

## DESIGN AND CONSTRUCTION REQUIREMENTS FOR RELOCATABLE BUILDINGS AND MODULAR ELEVATOR TOWERS

**Disciplines:** Structural

**History:**

Revised 10-19-17

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**PURPOSE:** This Interpretation of Regulations (IR) defines special design, construction and placement requirements for relocatable buildings and modular elevator towers.

The provisions of this IR apply to 2016 pre-check (PC) plans for new relocatable buildings and modular elevator towers, and for other new relocatable construction, alteration or relocation of existing certified buildings and elevator towers submitted to DSA under the 2016 California Building Code (CBC) after January 1, 2017. The provisions of this IR are optional for projects submitted prior to January 1, 2017.

**GENERAL:** All portions of a relocatable school building and a modular elevator tower are to conform to all requirements of the building standards adopted for public schools in Title 24 except as specifically described in this IR. The State Fire Marshal regulations and the regulations for accessibility are to be followed without modification. Each time relocatable buildings are moved, plans shall be submitted to the Division of the State Architect (DSA) for approval.

**1. SITE PLAN REQUIREMENTS:** A site plan is required which includes all of the following:

- Fully dimensioned location of the proposed relocatable building(s) in relation to other buildings on the site. Show all buildings and structures on the site and their corresponding DSA application numbers.
- Elevation of finished and original grade at each corner of each building and the elevation of the finished floor. Show elevation of adjacent exterior finished grade at each corner of the building if different from foundation grade, and the elevation of the top and bottom of stairs and ramps.
- Location of means of access and egress to and from each building including access compliance requirements and location of safe dispersal area(s).
- Location of all utilities, including underground fire alarm conductors serving each building, from the source to the point of connection. Include a signed statement, on the drawings, from the appropriate responsible engineer indicating their verification of the location of the utilities shown as existing and that their capacity is adequate for the additional load. If the source of utilities is in or on an existing building, show the DSA application number under which the building was approved.
- Approval (sign-off) of the Local Fire Authority for water requirements, fire department emergency vehicle access and a statement clarifying whether or not the project is located in a very high hazard fire severity zone as identified by CAL FIRE (California Department of Forestry and Fire Protection).
- Where automatic fire sprinklers are required to be installed in the relocatable building, the site plan shall include the following:
  - Water flow test data.
  - Underground fire water source, routing, pipe type and size.

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- Underground pipe thrust block or restraint types and locations.
- Post indicator valve and fire department connection locations.
- Reference to details for seismic expansion loops for utility connections between buildings.

**2. BASIC REQUIREMENTS FOR ALL RELOCATABLE BUILDINGS AND ELEVATOR TOWERS:****2.1 Protection Against Deterioration:** The following measures shall be taken to protect the building from deterioration due to dry rot, termite damage and rust:

- Drainage shall be provided to prevent water from ponding beneath buildings.
- Under-floor ventilation shall be provided in accordance with California Building Code (CBC) Section 1203.4.
- Cold-formed steel structural members shall have a material thickness not less than 33 mils. and shall be protected by rust inhibitive coating.
- Steel deck diaphragms shall have a material thickness not less than 20 gauge and shall be protected by galvanizing to a minimum coating weight of G60.
- The minimum thickness of non-structural steel roof decking and wall siding is 26 gauge, protected with a durability coating.
- The under-floor clearance at all points on all building floor framing members shall be no less than two inches regardless of the measures taken to prevent deterioration.
- Fasteners in contact with preservative-treated wood shall be hot-dipped zinc-coated galvanized or have equivalent corrosion resistance.

**2.2 Clearance From Grade to Untreated Wood Construction:** This section specifies the requirements for maintaining clearance from grade to untreated wood construction. Where the specified clearances cannot be provided, the wood shall be naturally durable or preservative-treated.**2.2.1 Under-floor Clearance:** Under-floor clearance and the treatment of wood members (including the floor sheathing) in close proximity to exposed ground shall meet the requirements of CBC Section 2304.12.1.1. If a rat slab is provided within the perimeter of the foundation or the building is placed on pavement, the minimum clearance requirements of CBC Section 2304.12.1.1 for providing naturally durable or preservative pressure-treated wood need not be met.**2.2.2 Adjacent Exterior Grade Clearance:** Clearance from exterior grade to untreated wood construction, including but not limited to, floor framing, floor sheathing, wall framing and wall sheathing shall meet the requirements of CBC Section 2304.12.1.2.

