

(September 8, 1994)

MEMORANDUM

TO: State Capital Project Coordinators
Designers of State Projects

FROM: Speros J. Fleggas, PE

SUBJECT: Design Procedures Policy for State-Owned Modular Buildings

DATE: September 8, 1994

In recent years, modular buildings have grown in size and sophistication. They are sometimes viable alternatives to other forms of construction, particularly when speed of construction and/or portability are essential criteria for a specific project.

It is this increased sophistication, combined with ever more stringent code requirements, that prompt this office to formulate policy and guideline criteria for State-owned modular buildings in an effort to assure that the expenditure of State monies yields functional and code-complying facilities.

Previously, the Division of Purchase and Contract issued specifications, solicited bids, and awarded purchase contracts for modular buildings. Site utilities and site layouts for modular buildings were designed by the owning agency, either by in-house personnel or by a contracted consultant. The Third Party Certification of the modular unit itself was seen as evidence of code compliance of the architectural, structural, mechanical, and electrical systems of the building. Foundations were usually constructed in accordance with the manufacturer's standard details, again bearing the stamp of the Third Party engineering firm.

The above procedure has proven generally successful, but the growing complexity of the buildings and related regulations have shown the need for the continuous involvement of a qualified design professional throughout the design, procurement, and construction process. Such involvement is vital to insure that specific requirements of special usages are addressed thoroughly and communicated clearly to the modular building manufacturer. Also, the site layout and utilities must reflect the occupancy of the unit and fully comply with pertinent code requirements.

In consideration of the above, henceforth it shall be the policy of the State Construction Office that all State-owned (new or used purchases) modular buildings shall be considered as equivalent to other forms of construction and subject to the procedures required for any other capital improvement projects. Specifically, any project involving the purchase of a modular building will require the continuous involvement of a registered design professional employed as stipulated in Section 107 of the North Carolina Construction Manual. Modular buildings

will be specified as part of the general contract and will be supplied by the contractor as any other construction material or system.

Owning agencies, capital project coordinators, and designers are advised that the selection of modular construction as a primary building system shall reflect a thorough analysis of the functional requirements of the specific project, the State criteria established for capital projects, and the ability of modular construction to meet these requirements in a cost effective manner. The utilization of modular construction to circumvent steps in the State Construction Office process or to mitigate schedule difficulties caused by inadequate planning is unacceptable. Please be aware that the definition of a Temporary Construction Building as provided in Section 201 of Volume VIII (Modular Construction Regulations) of the North Carolina State Building Code shall be strictly interpreted to apply solely to field offices of contractors or other entities directly engaged in building construction activities.

Leased modular buildings are not capital projects and do not involve the State Construction Office. Similarly, should an agency wish to purchase a modular building which has previously been leased and utilized on state property, such purchase will involve the State Property Office and the Division of Purchase and Contract. The State Construction Office will provide facility evaluation services only upon the request of the State Property Office.

The intent of the attached criteria is not to establish prescriptive requirements for the use of modular construction. Instead, the intent is to provide general direction and point out potential pitfalls.

State Construction Office

CRITERIA FOR MODULAR BUILDINGS

1. INTRODUCTION

It shall be the policy of the State Construction Office that all State owned (new or used purchases) modular buildings shall be considered as equivalent to other forms of construction and subject to the procedures required for any other capital improvement projects. Modular buildings will be specified as part of the general contract and will be supplied by the contractor in the manner of any other construction material or system.

2. SPECIFICATION OF THE MODULAR BUILDING

The design of the various building components and general systems is accomplished by the Third Party engineering firm. This design is to be facilitated by the establishment of clear specifications for floor and roof live loads, wind load, electrical loads, heating and cooling loads, etc. The owner's design professional is to tailor the specifications to the specific project utilizing an effective working knowledge of the conventions, limitations, and capabilities of the modular building industry. The Designer is expected to be knowledgeable of the provisions of Volume VIII (Modular Construction Regulations) of the North Carolina State Building Code.

3. SITE EVALUATION

As with any other State project, the project site must be evaluated for flood plain involvement per Section 320 of the North Carolina Construction Manual.

The site must be accessible to the handicapped as required by the North Carolina State Building Code and the Americans with Disabilities Act (ADA). Necessary improvements such as accessible parking and sidewalks must be addressed by the design.

