SWH TOOLKIT DOCUMENT #2A

Eligibility Checklist for Expedited Solar Domestic Water Heating Permitting for One- and Two-Family Dwellings

GENERAL REQUIREMENTS

A.	System size is 30 kWth (462 square feet of collector) or less	○Y	○N
B.	The solar array is roof-mounted on one- or two-family dwelling or accessory structure	○Y	○N
C.	The solar collector arrays will not exceed the maximum legal building height	○Y	○N
D.	Solar collectors are certified by an accredited listing agency	○Y	○N
E.	Solar domestic water heating system is certified by an accredited listing agency	○Y	○N
F.	Permit application is completed and attached	○Y	○N
G.	System schematic is included	○Y	○N
H.	List of major components to match system schematic	○Y	○N
I.	Heat transfer fluid is either water or a nontoxic fluid	○Y	○N

PLUMBING REQUIREMENTS

A.	Adequate extreme temperature protection is provided	○Y	○N

STRUCTURAL REQUIREMENTS

A.	A completed Structural Criteria and supporting documentation is attached (as required)	○Y	○N

Notes:

These criteria are intended for streamlined solar permitting process.

1. *If any items are checked NO, revise design to fit within Eligibility Checklist, otherwise permit application may go through standard process.*

HUNTINGTON BEACH

SWH TOOLKIT DOCUMENT #5A

Inspection Guide for SDWH Systems in One- and Two-Family Dwellings

This document is a field inspection guide for SDWH systems. These inspection references detail most of the issues that relate to SDWH systems during the inspection process.

All California Electrical Code (CEC), California Residential Code (CRC), California Building Code (CBC), California Mechanical Code (CMC) and California Plumbing Code (CPC) references are to the 2013 versions unless otherwise noted.

SOLAR DOMESTIC WATER HEATING SYSTEM ELIGIBILITY			
SYSTEM	Criteria		Yes
	1. Major components installed match those of certified system?		☐
SOLAR DOMESTIC WATER HEATING INSPECTION GUIDE			
	Guideline	Source of Guideline	Yes
ROOF	I. Roof penetrations/attachments are properly flashed	CBC Chap. 15, CRC Chap. 9	☐
SOLAR LOOP PIPING	I. Piping must be properly supported, hung and anchored per code	CPC 313.1	☐
	II. Solar piping properly insulated	See local ordinance.	☐
	III. Dissimilar materials isolated, as required	CPC 310.6	☐
	IV. Penetrations through structural members as per code	CPC 312.2	☐
	V. Penetrations through fire-resistant assemblies installed per code	CPC 1505.2	☐
	VI. System has adequate freeze protection	CPC 312.6	☐
	VII. System overheat protection	CPC 505.2	☐
	VIII. Expansion tank sized correctly (indirect system) according to need for operation or overheat protection?	CMC 1005.3, 1005.4	☐
	IX. Pressure relief/temperature relief valve(s) installed per design (if applicable)	CPC 608.4 & 608.5	☐
	X. Piping labels show type of fluid and direction of flow	CPC 601.2	☐
	XI. Drain and fill valves capped and labeled	CPC 601.2	☐
STORAGE TANK	I. Tank labeled with pressure rating for pressurized storage	CPC 505.4	☐
	II. Relief drain installed properly for pressurized storage	CPC 504.6, CMC 1006.1	☐
	III. Heat exchanger must protect potable water system from being contaminated by the heat transfer medium	CPC 603.5.4	☐
	IV. Tank installed in garage meets code requirements	CPC 507.13	☐
	V. Pan installed under tank (as required)	CPC 507.4	☐
	VI. Tank installed on level surface	CPC 508.4.3	☐
	VII. Tank supported for seismic loads	CPC 507.2	☐
	VIII. All valves, fittings and solders are rated for potable systems and meeting CA lead law requirements	CPC 604.1	☐
	IX. Unions installed within 12” of tank connections for all piping to and from tank and heat exchangers	CPC 609.5	☐

