SOLAR CONTRACTORS
GENERAL TRADE KNOWLEDGE
EXAMINATION CONTENT INFORMATION

Revised September 14

The General Trade Knowledge portion of the examination is administered daily in Computer Based Testing (CBT) format. It will consist of 80 equally weighted questions.

The examination will have questions relating to the following content areas and necessary knowledge for each area includes:

- reading and interpreting plans and specifications
- reading and interpreting codes
- basic mathematics
  (addition, subtraction, multiplication, division, calculations of area and volume, fractions, decimals, percentages, calculating the sides of triangles, square roots, powers of numbers, and solving simple algebraic equations for unknown variables)

You should be prepared to respond to examination questions on any of the content areas listed. Questions asked and content areas tested on previous examinations should not be assumed to be the only possible questions to be asked or content areas to be tested on this examination.

The percentage of questions shown for each content area may vary by as much as plus or minus three (3) percent. Please refer to the Candidate Information Brochure and the Reference List for additional information.

Content Area A — 25%
Swimming Pools

1. Site Survey and Collector Orientation

Knowledge of shading effects (e.g., current, future)
Knowledge of site selection tools
Knowledge of collector layouts
Ability to match design to site conditions
Knowledge of design temperature

2. Designing pool and spa heating systems

knowledge of temperature requirements
knowledge of length of swim season
knowledge of physical location of equipment
knowledge of proper location of solar components in relation to other components (e.g., chlorinators)
knowledge of system and pool hydraulics (e.g., multi and variable speed pumps, piping, appropriate sizing)
Knowledge of integrating solar system with circulation control systems
knowledge of potential system pressures (positive and negative)
knowledge of requirements for isolated systems (e.g., pressure relief valves)
Knowledge of impact of adding solar to existing system (e.g., electrical, plumbing)
Knowledge of system sizing for application (e.g., pipe size, array size)
Knowledge of energy yield, and economic analysis
Knowledge of industry collector ratings and system approvals (e.g., SRCC, IAPMO, FSEC)

3. Installing solar collectors

Knowledge of collector types (e.g., low, medium temperature)
knowledge of different types of roof sealants and waterproofing
knowledge of roof penetration methodologies
knowledge of mechanical roof attachments for different types of roofs
knowledge of wind loading requirements
knowledge of mounting systems (e.g., ballasted, ground mounted)

4. Piping system

knowledge of potential harm to property if improperly installed
knowledge of connection methods (e.g., compression fittings, threaded, solvent welding)
knowledge of securing piping (e.g, hanging, burying)
knowledge of galvanic corrosion

knowledge of materials and fittings

5. **Attaching system plumbing components**
   ability to properly install and design components for the higher temperatures normally associated with solar
   knowledge of high temperature limit cut off requirements

6. **Connecting electrical control systems**
   knowledge of alternating and direct current systems
   knowledge of GFCI requirements

7. **Activating, inspecting and troubleshooting systems**
   knowledge of all system components
   ability to inspect subcontracted work

8. **Demonstrating system operation to owners**
   knowledge of freeze protection requirements and methods

9. **Complying with safety procedures and building codes**
   knowledge of code requirements (e.g., SVRS (suction, vacuum, release systems) requirements)
   knowledge of dangers associated with higher temperatures (e.g., above 104 degrees)
   knowledge of permitting requirements
   knowledge of OSHA

Content Area B 25%

Domestic Hot Water

1. **Site Survey and Collector Orientation**
   Knowledge of shading effects (e.g., current, future)
   Knowledge of site selection tools
   Knowledge of collector layouts
   Ability to match design to site conditions
   Knowledge of design temperature

2. **Designing solar domestic hot water systems**
   Knowledge of collector types (e.g., low, medium, high temperature)
   knowledge of potential system pressures (positive and negative)
   knowledge of requirements for isolated systems (e.g., pressure relief valves)
   Knowledge of impact of adding solar to existing system (e.g., electrical, plumbing)
   Knowledge of system sizing for application (e.g., pipe size, pump size, array size)
   Knowledge of energy yield, and economic analysis
   Knowledge of active and passive heat dissipation methods
   Knowledge of storage tanks
   Knowledge of industry collector ratings and system approvals (e.g., SRCC, IAPMO, FSEC)

3. **Installing solar water heating systems**
   knowledge of different types of roof sealants and waterproofing
   knowledge of roof penetration methodologies
   knowledge of mechanical roof attachments for different types of roofs
   knowledge of wind loading requirements
   knowledge of mounting systems (e.g., ballasted, ground mounted)

