USDA

**RURAL DEVELOPMENT**
Rural Housing Service
Rural Business – Cooperative Service
Rural Utility Service

*Dedicated to Strengthening and Serving Rural America*

Colorado State Office
655 Parfet Street, Room E100
Lakewood, Colorado 80215
(720) 544-2912 (Voice line)
(720) 544-2972 (FAX line)
(720) 544-2976 (TTY line)

**SUBJECT:** **ARCHITECTURAL TECHNICAL GUIDE 0002 (December 19, 2002)**
Professional Foundation Design and Certification:
Requirements for Single Family Housing New Construction and Additions

## PURPOSE:

The purpose of this technical guide is to extend Rural Development's continuing practice in Colorado of requiring that a professionally certified/designed foundation system be provided for all new SFH residences (as well as new additions to existing residences) financed under the authorities of the Section 502 Direct and Guarantee Loan Programs. This special certification requirement is in addition to the more general "final drawings and specifications" certification required by Subparagraph 1924.5(f)(1)(iii) of the Instruction. This certification must be accomplished by either a Colorado registered architect or engineer.

Past experience has shown that a variety of hazards posed by very unpredictable subsurface conditions across Colorado have often resulted in excessive repair costs to borrowers and the U.S. government.

## IMPLEMENTATION RESPONSIBILITIES:

All foundation systems pertaining to newly constructed residences and additions to existing residences financed under the Section 502 Rural Housing Program should be designed and certified by either a Colorado registered architect or engineer. This should become a loan making condition and should be determined a reimbursable expense, incurred by the general contractor as part of the total development cost. The general contractor should arrange for and itemize a maximum bid price for all professional services related to:

(1) Direct Loan Program:

(a) Producing three complete sets of registered architect or engineer sealed construction drawings and specifications (for the applicant, contractor, and Rural Development), pertaining only to the foundation system for the new residence or addition;

(b) Completing a related certification (*"Design Architect's/Engineer's Certification"*, Exhibit A, to this AN);

(c) Performing any work determined necessary by the design architect or engineer to verify actual subgrade conditions; and

(d) Accomplishing any redesign work necessitated by verified actual subgrade conditions.

(2) Guaranteed Loan Program:

(a) Producing two complete sets of registered architect or engineer sealed construction drawings and specifications (for the applicant and contractor), pertaining only to the foundation system for the new residence or addition;

(b) Completing a related certification (*"Design Architect's/Engineer's Certification"*, Exhibit A, to this AN);

(c) Performing any work determined necessary by the design architect or engineer to verify actual subgrade conditions; and

(d) Accomplishing any redesign work necessitated by verified actual subgrade conditions.

Prior to the obligation of Section 502 funds under the Direct Loan Program, the Rural Development loan manager should review and accept three identical and complete sets of foundation system construction drawings, specifications, and the Exhibit A certification. Particular attention should be focused on whether or not the foundation system drawings and specifications address special concerns as identified in items 1 through 8 of the *"Design Architect's/Engineer's Certification"* (concerns regarding whether or not a foundation subdrainage system would be necessary, for example). If these drawings and specifications appear inadequate in this regard, they should not be accepted without appropriate revision work.

Prior to the obligation of Section 502 funds under the Guarantee Loan Program, the Rural Development loan manager should insure the lender has provided adequate evidence that the above discussed foundation design and certification have been properly accomplished. This would constitute the final Rural Development oversight role in this respect.

Prior to the issuance of payment to the Contractor for any foundation system work-in-place under the Direct Loan Program, the Rural Development loan manager should inspect (as time constraints apply) the following five portions of the work to determine consistency with the Rural Development accepted foundation drawings and specifications. Rural Development loan managers are urged to coordinate site visits to inspect as many items as possible during a single trip. Form FmHA 1924-12, *"Inspection Report"*, should be completed for each trip and should document pertinent findings regarding the following inspected aspects:

(1) **Subgrades:** Prior to the placement of any permanent foundation components, actual subgrades should be studied to ascertain consistency with the soil type(s) and subdrainage features upon which the foundation design was based, as stated in the completed Exhibit A, *"Design Architect's/Engineer's Certification"*. If an unanticipated high water table were encountered, for instance, a previously accepted basement design might need to be reconsidered. Any significant inconsistencies should be brought to the attention of the contractor and the borrower.