POTABLE PIPING	I. All valves, fittings and solders are rated for potable systems and meeting CA lead law requirements	CPC 604.1	☐
	II. Potable water piping properly labeled	CPC 601.2	☐
	III. Any connection to PEX is more than 18” from tank fittings	CPC 604.13	☐
	IV. Hot water service piping insulated properly	See local ordinance.	☐
	V. Vacuum relief valve properly installed (if required)	CPC 603.5.4, 608.7	☐
CONTROLS	I. Control and pump disconnect(s) properly installed	CEC 430 (IX), 690.17	☐
	II. Conductors between control and power source properly installed	CEC 430 (II)	☐
	III. Conductors between control and pump properly installed	CEC 430 (II), 690 (IV)	☐
	IV. Solar collector sensors protected from sun and weather	CEC 310.8 B, D(1), D(2)	☐
	V. Control relay rated higher than load for each output	CEC 430.83	☐

SWH TOOLKIT DOCUMENT #1A

Submittal Requirements Bulletin – Solar Domestic Water Heating Installations 30 kWth or Less for One- and Two-Family Dwellings

This information bulletin is published to guide applicants through a streamlined permitting process for solar domestic water heating (SDWH) projects 30 kWth (462 square foot) in size or smaller. This bulletin provides information about submittal requirements for plan review, required fees and inspections.

1. Approval Requirements

The following permits are required to install a SDWH system with a maximum thermal output of 30 kWth or less:

a) Solar Permit

Planning review is required for SDWH installations of this size.

2. Submittal Requirements

a) Completed permit application form. This permit application form can be downloaded at www.huntingtonbeachca.gov

b) Demonstrate compliance with the eligibility checklist for expedited permitting. These criteria can be downloaded at www.huntingtonbeachca.gov

This Guidebook recommends use of a simple checklist to clearly identify eligibility criteria for expedited permitting, where established.

c) A completed Standard Plumbing, Electrical, Structural and Mechanical Plan. The standard plan may be used for proposed solar installations 30 kWth in size or smaller and can be downloaded at www.huntingtonbeachca.gov

A standard plan should be submitted that includes the following:

- *Total number of collectors and area*
- *Make, model and collector certification number*
- *System certification number*
- *Solar storage tank name, model, insulation and capacity*
- *Heat exchanger make and model (if applicable)*
- *Specifications of heat transfer fluid (if applicable)*

d) A roof plan showing roof layout and solar collectors with attachment details.

e) System schematic, including major components.

f) Equipment cut sheets including collectors, controller, storage tank/heat exchanger (if applicable).

g) Completed expedited Structural Criteria checklist along with required documentation can be downloaded at www.huntingtonbeachca.gov

For systems that do not meet all the requirements in the structural criteria checklist, provide structural drawings and calculations along with the following information.

- The type of roof covering and the number of roof coverings installed
- Type of roof framing, size of members and spacing
- Weight of panels, support locations and method of attachment
- Framing plan and details for any work necessary to strengthen the existing roof structure
- Site-specific structural calculations
- Where an approved racking system is used, provide documentation showing manufacturer of the rack system, maximum allowable weight the system can support, attachment method to the roof or ground and product evaluation information or structural design for the rack system

3. Plan Review

Permit applications can be submitted to the Building & Safety Division, in person at 2000 Main Street (3rd Floor), Huntington Beach, CA 92648.

Permit applications utilizing a standard plan should be reviewed within 3 business days.

4. Fees

15 kW or less: $384 flat fee
More than 15 kW: $384 + $10 per kW above 15

5. Inspections

Once all permits to construct the solar installation have been issued and the system has been installed, it must be inspected before final approval is granted. On-site inspections can be scheduled by contacting the Building & Safety Division by telephone at (714) 536-5241 or online at http://www.huntingtonbeachca.gov/services/forms-applications/inspection-request/index.cfm Inspection requests received within business hours are typically scheduled for the next business day. If next business day is not available, inspection should happen within a five-day window.