**Exceptions for Buildings With Floor Area 2,160 sf or Less:** The following exceptions apply to buildings with a floor area of 2,160 square feet or less:

- The minimum clearance requirements of CBC Section 2304.12.1.2 for providing preservative-treated floor sheathing need not be met.
- The minimum clearance requirements of CBC Section 2304.12.1.2 for providing naturally durable or preservative treated wall framing and wall sheathing need not be met.

See Section 2.3 for the requirements for a waiver of durability.

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Where the surface of the adjacent exterior grade is higher than the bottom of the floor joists on any side of the building, the following requirements shall also be met:

- All wood in the substructure and floor framing shall be naturally durable or preservative-treated.
- Flashing, concrete mow strip/walkway and concrete cover shall be provided as shown in Figure 1.

**Note:** For relocatable buildings greater than 2,160 square feet, the flashing and mow strip/walkway shown in Figure 1 shall be provided in addition to meeting the requirements of CBC Section 2304.12.1.2.

**2.3 Request for a Waiver of Durability:** A request for a waiver of durability will only be accepted for buildings 2,160 square feet or less and is required when either of the following conditions exists:

- A non-permanent foundation is used.
- A permanent exterior foundation is used and the distance from the exterior exposed ground or pavement to untreated wood wall framing (including the wall sheathing) is less than required by CBC Section 2304.12.1.2.

**Note:** Use of the sheet metal flashing shown in Figure 1 does not relieve the owner from the requirement for a waiver of durability.

The request for a waiver of durability may be made on the application form or by letter from the applicant or an agent of the applicant. A request for waiver from the building manufacturer or leasing company will not be accepted. This written request shall be submitted to DSA before the construction documents are approved by DSA.

**2.4 Conditional Approval:** When a request is made for a waiver of durability, the applicant thereby acknowledges that a conditional approval is acceptable.

The conditional approval will state that the approval is based on modified durability requirements. The procedures for processing conditional approval are outlined below and are intended to follow the intent of California Education Code (CEC) Sections 17292 and 17405.

The DSA project approval letter will indicate, for conditional approval, that “the owner must periodically inspect for, and correct, deterioration in the building in order to maintain it in a safe condition,” and the final DSA certification letter will note that a “waiver of durability” was requested.

**2.5 Electrical, Mechanical and Plumbing:** All utility installations shall conform to the requirements of Title 24, Parts 3, 4 and 5. Provisions shall be made for grounding the electrical system and equipment for each individual building and this shall be shown on the drawings.

A bonded common grounding electrode shall be provided for each metal building, exposed metal frame, ramp, stair and the electrical system per DSA [IR E-1:Grounding of Buildings Fabricated Off-Site](#).

A means of access shall be provided per CBC Section 1209.1 to all under-floor utilities such as electrical, mechanical and plumbing.

**2.6 Permanent Foundations:** Permanent foundation design shall conform to all requirements of Title 24, Part 2. Foundation walls or pedestals may be constructed of reinforced concrete or reinforced, fully grouted, concrete block masonry. The maximum

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allowable soil bearing pressure for permanent foundations, designed in accordance with 2016 CBC Section 1808A, shall not exceed 1500 psf, unless substantiating soil data for a higher value is submitted to, and approved by, DSA. Provisions shall be made to transfer the required lateral forces to grade level.

**2.6.1 Modular Elevator Towers:** Permanent foundations are required for all modular elevator towers.

**2.6.2 Relocatable Buildings:** A permanent foundation is required for a relocatable building when any of the following conditions is met:

- The height between the underside of the lowest floor framing members and the supporting grade exceeds 18 inches.
- The building floor area exceeds 2,160 square feet.
- The building is more than one story in height.

A non-permanent foundation, meeting the requirements of Section 4, may only be utilized when a permanent foundation is not required by this section.

**Note:** A minimum connection between isolated piers and the building floor structure is required in accordance with ASCE 7-10, Section 1.4.4.

