

Job Task Analysis (JTA) for ACI Residential Concrete Foundation Technician Certification

HOW TO USE THIS JTA

On the written examination, the Candidate must:

- **Understand** the following general concepts, which may not have specified values, procedures, or measurements; *and*
- **Know** the following specific procedures or values; performance of these items may also be assessed on the performance examination.

RESOURCES:

International Residential Code, Chapter 4: Foundations
ACI 332 Residential Code Requirements for Structural Concrete and Commentary
ACI 332.1R Guide to Residential Concrete Construction
CFA Cold Weather Research Report
CFA TN-001 Using ACI 332 with the IRC
CFA TN-002 Backfilling Foundation Walls
CFA TN-003 Casting Residential Foundation Walls in Cold Weather
CFA TN-004 Cracking in Concrete Walls
CFA TN-010 Waterproofing, Backfill, and Maintenance
CFA TN-011 Soils & Excavation Safety
CFA TN-012 Concrete for the Residential Contractor

AREAS OF COMPETENCY:

Building Codes
Soils and Excavation
Footings
Foundation Walls
Cold-Weather Concreting
Concrete Properties and Placement
Backfilling
Waterproofing, Dampproofing, and Drainage
Troubleshooting

Building Codes

- Know the relationship between the IRC and ACI 332 requirements.
- Understand exceptions to provisions for frost protection, water proofing, etc.
- Know minimum concrete strengths required by code.
- Know the differences and limitations of prescriptive and calculated design
- Understand the minimum critical information necessary for prescriptive design.

Soils and Excavation

- Understand the physical traits of standard soil types that influence design.
- Understand the correct procedure if expansive, compressible, shifting, or other unknown soil characteristics are evident.
- Understand the basics of soil testing.
- Know the limitations and procedures when fill is necessary below footings.
- Understand the condition of the footing necessary before placing concrete.
- Know various methods for protecting excavations from freezing prior to concrete placement and why it is necessary.

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- Understand the conditions that allow concrete to be placed on saturated or frozen soils.
- Understand the definition and remedy for foundations in expansive soils.
- Understand that foundations constructed on expansive soils may involve additional design requirements.
- Know the measure and indicators of acceptable/unacceptable soil conditions.
- Understand how foundation settling occurs.
- Know items to be identified prior to excavation.
- Understand the required means of egress during use of excavations for foundations.
- Know that clearance distance of spoils and material staging from the edge of excavations.
- Understand benching and slope requirements of excavations.
- Know the minimum distance between an excavation bank and the foundation construction.
- Understand the minimum distance heavy equipment is allowed to operate from the excavated bank.

Footings

- Understand minimum requirements and prescriptive tables to design continuous, isolated and wall footings.
- Know how to determine the required depth of footings.
- Understand loads for footing design and soil bearing capacity.
- Know requirements for footings and foundation walls not continuously supported.
- Know the minimum design requirements for footings in high seismic zones.
- Understand detailing requirements for stem wall footings, slab on grade turn down footings, and monolithic slab & footing.
- Understand required connection options of walls to footings based on applicable code.
- Know minimum depth, and slope tolerance of soil bearing surface.
- Know minimum footing projection from wall edge and eccentricity.
- Understand shear transfer at foot to wall connection.
- Understand the purpose of footings.
- Understand limitations and construction of frost protected shallow footings.
- Understand the requirements for footing excavation.
- Know the types of footing classifications.
- Understand the types of load a footing must resist.
- Understand how to select footings for different loading conditions.
- Understand tolerances and deviations for footings.
- Know the various types of footing forms.
- Understand factors determining minimum footing width and height.
- Understanding footing steps and accepted practices.
- Understand lateral load transfer from footing to wall.
- Understand reinforcement detailing requirements including placement, cover and lap splice.
- Understand curing and protection from freezing temperatures and hot weather.

Foundation Walls

- Understand the different types of forming systems.
- Know details relating to installation of anchor bolts.
- Know the difference between structural reinforcement and temperature or shrinkage steel.
- Understand the conditions that constitute lateral restraint of foundation walls.
- Know the difference between plain structural and reinforced concrete.
- Know the conditions where plain structural concrete is permissible.