Permit holders must be prepared to show conformance with all technical requirements in the field at the time of inspection. The inspector will verify that the installation is in conformance with applicable code requirements and with the approved plans.

The inspection checklist provides an overview of common points of inspection, and the applicant should be prepared to show compliance with these points.

6. Departmental Contact Information

For additional information regarding this permit process, please consult our departmental website at www.huntingtonbeachca.gov or contact the Building & Safety Division at (714) 536-5241.

SWH TOOLKIT DOCUMENT #2A

Eligibility Checklist for Expedited Solar Domestic Water Heating Permitting for One- and Two-Family Dwellings

GENERAL REQUIREMENTS

A.	System size is 30 kWth (462 square feet of collector) or less	○Y	○N
B.	The solar array is roof-mounted on one- or two-family dwelling or accessory structure	○Y	○N
C.	The solar collector arrays will not exceed the maximum legal building height	○Y	○N
D.	Solar collectors are certified by an accredited listing agency	○Y	○N
E.	Solar domestic water heating system is certified by an accredited listing agency	○Y	○N
F.	Permit application is completed and attached	○Y	○N
G.	System schematic is included	○Y	○N
H.	List of major components to match system schematic	○Y	○N
I.	Heat transfer fluid is either water or a nontoxic fluid	○Y	○N

PLUMBING REQUIREMENTS

A.	Adequate extreme temperature protection is provided	○Y	○N

STRUCTURAL REQUIREMENTS

A.	A completed Structural Criteria and supporting documentation is attached (as required)	○Y	○N

Notes:

These criteria are intended for streamlined solar permitting process.

1. *If any items are checked NO, revise design to fit within Eligibility Checklist, otherwise permit application may go through standard process.*

HUNTINGTON BEACH

Structural Criteria for Residential Rooftop Solar Energy Installations

STRUCTURAL CRITERIA FOR RESIDENTIAL FLUSH-MOUNTED SOLAR ARRAYS

1. ROOF CHECKS

A. Visual Review/Contractor's Site Audit of Existing Conditions:
- 1) Is the roof a single roof without a reroof overlay? ☐ Y ☐ N
- 2) Does the roof structure appear structurally sound, without signs of alterations or significant structural deterioration or sagging, as illustrated in Figure 1? ☐ Y ☐ N

B. Roof Structure Data:
- 1) Measured roof slope (e.g. 6:12): _____:12
- 2) Measured rafter spacing (center-to-center): _____ inch
- 3) Type of roof framing (rafter or manufactured truss): ☐ Rafter ☐ Truss

2. SOLAR ARRAY CHECKS

A. Flush-mounted Solar Array:
- 1) Is the plane of the modules (panels) parallel to the plane of the roof? ☐ Y ☐ N
- 2) Is there a 2" to 10" gap between underside of module and the roof surface? ☐ Y ☐ N
- 3) Modules do not overhang any roof edges (ridges, hips, gable ends, eaves)? ☐ Y ☐ N

B. Do the modules plus support components weigh no more than: 4 psf for photovoltaic arrays or 5 psf for solar thermal arrays? ☐ Y ☐ N

C. Does the array cover no more than half of the total roof area (all roof planes)? ☐ Y ☐ N

D. Are solar support component manufacturer's project-specific completed worksheets, tables with relevant cells circled, or web-based calculator results attached? ☐ Y ☐ N

E. Is a roof plan of the module and anchor layout attached? (see Figure 2) ☐ Y ☐ N

F. Downward Load Check (Anchor Layout Check):
- 1) Proposed anchor horizontal spacing (see Figure 2): ____' - ____"ft-in
- 2) Horizontal anchor spacing per Table 1: ____' - ____"ft-in
- 3) Is proposed anchor horizontal spacing equal to or less than Table 1 spacing? ☐ Y ☐ N