### **3. SPECIAL REQUIREMENTS FOR ALL RELOCATABLE BUILDINGS AND ELEVATOR TOWERS:**

**3.1 Building and Elevator Tower Module Identification:** Each building module and elevator tower module shall be identified as follows:

**3.1.1 Building Module Identification:** The manufacturer or builder shall mechanically fasten two permanent metal identification labels on each building module; one on the exterior and the other located on the interior frame above the ceiling, at the end of the module. The labels shall show the DSA application number and CBC edition under which the building construction was authorized, the manufacturer or builder's name, the serial number, the design climate zones (per Title 24, Part 6, Section 140.3), the design live loads for the roof and floor framing, the design wind speed and exposure category and seismic design parameter  $S_s$ . Refer to Figure 2 for a sample identification label. The locations and mock-up image or figure of the identification labels shall be shown on the building plans.

For buildings that are manufactured in-plant, verified reports are required as specified in DSA Procedure [PR 13-01: Construction Oversight Process](#) and shall be attached to the building at the time of transport.

**3.1.2 Elevator Tower Module Identification:** For elevator towers that are manufactured in-plant, the elevator tower manufacturer or builder shall mechanically fasten two permanent metal identification labels on each tower, one on the exterior and the other located on the interior wall adjacent to the door opening. The labels shall show the DSA application number and CBC edition under which the building construction was authorized, the manufacturer or builder's name, the serial number, the design climate zones (per Title 24, Part 6, Section 140.3), the design live loads for the roof, the design wind speed and exposure category, and seismic design parameter  $S_s$ . Refer to Figure 2 for a sample identification label (the "Design Floor Live Load" is not required for elevator tower labels). The locations and mock-up image or figure of the identification labels shall be shown on the PC building plans.

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For elevator towers that are manufactured in-plant, verified reports are required as specified in PR 13-01 and shall be attached to the building at the time of transport.

- 3.2 Floor Live Load and Roof Snow Load Posting:** When buildings are designed and constructed for a floor live load exceeding 50 pounds-force or for any roof snow load, the building manufacturer shall post signs in a conspicuous location on each building depicting the design floor or roof loads in accordance with Section 106.1 of Title 24, Part 2. The Building Module Identification Labels required by Section 3.1.1 shall not be construed as meeting this requirement.
- 3.3 Building Placement:** Individual buildings may be placed adjacent to each other provided that any building will be capable of being relocated without affecting adjacent buildings and building area does not exceed limits in CBC Table 503 with allowable increases. The clear separation between buildings shall not be less than four inches and the joint may be covered with flashings or other materials that do not prevent differential movement of the buildings. Details of covered joints shall be shown on the drawings. Details shall be provided for all utilities (e.g., fire sprinklers, etc.) passing between seismically separated buildings (flexible joints, loops, etc.), that can accommodate the seismic relative displacement in accordance with ASCE 7-10, Section 13.3.2.
- 3.4 Fire Alarm and Fire Sprinkler Requirements:** Fire alarm and fire sprinkler requirements for relocatable buildings depend on building use, project funding source, the date on which the school campus was initially submitted to DSA for approval, and other factors. Fire alarm and fire sprinklers are required in accordance with CEC Sections 32001 and 17074.50 through 17074.56, and CBC Chapter 9. Refer to DSA Policy [PR 11-01](#) (Flood Design and Project Submittal Requirements) and Sections 5.5 and 5.6 below for additional requirements.

- 4. NON-PERMANENT FOUNDATIONS:** A non-permanent foundation may only be utilized for relocatable buildings when all of the following requirements are met:

- The relocatable building is a single-story structure.
- The floor area of an individual building shall not exceed 2,160 square feet.
- The distance between the underside of the lowest floor framing member and the top of grade under the building shall not exceed 18 inches.

If any one of these conditions is not met, a permanent foundation must be provided in accordance with Section 2.6 of this IR.

When a non-permanent foundation is utilized, the applicant shall initiate a request for waiver of durability in accordance with Section 2.3 of this IR at the time the application for plan approval is filed.

The following modifications to provisions are permitted for non-permanent foundations:

- A wood sill plate of foundation grade redwood or preservative pressure-treated sawn lumber may bear directly on soil or paved surface. Grass or turf shall be cleared to bare soil under the entire area of the building. The wood sill plate may support wood cripple studs, posts, or continuous blocking and sheathing which need not be treated.
- Isolated piers and continuous footings may be constructed of stacked wood members nailed together with hot-dipped zinc-coated galvanized or equivalent corrosion resistant nails. Nailing shall be sufficient to transfer the required lateral forces to grade level. The bottom layer of wood shall be foundation grade redwood or preservative pressure-treated sawn lumber.

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**Note:** A minimum connection between isolated piers and the building floor structure is required in accordance with ASCE 7-10, Section 1.4.4.