(2) **Reinforcing Steel:** Prior to concrete pouring, reinforcing steel placement should be evaluated for: correct number (as specified), correct size (as specified), proper type (deformed rib bar vs. smooth bar), proper location (as specified), cleanliness (no mud or oil presence on the bars), unacceptable rusting (excessive), proper tying (to resist movement while pouring concrete), and minimum concrete cover (per *"Uniform Building Code"*). Any noteworthy inconsistencies should be brought to the attention of the contractor and the borrower.

(3) **Concrete Placement:** During and after concrete pouring, the following concrete placement aspects should be scrutinized: state of completion; aggregate content in concrete mix (a variety of aggregate sizes should be used); undesirable water addition to the concrete mix (added to improve the workability of the mix after pouring); serious cracking after concrete placement; excessive fall of concrete during placement (exceeding 3 feet vertically); quality and correctness of finishing (smooth or broomed finish); unpatched "honeycombing"; unacceptable cold weather placement (allowed to freeze or placed at temperatures below 40 degrees F without special measures taken); and evidence of proper curing methods (flooded with water, acceptable curing membrane, or acceptable curing compound). Again, any significant inconsistencies should be brought to the attention of the contractor and the borrower.

4. **Peripheral drain:** Prior to backfilling, peripheral subdrainage systems (if required in the certified design) should be analyzed for correctness of materials (as specified), overall workmanship, proper slope (as specified or minimum 1/8" fall per linear foot), and proper outfall (drain to daylight or storm sewer connection). Again, any noteworthy inconsistencies should be brought to the attention of the contractor and the borrower.

5. **Damproofing:** Prior to backfilling, damproofing should be inspected for: proper type (as specified), proper temperature placement (per manufacturer's instructions), complete coverage, (all areas below grade), and continuity (unbroken surface).

   Again, any significant inconsistencies should be brought to the attention of the contractor and the borrower.

Additional inspection guidance is provided in*, "Stage 1 Inspection Checklist: Foundation Systems"*, Exhibit B to this AN. The contents of this guide are intended to facilitate performing the Stage 1 inspection.

Events in the construction arena do not always proceed as planned, even with the best of intentions. The State Architect should be consulted for evaluation and recommendations regarding noncompliances, corrections, alternatives, conflicts, etc. In most cases, an acceptable mitigative solution can probably be found.

All requirements of this Administrative Notice should be fully explained to applicants, contractors, and lenders, as appropriate, prior to obligating funds.

DAVID W. RIGIROZZI
State Architect
USDA/Rural Development

Attachments: Exhibit A, *"Design Architect's/Engineer's Certification"*

Exhibit B, *"Stage 1 Inspection Checklist:  Foundation Systems"*

**Exhibit A**

# DESIGN ARCHITECT'S/ENGINEER'S CERTIFICATION

*(The following statement shall be attached to the professional architect or engineer stamped foundation drawings for the U.S. Department of Agriculture/Rural Housing Service (USDA/RHS) assisted residence in question.)*

Concerning the proposed residence to be located at _____, this foundation design (drawings and specifications dated_____) has been prepared from the results of a thorough investigation of site specific soils which have been determined to exhibit the following characteristics:

1. Dominant soil geological series name: _____.
2. Design soil bearing pressure (p.s.i.): _____.
3. Design frost depth (inches): _____.
4. Approximate depth to high water table: _____.
5. Sulfate resistant concrete necessary: _____yes _____no.
6. Foundation subdrainage system necessary: _____yes _____no.
7. Should lawn irrigation be practiced within 5 feet of the foundation? _____yes _____no.
8. Dominant ASTM Unified Soil Classification System soils group(s) (check, as applicable):

| | FOUNDATION BEARING LEVEL: | | SLAB BEARING LEVEL: |
|---|---|---|---|
| ___GW | Well-graded gravels, gravel-sand mixtures mixtures little or no fines. | ___GW | Well-graded gravels, gravel-sand little or no fines. |
| ___GP | Poorly graded gravels or gravel-sand mixtures, little or no fines. | ___GP | Poorly graded gravels or gravel-sand mixtures, little or no fines. |
| ___SW | Well-graded sands, gravelly sands, little or no fines. | ___SW | Well-graded sands, gravelly sands, little or no fines. |
| ___SP | Poorly graded sands or gravelly sands, little or no fines. | ___SP | Poorly graded sands or gravelly sands, little or no fines. |
| ___GM | Silty gravels, gravel-sand-silt. | ___GM | Silty gravels, gravel-sand-silt. |
| ___SM | Silty sand, sand-silt mixtures. | ___SM | Silty sand, sand-silt mixtures. |
| ___GC | Clayey gravels, gravel-sand-clay mixtures. | ___GC | Clayey gravels, gravel-sand-clay mixtures. |
| ___SC | Clayey sands, sand-clay mixture. | ___SC | Clayey sands, sand-clay mixture. |
| ___ML | Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity. | ___ML | Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity. |
| ___CL | Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays. clays. | ___CL | Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean |
| ___CH | Inorganic clays of high plasticity, fat clays. | ___CH | Inorganic clays of high plasticity, fat clays. |
| ___MH | Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts. | ___MH | Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic soils. |
| ___OL | Organic silts and organic silty clays of low plasticity. | ___OL | Organic silts and organic silty clays of low plasticity. |
| ___OH | Organic clays of medium to high plasticity, organic silts. | ___OH | Organic clays of medium to high plasticity, organic silts. |