G. Wind Uplift Check (Anchor Fastener Check):
- 1) Anchor fastener data (see Figure 3):
  - a. Diameter of lag screw, hanger bolt or self-drilling screw: _____inch
  - b. Embedment depth of rafter: _____inch
  - c. Number of screws per anchor (typically one): _____
  - d. Are 5/16" diameter lag screws with 2.5" embedment into the rafter used, OR does the anchor fastener meet the manufacturer's guidelines? ☐ Y ☐ N

3. SUMMARY

○ A. All items above are checked YES. No additional calculations are required.

○ B. One or more items are checked NO. Attach project-specific drawings and calculations stamped and signed by a California-licensed civil or structural engineer.

Job Address: _____ Permit #: _____

Contractor/Installer: _____ License # & Class: _____

Signature: _____ Date: _____ Phone #: _____

Optional Additional Rafter Span Check Criteria

[At option of CBO, insert rows (4) to (7) below into table above after row 1.B.(3)]

1. ROOF CHECKS

B. Roof Structure Data:
- 4) Measured rafter size (e.g. 13/4 x 33/4, not 2x4): ____ x ____ inch
- 5) Measured rafter horizontal span (see Figure 4): ____' - ____"ft-in
- 6) Horizontal rafter span per Table 2: ____' - ____"ft-in
- 7) Is measured horizontal rafter span less than Table 2 span? ☐ Y ☐ N ☐ Truss

Table 1. Maximum Horizontal Anchor Spacing				
Roof Slope		Rafter Spacing		
		16” o.c.	24” o.c.	32” o.c.
Photovoltaic Arrays (4 psf max)				
Flat to 6:12	0° to 26°	5’-4”	6’-0”	5’-4”
7:12 to 12:12	27° to 45°	1’-4”	2’-0”	2’-8”
13:12 to 24:12	46° to 63°	1’-4”	2’-0”	2’-8”
Solar Thermal Arrays (5 psf max)				
Flat to 6:12	0° to 26°	4’-0”	4’-0”	5’-4”
7:12 to 12:12	27° to 45°	1’-4”	2’-0”	2’-8”
13:12 to 24:12	46° to 63°	Calc. Req’d	Calc. Req’d	Calc. Req’d

Solar support component manufacturer’s guidelines may be relied upon to ensure the array above the roof is properly designed, but manufacturer’s guidelines typically do NOT check to ensure that the roof itself can support the concentrated loads from the solar array. Table 1 assumes that the roof complied with the building code in effect at the time of construction, and places limits on anchor horizontal spacing to ensure that a roof structure is not overloaded under either downward loads or wind uplift loads. Note 4 below lists the basic assumptions upon which this table is based.

Table 1 Notes:

1. Anchors are also known as “stand-offs,” “feet,” “mounts” or “points of attachment.” Horizontal anchor spacing is also known as “cross-slope” or “east-west” anchor spacing (see Figure 2).
2. If anchors are staggered from row-to-row going up the roof, the anchor spacing may be twice that shown above, but no greater than 6’-0”.
3. For manufactured plated wood trusses at slopes of flat to 6:12, the horizontal anchor spacing shall not exceed 4’-0” and anchors in adjacent rows shall be staggered.
4. This table is based on the following assumptions:
   - The roof structure conformed to building code requirements at the time it was built.
   - The attached list of criteria is met.
   - Mean roof height is not greater than 40 feet.
   - Roof sheathing is at least 7/16” thick oriented strand board or plywood. 1x skip sheathing is acceptable.
   - If the dwelling is in Wind Exposure B (typical urban, suburban or wooded areas farther than 500 yards from large open fields), no more than one of the following conditions apply:
     - The dwelling is located in a Special Wind Region with design wind speed between 115 and 130 mph per ASCE 7-10.
     - The dwelling is located on the top half of a tall hill, provided average slope is less than 15%.
   - If the dwelling is in Wind Exposure C (within 500 yards of large open fields or grasslands), all of the following conditions apply.
     - Design wind speed is 110 mph or less (not in a Special Wind Region).
     - The dwelling is not located on the top half of a tall hill.
   - The solar array displaces roof live loads (temporary construction loads) that the roof was originally designed to carry.
   - The Structural Technical Appendix provides additional information about analysis assumptions.