- Metal frame jacks, specifically designed or justified by testing for the project, may be used as isolated piers. Metal jacks shall be attached to the structure by mechanical means. Overturning and bending forces due to vertical and lateral loads are to be resisted in accordance with the applicable provisions of Title 24, Part 2.
- The maximum bearing pressure for wood foundations bearing on soil or paving shall not exceed 1000 psf, unless substantiating soil data for a higher value is submitted to and approved by DSA. The footings and foundation structure shall be capable of resisting all loads specified in Title 24, Part 2. Unless the individual modules of the building are positively fastened together at intervals not exceeding 10'-0" o.c. at the roof and floor level, each module and its diaphragm shall be designed as a separate unit.
- The foundation shall be designed to prevent sliding on the supporting surface by attaching the wood foundation plates for the building, ramps and stairs to the ground with restraining devices. An acceptable design would incorporate one-inch diameter Standard Weight (1.315" actual O.D.) hot-dipped galvanized pipes or one-inch diameter solid steel rods spaced at not more than 10'-0" o.c. One pipe/rod shall be located a maximum of two feet from each corner in both directions, and a minimum of two pipes/rods per discontinuous foundation strip is required. Pipes shall penetrate into soil and/or paving a minimum of 12" measured vertically. Alternate or equivalent designs, when provided with structural calculations and details, will be considered.
- Wood foundations utilizing pipe anchors described above to prevent sliding are deemed acceptable by DSA to resist uplift resulting from code-defined load combinations based upon historical performance during seismic and wind events.
- The crawl space and access opening requirements of CBC Section 1209.1 need not apply to relocatable buildings utilizing non-permanent foundations.

- 5. RELOCATION OF EXISTING RELOCATABLE SCHOOL BUILDINGS:** When DSA certifies relocatable buildings as part of a project, the certification applies only to the building locations shown on the DSA-approved site plans for that project.

**Exception:** In the case of "stockpile" projects, certification applies only to the construction of the buildings themselves. A separate DSA application is required to relocate the buildings from the stockpile to an actual site before the buildings can be used.

- 5.1 Relocation:** The California Administrative Code (CAC) defines relocation as the physical moving of any certified building either as a single unit or in parts from its original location to a new location on the same campus or on a different campus.

The filing fee for a relocation project shall be based on the estimated value of the work shown on the plans and specifications, including moving costs. The value of the existing buildings need not be included.

- 5.2 Alteration:** Alteration is defined in the CAC as any construction or renovation to an existing certified building other than reconstruction, rehabilitation, or addition. The relocation or moving of an existing certified school building is considered to be an alteration requiring filing of the plans and specifications with, and certification by, DSA.

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**Note:** For purposes of relocating a relocatable building in accordance with this section, the project scope shall be identified as “Relocation of:” on the Application for Approval of Plans and Specifications, Form [DSA 1](#).

Any alterations to the existing building, beyond the work required to place the building at the new site using the original approved building drawings, shall comply with Title 24 requirements in effect at the time the project application is received by DSA. Such alteration shall be identified as “General Alteration to:” on the Application for Approval of Plans and Specifications, Form [DSA 1](#).

**Exception:** The following requirements may be triggered regardless if the original DSA approved building drawings are used:

- See Section 6 for requirements for CALGreen Code compliance.
- See CBC Section 11B-202. Accessibility requirements may be triggered. Consult with the applicable DSA Regional Office if any questions arise.

**5.3 Additional Requirements and Clarifications:** This section contains additional requirements and clarifications for building relocation projects.

**5.3.1** Complete site plans for the new site shall be provided to allow verification of site specific design parameters; and to facilitate review of electrical, mechanical, utility, fire and panic work as well as access compliance.

- Plans shall indicate the application number of the original DSA certified project which included the construction of the buildings.
- Plans shall indicate whether the buildings will be moved as complete buildings, or separated into modules and then reconnected at the new location.

**5.3.2** The original DSA-approved relocatable building drawings are not required to be updated to current code unless the design parameter limits below are exceeded.

The structural design parameters for the new site (wind, seismic, snow, etc.) shall be within the design parameter limits indicated on the original design drawings and verified based upon the building code under which the building was originally approved and certified. Changes that have occurred in subsequent building codes since the building was originally approved and certified, such as wind load amplifications (i.e., topographic wind load factor [ $K_{zt}$ ]), or higher ground motion parameters (such as near source factors, higher  $S_s$  cap, etc.) need not be considered for this analysis. If the design parameter limits are exceeded, then the building shall be analyzed and rehabilitated as necessary in accordance with current Code for the increased loading per Title 24, Part 1, Section 4-309(c).

