown in Fig. 4.1.

Using this model is helpful in directing the required collection of data. Inputs for energy are typically given in units such as British thermal units or megajoules; inputs for raw materials are given in pounds or kilograms; and water is commonly measured in gallons or liters. Output is typically given by weight in pounds or kilograms.

Criteria for Evaluating Building Materials

Some of the criteria for evaluating how sustainable a product or construction process is include the following. Of course, not all of the criteria apply to every product.

- *Embodied energy:* The material or product should require as little energy as possible for its extraction as a raw material, initial processing, and subsequent manufacture or fabrication into a finished building product. This includes the energy required for transportation of the materials and products during their life cycle. The production of the material should also generate as little waste or pollution as possible.

- *Renewable materials:* A material is sustainable if it comes from sources that can renew themselves within a fairly short time. LEED credits are given for using rapidly renewable building materials and products

for 5% of the total value of all building materials and products used in the project. These include products typically made from plants that are harvested within a cycle of 10 years or less. Products that meet this criterion include wool carpets, bamboo flooring and paneling, straw board, cotton batt insulation, linoleum flooring, poplar oriented strand board (OSB), sunflower seed board, and wheatgrass cabinetry.

- *Recycled content:* The more recycled content a material has, the less raw materials and energy required to process the raw materials into a final product. Each of the three types of recycled content should be considered: post-consumer materials, post-industrial materials, and recovered materials. Refer to the definitions at the end of this chapter for a description of these terms.

- *Energy efficiency:* Materials, products, and assemblies should reduce the energy consumption in a building.

- *Use of local materials:* Using locally produced materials reduces transportation costs and can add to the regional character of a design. A building can receive LEED credit if 20% of the combined value of construction and furniture were manufactured regionally, that is, within a radius of 500 mi (804 km). Additional credit is available if 10% or more of the combined value of construction and furniture were extracted, harvested, or recovered, as well as manufactured, within 500 mi (804 km) of the project.

- *Durability:* Durable materials will last longer and generally require less maintenance over the life of a product or building. Even though initial costs may be higher, the life-cycle costs may be less.

- *Low volatile organic compound (VOC) content:* LEED credits are given for using low-emitting materials, including adhesives and sealants, paints and coatings, flooring systems, composite wood and agrifiber products, and systems furniture and seating.

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MECHANICAL AND ELECTRICAL SYSTEMS

This chapter reviews some of the mechanical and electrical systems with which NCIDQ candidates should be familiar. Mechanical systems include heating and cooling, plumbing, and fire protection. Electrical systems include power, lighting, telephone, and other communication systems. (Refer to Ch. 20 for more information on lighting design.)

Although the interior designer is not responsible for designing or producing construction drawings for structural, mechanical, and electrical systems, he or she must know when and how to coordinate with consulting engineers, how to read consultants' drawings, and how to make design decisions based on these systems. For example, the existing location of a soil stack may limit the area within which the designer can plan for a new rest room. In another instance, an interior designer may be able to recommend cutting a hole in a floor to provide for a new stairway if the structural system can accommodate it.

HVAC

HVAC is the acronym for *heating, ventilating, and air conditioning* and includes all the systems used for these purposes. One

system may combine all three, or there may be two or more systems to heat and cool a building.

Types of Systems

HVAC systems are often classified by the medium used to heat or cool the building. The two primary methods of heating and cooling use air or water. In some parts of the country, electricity is also used for heating. Some systems use a combination of media.

All-air systems cool or heat spaces by conditioned air alone. Heat is transported to the space with supply and return air ducts. A common example of an all-air system is a residential forced hot air furnace. A boiler powered by oil or gas heats air that is distributed throughout the house in ductwork. Return air ducts in each room collect the cooled air and return it to the furnace for reheating. If necessary, an air conditioning unit is connected to the same ductwork to provide cooled and dehumidified air.

For commercial buildings, there are several variations of systems, including variable air volume (VAV), high-velocity dual duct, constant volume with reheat, and multi-zone systems. All types require supply air

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FINISHES

FLOORING

This section outlines some basic construction methods for flooring that is built with several components above structural floors as well as for flooring that is simply applied as a single thin material, such as resilient tile or carpet.