Table 2. Roof Rafter Maximum Horizontal Span (feet - inches)1								
Assumed Vintage	Nominal Size	Actual Size	Non-Tile Roof[2]			Tile Roof[3]		
			Rafter Spacing					
			16" o.c.	24" o.c.	32" o.c.	16" o.c.	24" o.c.	32" o.c.
Post-1960	2x4	1½"x3½"	9'-10"	8'-0"	6'-6"	8'-6"	6'-11"	5'-6"
	2x6	1½"x5½"	14'-4"	11'-9"	9'-6"	12'-5"	10'-2"	8'-0"
	2x8	1½"x7¼"	18'-2"	14'-10"	12'-0"	15'-9"	12'-10"	10'-3"
Pre-1960	2x4	1¾"x3¾"	11'-3"	9'-9"	7'-9"	10'-3"	8'-6"	6'-9"
	2x6	1¾"x5¾"	17'-0"	14'-0"	11'-3"	14'-9"	12'-0"	9'-9"
	2x8	1¾"x7¾"	22'-3"	18'-0"	14'-6"	19'-0"	15'-6"	12'-6"

Beyond a visual review by the contractor checking for unusual sagging or deterioration, some CBOs may want additional assurance that the roof structure complies with structural building code requirements. Table 2 is an optional table some CBOs may elect to use to provide additional assurance by requiring a check of existing roof rafter spans, and supports optional criteria 1.B.5 and 1.B.6. For post-1960 construction, these span tables match the rafter span tables found in the 2013 California Building and Residential codes. For pre-1960 construction, the rafter span tables are based on structural calculations with lumber sizes and wood species and grade appropriate for older construction. Note 5 below lists the basic assumptions upon which this table is based.

Table 2 Notes:

1. See Figure 4 for definition of roof rafter maximum horizontal span.
2. "Non-tile Roof" = asphalt shingle, wood shingle and wood shake, with an assumed roof assembly weight of 10 psf.
3. "Tile Roof" = clay tile or cement tile, with an assumed roof assembly weight of 20 psf
4. Unaltered manufactured plated-wood trusses may be assumed to be code compliant and meet intent of Table 2.
5. This table is based on the following assumptions:
   - Span/deflection ratio is equal to or greater than 180.
   - For post-1960 construction, wood species and grade is Douglas Fir-Larch No. 2.
   - For pre-1960 construction, wood species and grade is Douglas Fir-Larch No. 1.
   - Other wood species and/or grade are also acceptable if allowable bending stress is equal or greater to that listed.