4. **Piping system**
   knowledge of connection methods (e.g., soldering, brazing, compression fittings, threaded, solvent welding)
   knowledge of pipe selection, securing and insulating, UV protection
   knowledge of thermal expansion effects
   knowledge of drain capabilities
   knowledge of galvanic corrosion
   knowledge of materials and fittings

5. **Addressing problems caused by water conditions**
   knowledge of water chemistry (e.g., scaling, erosion)
   knowledge of effects of high temperature on system component

6. **Installing components unique to indirect (closed loop) systems**
   knowledge of capacities
   knowledge of pressures
   knowledge of hazards of glycol systems
   knowledge of cleaning system
   knowledge of pressure testing
   knowledge of heat exchangers
   knowledge of heat transfer fluids and labeling requirements
   knowledge of measuring specific gravity and pH

7. **Commissioning systems**
   knowledge of all system components
   ability to inspect subcontracted work
   knowledge of programming controls, monitoring/metering equipment

8. **Servicing Systems**
   Knowledge of maintenance requirements
   Knowledge performance verification
   Knowledge of recommissioning requirements
   Knowledge of troubleshooting
   Knowledge of anode rods

9. **Demonstrating system operation to owners**
   knowledge of labeling requirements and manuals to be delivered

10. **Using tools and equipment**
    knowledge of multi-meters
    knowledge of thermometers
    knowledge of pressure gauges
    knowledge of flow meters
    knowledge of infrared cameras

11. **Connecting electrical control systems**
    knowledge of proper sensor placement
    knowledge of wiring (e.g., sizing, shielding, connections, securing, UV protection, grounding)

12. **Complying with safety procedures and building codes**
    knowledge of code requirements
    knowledge of OSHA
    knowledge of dangers associated with higher temperatures (e.g., tempering valves, pressure relief)
    knowledge of permitting requirements

Content Area C — 50%
Photovoltaics

1. **Site Survey and Module Orientation**
   Knowledge of shading effects (e.g., current, future)
   Knowledge of site selection tools
   Knowledge of array layouts
   Ability to match design to site conditions
   Knowledge of string sizing to local site conditions (e.g., geographic temperatures)

2. **Designing photovoltaic systems to meet end-use requirements**
   knowledge of system performance projections
   Match design to customer expectations
   Knowledge of system sizing for application
   Knowledge of energy yield, and economic analysis

3. **Designing Grid Tied systems**
   knowledge of utility interconnection
   knowledge of National Electrical Code
   knowledge of battery back-up
   knowledge of inverters (e.g., string, micro, AC panels)
   knowledge of module types (e.g., single or poly crystal, thin film)
   knowledge of balance of systems (BOS)

4. **Designing Standalone/Non-grid Connected Systems**
   Knowledge of system types (e.g., pumping, lighting, remote power)
   Knowledge of battery sizes, types, storage and installation
   Knowledge of charge and load controllers

5. **Designing with hybrid systems**
   Knowledge multiple power sources (e.g., wind, hydro, generator)
   Knowledge of programming systems
   Knowledge of balancing power sources

6. **Installing photovoltaic systems**
   knowledge of D.C. circuits
   knowledge of wire sizing and types
   knowledge of voltage drops
   knowledge of grounding
   knowledge of DC/AC disconnects
   knowledge of different types of roof sealants and waterproofing
   knowledge of penetration methodologies
   knowledge of mechanical roof attachments for different types of roofs
   knowledge of wind loading requirements
   knowledge of mounting systems (e.g., ballasted, ground mounted)
   knowledge of labeling requirements
   knowledge of wire termination and torque requirements

7. **Commissioning systems**
   knowledge of all system components
   ability to inspect subcontracted work
   knowledge of programming controls, monitoring/metering equipment
   knowledge of expected voltages and currents
   Knowledge of testing of wiring, insulation and connections
   Knowledge of documentation requirements (e.g., system start up data)

8. **Using photovoltaic tools and equipment**
   Knowledge of tools and measuring devices
   Knowledge of multi-meters
   Knowledge of infrared cameras
   Knowledge pyranometers
   Knowledge of measuring specific gravity (batteries)
   Knowledge of torque wrenches, crimping tools

9. **Maintaining PV Systems**
   Knowledge of module cleaning requirements
   Knowledge of battery equalization methods and controller settings
   Knowledge of system performance monitoring

10. **Complying with safety procedures and building codes**
    knowledge of OSHA
    knowledge of permitting requirements
    knowledge of PPE