Wood Flooring

There are four basic types of wood flooring. *Strip flooring* is one of the most common and consists of thin strips from $\frac{3}{8}$ in to $\frac{25}{32}$ in (10 mm to 20 mm) thick of varying lengths with tongue-and-groove edges. Most strip flooring is $2\frac{1}{4}$ in (57 mm) wide, but $1\frac{1}{2}$ in (38 mm) wide strips are also available.

Plank flooring comes in the same thicknesses as strip but is from $3\frac{1}{4}$ in to 8 in (83 mm to 203 mm) wide. It is used where a larger scale is desired or to emulate wider, historic planking.

Block flooring is made of preassembled wood flooring in three basic configurations. *Unit block flooring* is standard strip flooring assembled into a unit held together with steel or wood splines. *Laminated block flooring* is flooring made from three to seven

plies of cross-laminated wood veneer. Both types of block flooring are from $\frac{3}{8}$ in to $\frac{25}{32}$ in (10 mm to 20 mm) thick. *Parquet flooring* is made of preassembled units of several small, thin slats of wood in a variety of patterns. It may be finished or unfinished. Parquet flooring is usually sold in 12 in (300 mm) squares, $\frac{5}{16}$ in (8 mm) thick, for mastic application. Parquet flooring is easier and less expensive to install than other types of flooring and can be installed in a wide range of designs.

The fourth type of wood floor is made from solid *end-grain blocks*. These are solid pieces of wood from $2\frac{1}{4}$ in to 4 in (57 mm to 102 mm) thick laid on end. Solid block floors are very durable and resistant to oils, mild chemicals, and indentation. They were often used for industrial floors, but their use has been supplanted by other materials.

Wood flooring is graded differently from other wood products. Grading rules are set by the various trade associations, such as the National Oak Flooring Manufacturers Association and the Maple Flooring Manufacturers Association. Unfinished oak flooring is graded as clear, select, no. 1 common, and no. 2 common. Clear is the best grade with

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PRINCIPLES OF DESIGN

BALANCE

Balance is the arrangement of elements in a composition to achieve visual equilibrium. Balance is important in interior design because every interior is composed of a wide variety of forms, shapes, colors, lines, patterns, textures, and light. Functional needs may determine much of the way an interior is designed, but the final composition must still be coordinated to establish a comfortable environment.

Balance depends on the idea of visual weight. To the human eye, some elements appear “heavier” than others by the nature of their size, shape, complexity, color, texture, or location in space. These elements can be balanced by other objects in a variety of ways.

A good analogy is that of a balancing scale, as diagrammed in Fig 24.1. Two identical objects are in balance if they weigh exactly the same and are placed an identical distance away from the fulcrum, or balance point. If one object is half as heavy as the other, things will still be balanced if the lighter object is placed twice as far from the fulcrum as the heavier one. Balance depends on both object (weight) and placement.

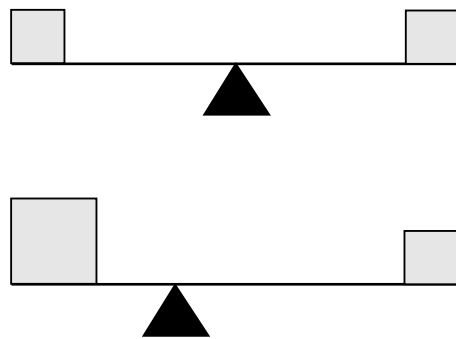


Figure 24.1
Balance of Visual Weight

For interior design (as well as architecture, graphics, and other visual arts), balance is not quite as exact or objective as weighing objects on a scale, but the same principles apply. Some of the ways objects or elements vary in visual weight include the following.

- Large objects are heavier than smaller objects with the same form, shape, color, and texture.
- Highly textured or detailed elements are heavier than plain elements.
- Dark elements are heavier than lightly shaded elements.
- Bright colors carry more “weight” than neutral colors.