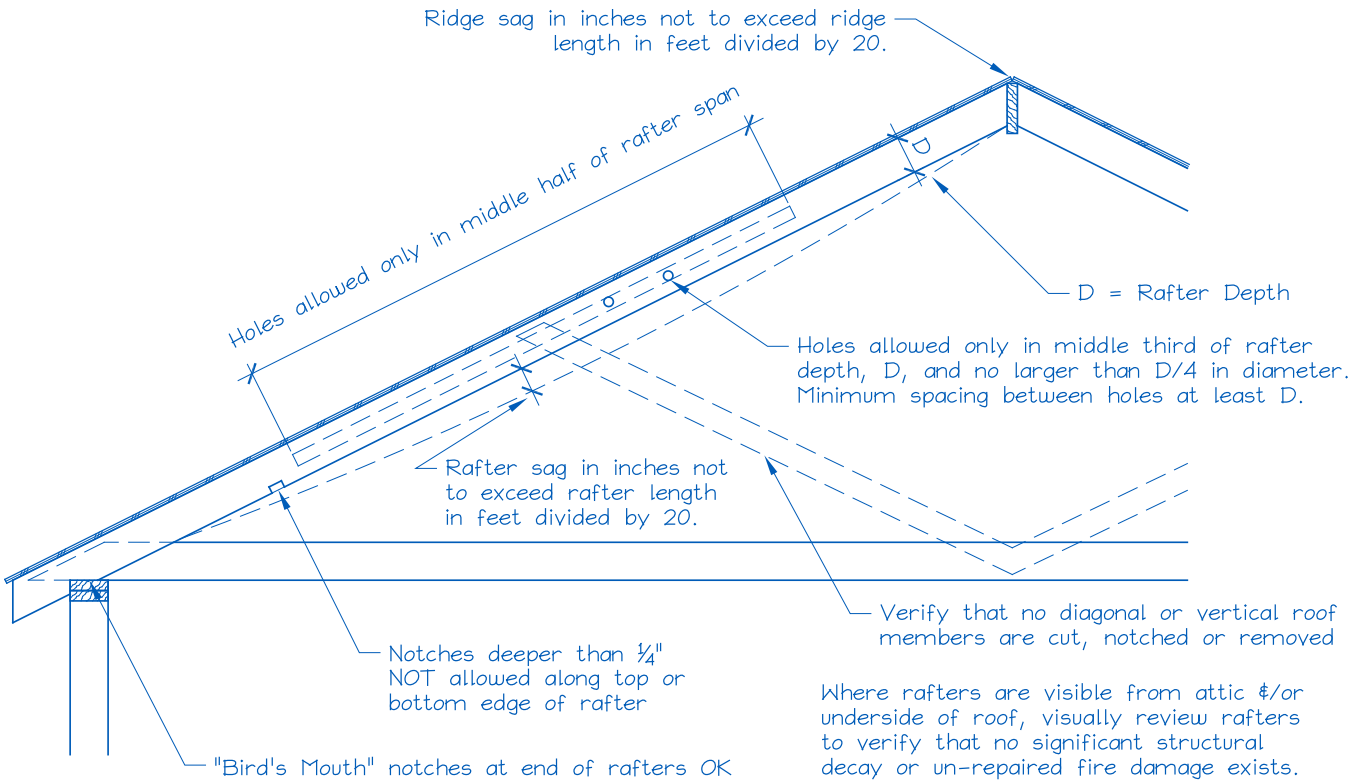

Figure 1. Roof Visual Structural Review (Contractor's Site Audit) of Existing Conditions.

The site auditor should verify the following:

1. No visually apparent disallowed rafter holes, notches and truss modifications as shown above.
2. No visually apparent structural decay or un-repaired fire damage.
3. Roof sag, measured in inches, is not more than the rafter or ridge beam length in feet divided by 20.

Rafters that fail the above criteria should not be used to support solar arrays unless they are first strengthened.