**Exception:** If the existing building has deteriorated, or is not in compliance with the building code in effect at the time of its construction, it must be rehabilitated in accordance with the current building code.

**5.3.3** When a relocated building is placed at a new site, the underfloor-to-grade clearance to non-preservative treated floor sheathing in the existing relocatable building may be less than 18 inches.

**5.3.4** In addition to the plans for the new site, the project submittal must include plans and details of the existing relocatable building as follows:

- DSA-approved drawings of the existing relocatable building shall be submitted with the relocation application. The drawing set shall include all plans and details

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necessary to place the building at the new project site, but shall include as a minimum, the foundation plan and foundation construction details\*, superstructure to foundation connection details and module interconnection details (if required to reassemble multiple modules). In lieu of submitting the minimum sheets necessary to place the building at the new site, the design professional may submit the complete set of existing building drawings with the application package.

**\*Note:** Building placement at the new site may be accomplished using DSA “Pre-Checked” (PC) foundation plans and details approved for use with the building being relocated, and designed to comply with Title 24 requirements in effect at the time the project application is received by DSA. Placing the building on a current code compliant pre-checked foundation does not trigger a requirement to bring the existing building into compliance with Section 2.2.1 of this IR.

- All original DSA-approved relocatable building drawings submitted with the building relocation will be stamped as part of the approval for relocation.
- 5.3.5** All fire sprinkler and fire alarm devices are required to be tied into the campus fire alarm system per California Fire Code, Section 903.4.
- 5.3.6** Automatic fire sprinkler systems (AFSS) shall be added to buildings (if not already installed) as required. The structural framing shall be reviewed/reinforced as necessary to support the weight of the new AFSS; complete details for any necessary reinforcement of framing shall be provided.
- 5.3.7** If high-strength bolts (i.e., ASTM A325) are required, plans shall clearly indicate that new high-strength bolts are required; existing high-strength fastener assemblies shall not be re-used.
- 5.3.8** The climate zone of the new building site shall comply with the climate zones indicated on the DSA-approved PC documents.
- 5.4 Deterioration or Existing Non-Compliant Construction:** The following note shall be placed on the drawings:
- “If any condition is discovered which, if left uncorrected, would make the building non-compliant with the requirements of the edition of the CBC in force at the time of **original** construction, the condition must be corrected in accordance with **current** code requirements. A construction change document, or a separate set of plans and specifications detailing and specifying the required repair work shall be submitted to and approved by DSA before proceeding with the repair work.”
- 5.5 Relocation of Uncertified Relocatable Buildings:** Projects that include relocation of existing buildings which are part of a previously uncertified project, defined as “Relocation of” on the form [DSA 1](#) (Application for Approval of Plans and Specifications), are only permitted for the relocation of buildings for which the original building construction is compliant. Evidence of relocatable building compliance can be either DSA’s “Certificate of Compliance” letter for the original project wherein the building was constructed, or a final verified report from the in-plant inspector for the original construction of the buildings. Refer to DSA’s [Project Certification Guide](#) (Section 11 and Appendix D) for methods of addressing certification issues.
- 6. COMPLIANCE WITH THE CALIFORNIA GREEN CODE (TITLE 24, PART 11):** PC designs submitted to DSA must comply with the mandatory measures of the current California Green