The necessities of using special foundation design features to meet the U.S. Department of Agriculture, Rural Housing Service's development standards (*Uniform Building Code*, latest Edition), applicable state and local codes and ordinances, soil hazard alleviation, and good professional practice have been addressed in this design.

SIGNED:_____

COLORADO LICENSE NO.:_____

FIRM NAME:_____

FIRM ADDRESS:_____

FIRM TELEPHONE NO.:_____

DATED:_____

*(WARNING: Title 18 U.S.C. 101, provides in part that whoever knowingly and willfully makes or uses a document containing any false, fictitious, or fraudulent statement or entry, in any matter in the jurisdiction of any department or agency of the United States, shall be fined not more than $10,000 or imprisoned for not more than five years or both.)*

*(NOTE: This document may be issued to non-USDA/RHS personnel and may be reproduced without prior authorization from USDA/RHS.)*

**Exhibit B**

# STAGE 1 INSPECTION CHECKLIST: FOUNDATION SYSTEMS

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*[The contents of this report are confidential and are the property of the U.S. Department of Agriculture/Rural Housing Service (USDA/RHS). Any other use or reproduction without the express authorization of USDA/RHS is strictly prohibited. If this report is included in the borrower's case file, it will not be released unless so authorized through a Freedom of Information or Privacy Act request. The applicant/borrower should not be asked to sign or review this checklist. Also, it is to be used as a guide only and shall not be considered as a development standard. Appropriate observations and comments should be documented in the space before and following each item.*

*This report is based on a visual inspection only in easily accessible areas and; therefore, cannot and does not guarantee that defects, whether structural, mechanical, or otherwise, do not exist.]*

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**A. PERMITS:**

_____ Building permits secured? _____
_____ Well permit secured? _____
_____ Water tap secured? _____
_____ Septic/drain field permit secured? _____
_____ Sewer tap secured? _____
_____ Other: _____

**B. INSURANCE:**

_____ Builder's risk policy in effect for full contract price and full construction period? _____
_____ Workman' compensation fund policy in effect for general contractor's employees? _____
_____ Other: _____

**C. EQUAL EMPLOYMENT OPPORTUNITY AND LABOR COMPLIANCE:**

_____ Form FmHA 400-6, "Compliance Statement", secured for all contracts/subcontracts > $10,000? _____
_____ Form AD-767, "Equal Employment Opportunity Contract Compliance Notices", attached to all contracts/subcontracts > $10,000? _____
_____ 41 CFR 60 - 1.4 (a) & (b), "Equal Opportunity Clause", attached to all contracts/subcontracts > $10,000? _____
_____ U.S. Department of Labor, poster, WH Publication 1321, "Notice to All Employees", properly displayed on site for contracts/subcontracts > $10,000? _____
_____ U.S. Department of Agriculture, poster, Form AD-475-C, "And Justice for All", properly displayed on site for contracts/subcontracts > $10,000? _____
_____ Evidence of discrimination or unsafe work practices? _____

**D. GENERAL SITE WORK:**

_____ Site neat? _____
_____ Existing trees to be saved properly protected? _____
_____ Temporary positive drainage provided? _____
_____ Property lines staked? _____
_____ Materials for which payment is requested are properly stored within the property lines? _____
_____ Topsoil stripped and stockpiled? _____
_____ Other: _____

**E. EXCAVATION WORK:**

_____ Sides stabilized? _____
_____ Bottom free of debris at locations for concrete pours? _____
_____ Stumps located under foundation bearing points removed to minimum 12" below grade? _____
_____ Other: _____

**F. BACKFILL WORK:**

_____ Placed in lifts under 12" thick? _____
_____ No topsoil used under foundation bearing locations? _____
_____ No frozen fill material placed? _____
_____ Termite treatment scheduled prior to backfilling? _____
_____ Backfilling scheduled after attachment of floor framing to foundation? _____
_____ No cobbles exceeding 6" in dimension in backfill material? _____
_____ Other: _____