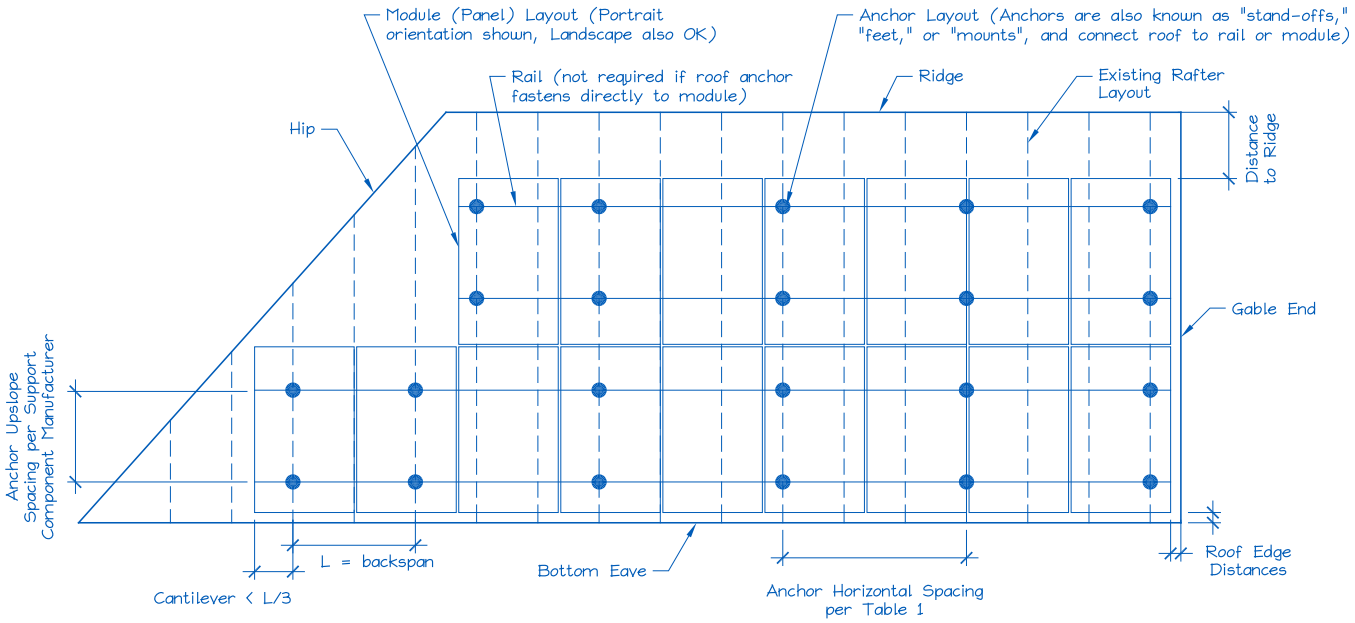

Figure 2. Sample Solar Panel Array and Anchor Layout Diagram (Roof Plan).

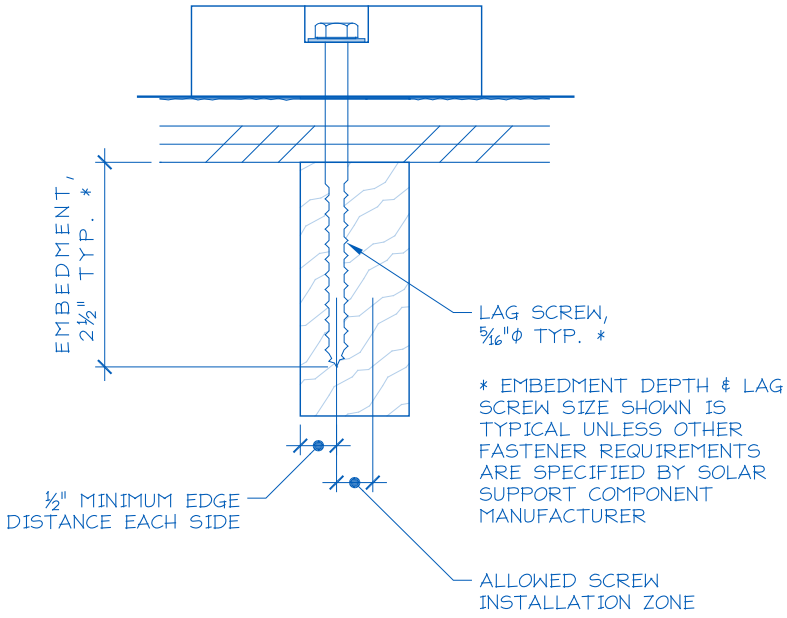

Figure 3. Typical Anchor with Lag Screw Attachment.