Site grade contours must be evaluated for adequate drainage with respect to the building. Final grades must prevent the accumulation of water beneath or around the modular building.

In positioning the unit on the site, the designer must consider all separation requirements of the North Carolina State Building Code.

4. **SITE UTILITIES**

The design must fully define all utilities necessary to support the modular building. These utilities include electrical power, sanitary sewer, water supply, and any other specialized connections such as computer data sources.

5. **FOUNDATIONS**

Modular buildings are usually supported on numerous lightly loaded and closely spaced piers and spread footings. Modular building manufacturers are required to submit standard foundation details bearing the Third Party Certification to the Modular Building Section of the NC Department of Insurance. Designers of foundations for modular buildings may use these designs in lieu of designing a project specific foundation system **provided that:**

- a. The designer has carefully reviewed the certified foundation plans of the acceptable modular building manufacturers.
- b. The stated design loads for the certified foundations meet current Code requirements for the specific project.
- c. The site contours do not result in pier heights in excess of the design parameters of the certified foundation plans.

The designer is encouraged to consider alternative foundation designs that may be more efficient for particular site conditions, provided that these designs provide support to the modular building structure in a manner that is consistent with the manufacturer's chassis framing requirements.

All foundation systems must provide positive anchorage to resist net wind uplift forces. This anchorage must satisfy the requirements of Section 1201.1.1 of the North Carolina State Building Code.

6. **EXTERIOR STEPS AND RAMPS**

Some modular building manufacturers offer generic plans for exterior steps and ramps that bear the Third Party Certification for the State of North Carolina. Designers are cautioned that such plans may only be used after a thorough project-specific evaluation of these plans considering the site contours and the final elevations of these structures above grade.

7. **PLUMBING**

Domestic water systems should generally require only one point of connection by the installing Contractor. Cold and hot water distribution piping is usually furnished entirely by the modular

building manufacturer, along with field-interconnections between multiple units. The installing Contractor shall provide a domestic water supply shut off valve in an accessible location, preferably in an underground valve box adjacent to the modular building. Consideration should be given to the provision of insulation for water supply piping exposed beneath the modular building.

Pressure testing and disinfection of the entire water supply and distribution system shall be the responsibility of the installing Contractor. Leaks identified within the modular building distribution system shall be repaired by the Contractor responsible for the provision of the modular building.

Typically, the drains from the water heater T&P relief valve and the water heater drain pan are stubbed through the floor and terminated beneath the building. The installing Contractor shall be required to extend both drains full size, through the building skirt or foundation wall, to provide visible indication of discharge.

The design must show all points of sewer connection to the modular building. The routing of pipe, including connection to the site sanitary sewer system, must be indicated. One waste connection is typically required at each toilet group and each isolated fixture; however, designers should closely coordinate all required connections with the modular building manufacturer.

8. HVAC

Using Agencies should recognize that modular buildings are typically provided with packaged single-zone constant volume HVAC systems offering limited thermal control. Careful consideration should be given to the occupant comfort and general ventilation requirements prior to embarking on a project utilizing modular building construction.

9. ELECTRICAL

The electrical design must show the proposed electrical service arrangement, including all transformers, raceways, cabling, and other essential equipment necessary for a complete installation. The service arrangement must be coordinated with the existing site conditions and should accommodate any future provisions to support the overall master plan for the site. Consideration must be given to any special equipment or unique loads to be served to ensure that all necessary utilization voltages are provided.

Prior to energizing the electrical system, the interrupting rating of the main breaker must be confirmed to meet or exceed the fault current available at the line terminals of the service equipment for the specific project site.

Water heaters and HVAC equipment shall be provided with readily accessible electrical disconnects. The branch circuit breaker shall be permitted to serve as the disconnecting means where the circuit breaker is within sight of the equipment served.

All secondary conductors shall be copper with THHN/THWN insulation.

10. INSPECTION OF THE WORK

As for other capital projects, the Designer shall visit the jobsite and inspect the construction as stipulated by Articles 1-13 (f) and (g) of the Standard Form of Agreement Between Owner and Designer. A final inspection shall be performed as required by Sections 111.8 and 205.4 of the North Carolina Construction Manual. The Third Party Certification of the modular building eliminates the need for the Designer to inspect the manufacture of the modular building.