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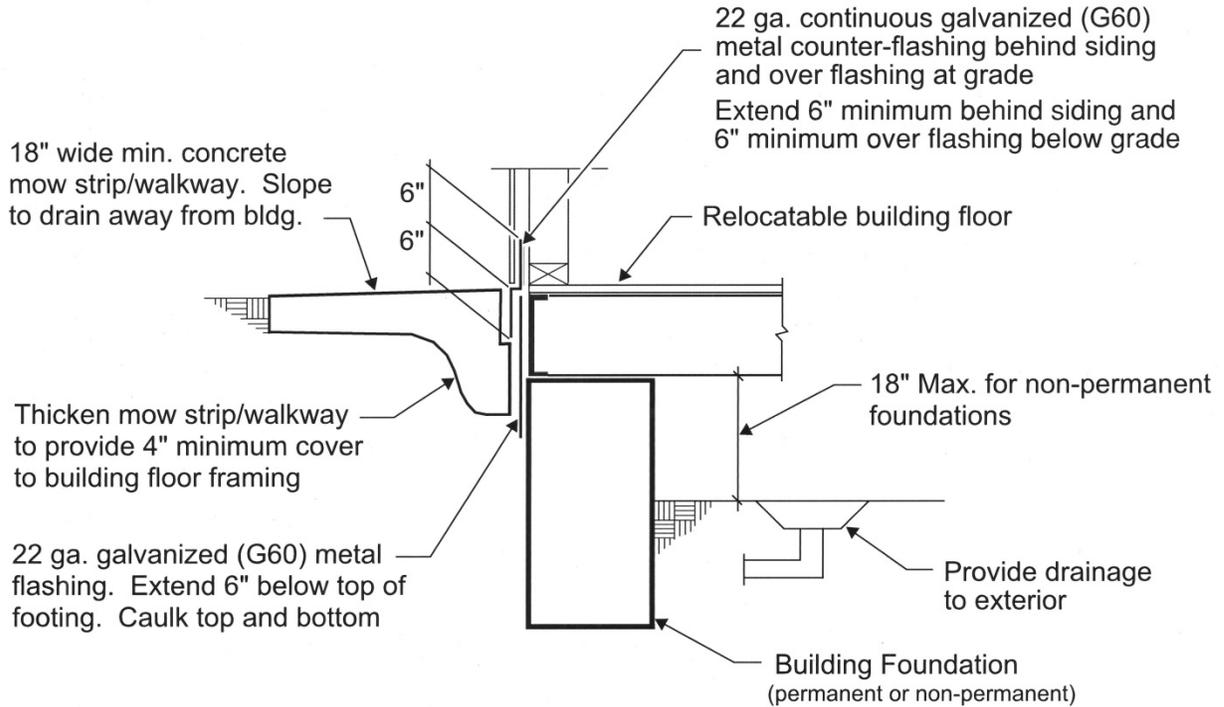
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Code (CALGreen), Title 24, Part 11. Relocation of or alterations to existing certified relocatable buildings are not required to comply with the CALGreen Code.

- 7. COMPLIANCE WITH THE CALIFORNIA ENERGY CODE (TITLE 24, PART 6):** PC designs submitted to DSA must comply with the current energy efficiency standards found in the California Energy Code (CEC), Title 24, Part 6. For compliance review requirements and procedures, see DSA [IR N-1](#) (Pre-Check Designs Energy Compliance Review). Alterations to existing certified relocatable buildings that change the water-heating system, space-conditioning system, lighting system or envelope, as defined in CEC Section 100.1, shall comply with CEC Section 141.0(b).

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**FIGURE 1** – Minimum requirements for the condition where the adjacent exterior grade is above the bottom of the floor joists.



**Note:**

1. For relocatable buildings greater than 2,160 sf, the flashing and mow strip/walkway shown in Figure 1 shall be provided in addition to meeting the requirements of CBC Section 2304.12.1.2.
2. Cross-ventilation at under-floor spaces is required per CBC Section 1203.3

**FIGURE 2** – Sample Identification Label

DSA A#: _____	Design Roof Live Load: _____
CBC Edition: _____	Design Floor Live Load: _____
Manuf. or Builder's Name: _____	Design Wind Speed: _____
Serial Number: _____	Exposure Category: _____
Design Climate Zones: _____	Seismic Design Parameter $S_s$ : _____

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### REFERENCES:

California Code of Regulations Title 24

Part 1: California Administrative Code, Section 4-314

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This Interpretation of Regulations (IR) is intended for use by the Division of the State Architect (DSA) staff and by design professionals to promote more uniform statewide criteria for plan review and construction inspection of projects within the jurisdiction of DSA which includes State of California public elementary and secondary schools (grades K-12), community colleges and state-owned or state-leased essential services buildings. This IR indicates an acceptable method for achieving compliance with applicable codes and regulations, although other methods proposed by design professionals may be considered by DSA.

This IR is reviewed on a regular basis and is subject to revision at any time. Please check DSA's website for currently effective IRs. Only IRs listed on the webpage at [www.dgs.ca.gov/dsa/Resources/IRManual.aspx](http://www.dgs.ca.gov/dsa/Resources/IRManual.aspx) at the time of plan submittal to DSA are considered applicable.