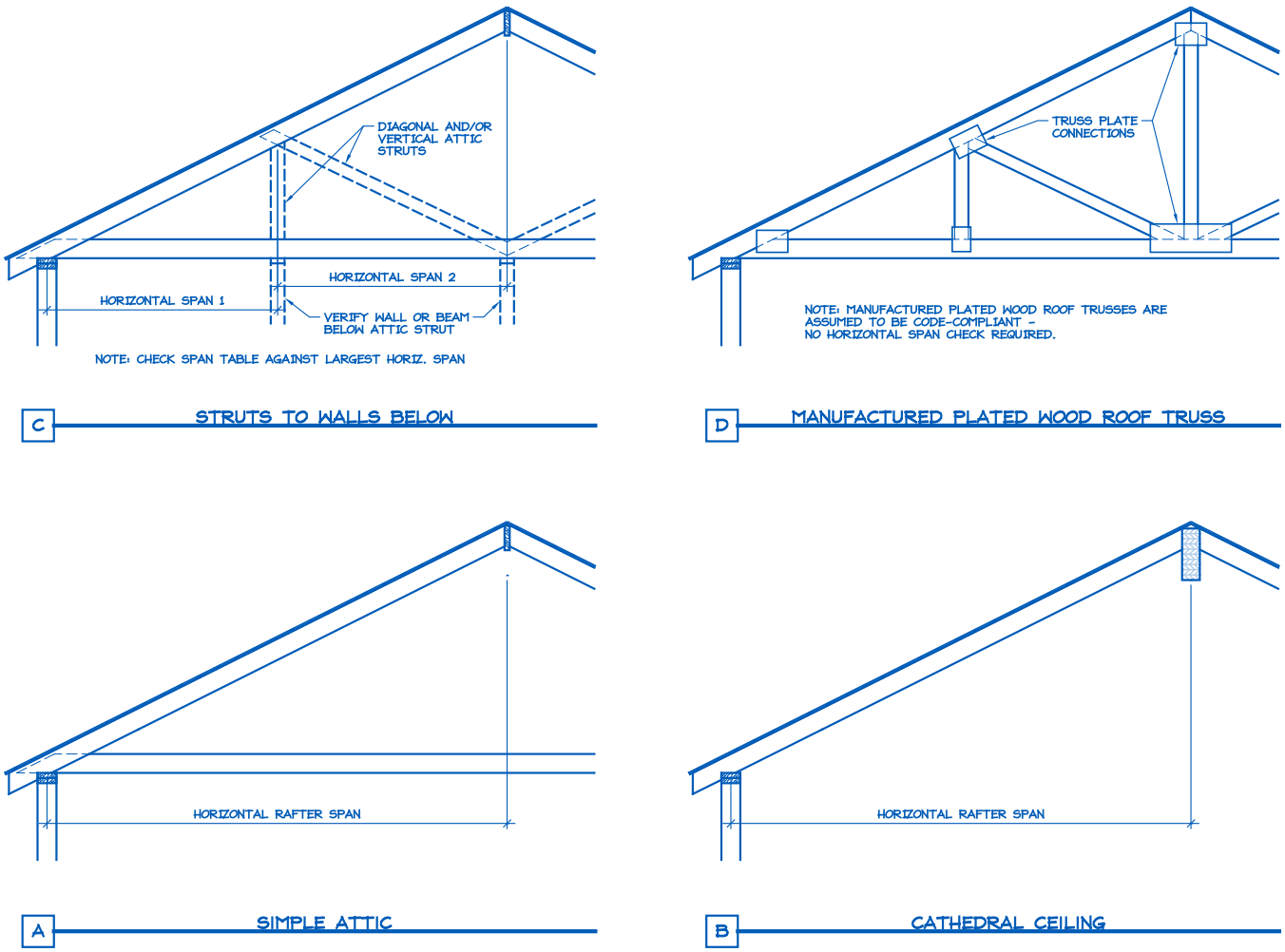

Figure 4. Definition of Rafter Horizontal Span.