**G. UTILITIES WORK:**

_____ Specified materials/sizes installed? _____
_____ Water lines installed below frost depth? _____
_____ Water piping not installed in or below gravel? _____
_____ Sewer lines at minimum 1/8" per foot slope (preferably 1/4" per foot) to connection? _____
_____ No joints in water lines below slabs? _____
_____ Sewer lines within 6' of water lines are located minimum 12" below water lines? _____
_____ No defective (i.e. ruptured) appearing materials used? _____
_____ Only new materials used? _____
_____ All piping sleeved through foundation walls and slabs? _____
_____ All materials dielectrically compatible (i.e. copper-to-brass-to steel)? _____
_____ Steel lines underground coated for corrosion protection? _____
_____ Other: _____

**H. FOOTING, PADS, FOUNDATION WALLS, AND SLABS:**

_____ Forms level, straight, and true, with tight fitting joints? _____
_____ Uniform form pour width? _____
_____ Clean form contact surfaces? _____
_____ Wood forms wetted down immediately prior to pouring? _____
_____ Forms not removed prematurely? (See table on the next page)_____

| Average Daily Temperature (degrees F) | Minimum Period of Protection (days) | |
|---|---|---|
| | Cement Type | |
| | I | II |
| 40 to 100+ | 7 to 2 | 10 to 3 |
| 24 to 39 | 14 | 20 |
| 16 to 23 | 21 | 28 |
| 16- | 29 | 35 |

_____ Dimensions per contract documents? _____
_____ Correct number, size, and location of reinforcing steel? _____
_____ Reinforcing steel clean, not oily, and relatively free of surface rusting? _____
_____ Reinforcing mesh located in middle of slabs? _____
_____ Reinforcing bars correctly tied? _____
_____ Reinforcing bars not bent below minimum bend diameter (6 x bar diameter)? _____

_____ Minimum concrete cover provided for reinforcing bars? (see table below) _____

| Application | Minimum Concrete Cover (inches) |
|---|---|
| **Concrete in contact with earth :** | **3** |
| **Concrete exposed to weather (<#6):** | **1-1/2** |
| **Concrete beams and columns:** | **1-1/2** |
| **Other applications:** | **3/4** |

_____ Aggregates well graded? _____
_____ Only potable water used in on-site mixed concrete? _____
_____ Water not added to plant mixed concrete for workability? _____
_____ Concrete placed within 45 minutes of mixing? _____
_____ Concrete not dropped over 3'? _____
_____ Concrete not allowed to freeze in first 24 hours? _____
_____ Concrete maintained at minimum 40 degree F for first two weeks? _____
_____ Slab kept moist by an approved method after completion of finishing? _____
_____ Proper slab finish? _____
_____ Excess concrete not dumped on the site? _____
_____ Expansion joint (1/2" felt or equivalent) installed at slab perimeter? _____
_____ Column and utility slab penetrations sleeved? _____
_____ Control joints (1/4" sawcut or equivalent.) provided to subdivide slab in max. 200 sf areas? _____
_____ Foundation damproofed prior to backfilling, if basement construction? _____
_____ Evidence of water table problems? _____
_____ Other: _____

## I. ALL-WEATHER WOOD FOUNDATION SYSTEMS:

_____ Construction level, straight, and true, with tight fitting joints? _____
_____ Pressure-treated lumber and plywood used, as specified? _____
_____ Polyethylene film on exterior side of foundation wall, if galvanized nails used? _____
_____ Stainless steel, aluminum, copper nails used, if polyethylene film not provide? _____
_____ Foundation damproofed, if polyethylene film not provided? _____
_____ Nailing type and spacing as specified? _____
_____ Lumber and plywood thicknesses as specified? _____
_____ Other: _____

## J. FOUNDATION SUBDRAINAGE SYSTEMS:

_____ Sizes, types, and locations of materials as specified? _____
_____ Perforated pipe used against the foundation wall? _____
_____ Solid pipe used elsewhere? _____
_____ Entire system sloped to drain at minimum 1/8" per foot, or steeper, if specified? _____
_____ System drains by gravity either to daylight or to an underground or surface storm drainage system? _____
_____ Perforated pipe set in trench of gravel, as specified? _____

_____ Perforated pipe located below bottom of footing outside the 45-degree structural loading line? _____
_____ Gravel trench wrapped in filter fabric, if specified? _____
_____ Other: _____

SIGNED: _____

TITLE: _____

DATE: _____