Job Task Analysis (JTA) for ACI Residential Concrete Foundation Technician Certification (Continued)

- Understand the horizontal reinforcement requirements for concrete walls.
- Know reinforcement detailing requirements for reentrant corners.
- Know the coverage for reinforcement in foundation walls.
- Know the minimum length for lap splices in reinforcement.
- Know the requirements for the use of the prescriptive design tables.
- Know how to determine the correct prescriptive wall table for a design condition.
- Understand the use of prescriptive requirements for wall thickness and reinforcement based on soil classification.
- Understand details related to reduced wall thicknesses.
- Know code conditions for embedded aluminum in concrete.
- Understand the requirements for construction joints.
- Know why and where horizontal reinforcement is to be used.
- Understand the minimum requirements for lintel beams.
- Understand the acceptable tolerances for foundation walls.
- Know what constitutes unbalanced backfill height.
- Understand the methods and advantages of concrete placement methods.
- Understand the methods and reasons for concrete consolidation.
- Know when the wall has adequate strength for form removal.
- Know minimum wall thickness for use of modified flexural strength equation.

Cold-Weather Concreting

- Know the relationship of the temperature concrete freezes to freezing air temperature.
- Know methods for protecting walls during cold weather.
- Understand the method by which concrete wall temperature and strength gain can be monitored.
- Understand mix design and proportioning related to cold weather concrete.
- Understand the reason why concrete can continue to gain strength in cold temperatures.
- Know the additional impact of higher water-cementitious ratios in cold weather concreting.
- Know different methods for accelerating the curing rate of the concrete.
- Know the limits for calcium chloride based on condition or use.
- Know the minimum required strengths for removal of protection during cold weather.
- Understand the conditions that define different exposure categories.
- Know how to assess the effect of mix design on compressive strength.
- Know how to read a maturity curve to assess mix design performance.
- Understand the protection methods for fresh concrete in cold weather.

Concrete Properties and Placement

- Know the general mixture proportions of concrete materials.
- Understand varying concrete properties with mix proportioning.
- Understand the factors influencing concrete curing.
- Understand the factors that influence concrete strength gain.
- Understand how to determine the required concrete strength based on application.
- Know the impact and limitations to adding water.
- Know the different types of cementitious materials and their uses.
- Understand what a blended cement is and its uses.
- Understand the relationship between water/cementitious ratio and strength.
- Know the relationship between concrete design strength and maximum slump.
- Know the different types of admixtures for concrete.

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- Know principal reason for entrained air in concrete.
- Understand the effect of different admixtures.
- Know the use and impact of water reducing admixtures.
- Understand the process by which concrete hardens.
- Understand the tensile/flexural properties of concrete and their relationship to compressive strength.
- Know aggregate properties that affect the quality of concrete.
- Know the difference between entrained and entrapped air.

Backfilling

- Understand when backfilling can be performed.
- Understand when full height backfilling may be performed.
- Understand what temporary bracing is and when it is required.
- Understand at what height of unbalanced backfill top support of the wall is necessary.
- Know that the integrity of the dampproofing or waterproofing is to be maintained during backfilling.
- Know the preferred procedures and methods compacting backfill.
- Understand what types of backfilling materials are recommended.
- Understand the placement of backfill.
- Know the required foundation height above finished grade.
- Understand the difference between rough and finished grade requirements for foundations.

Waterproofing, Dampproofing, and Drainage

- Understanding drainage systems and water discharge system gravity or mechanical.
- Know the types of drainage methods and their proper installation.
- Understand what types of soil conditions do not require a drainage system.
- Understand Unified Soil Classification system and drainage characteristics.
- Know the definition of waterproofing versus dampproofing.
- Understand when why dampproofing is used and how it is to be installed.
- Know what type of material is typically used for dampproofing.
- Know what constitutes waterproofing and when it is required or recommended.
- Understand coverage and application of waterproofing.
- Know the requirements for grading adjacent to the structure.
- Understand the characteristics of maintenance for successful residential drainage systems.
- Understand the importance and different types of footing drains.

Troubleshooting

- Know what causes cracking.
- Understand the types of cracks.
- Know the causes and methods of reducing shrinkage/temperature cracking.
- Know what crack geometry implies.
- Know how to minimize cracking.
- Know when a crack is a concern.
- Know when honeycombing must be addressed and procedures for correcting.
- Know when projecting fins and irregularities should be removed or repaired.