



HOUSTON BUILD EXPO: RESIDENTIAL 101'S

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HOUSTON PERMITTING CENTER



HOUSTON PERMITTING CENTER

**Welcome to the Houston
Permitting Center
1002 Washington Avenue
Houston, TX 77002**



HOUSTON CONSTRUCTION CODE

- 2021 International Residential Code (IRC) and Houston Amendments
- 2021 International Building Code (IBC) and Houston Amendments
- 2021 International Fire Code (IFC) and Houston Amendments
- 2021 International Existing Building Code (IEBC) and Houston Amendments
- 2021 Uniform Mechanical Code (UMC) and Houston Amendments
- 2021 Uniform Plumbing Code (UPC) and Houston Amendments
- 2023 National Electrical Code (NEC) and Houston Amendments*
- 2021 International Energy Conservation Code (IECC) and Houston Amendments
- 2021 International Swimming Pool and Spa Code (ISPSC) and Houston Amendments

All effective January 1, 2024

***NEC effective September 1, 2023**



RESIDENTIAL FIREWALLS 101

2021 International Residential Code

FIRE SEPARATION DISTANCE

TABLE R302.1(1)
EXTERIOR WALLS

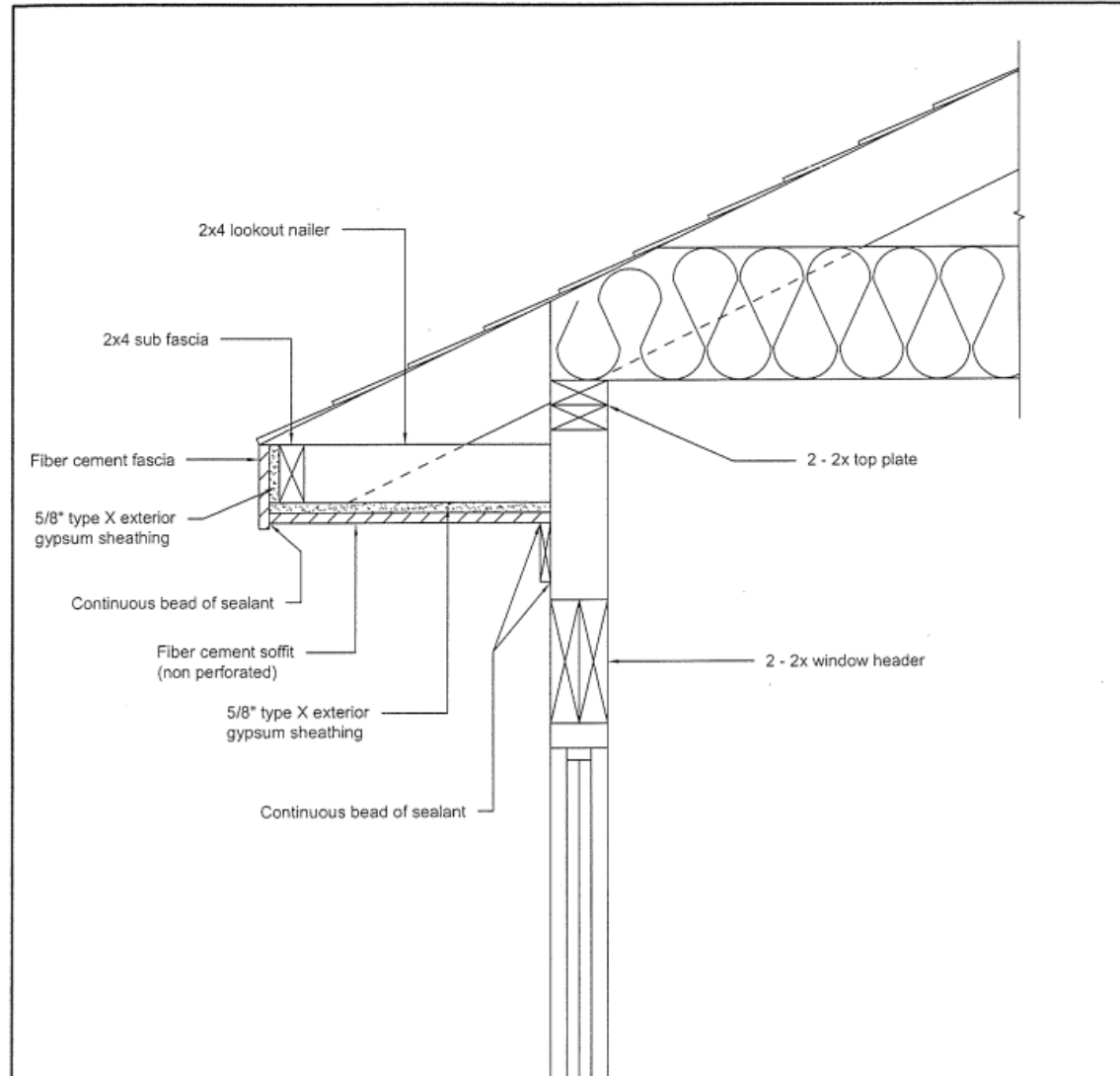
| EXTERIOR WALL ELEMENT | | MINIMUM FIRE-RESISTANCE RATING | MINIMUM FIRE SEPARATION DISTANCE |
|-----------------------|---------------------------|---|----------------------------------|
| Walls | Fire-resistance rated | 1 hour—tested in accordance with ASTM E119, UL 263 or Section 703.3 of the <i>International Building Code</i> with exposure from both sides | 0 feet |
| | Not fire-resistance rated | 0 hours | ≥ 5 feet |
| Projections | Not allowed | NA | < 2 feet |
| | Fire-resistance rated | 1 hour on the underside, or heavy timber, or fire-retardant-treated wood ^{a, b} | ≥ 2 feet to < 5 feet |
| | Not fire-resistance rated | 0 hours | ≥ 5 feet |
| Openings in walls | Not allowed | NA | < 3 feet |
| | 25% maximum of wall area | 0 hours | 3 feet |
| | Unlimited | 0 hours | 5 feet |
| Penetrations | All | Comply with Section R302.4 | < 3 feet |
| | | None required | 3 feet |



For SI: 1 foot = 304.8 mm.

NA = Not Applicable.

- a. The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the eave overhang if fireblocking is provided from the wall top plate to the underside of the roof sheathing.
- b. The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the rake overhang where gable vent openings are not installed.

FIRE SEPARATION DISTANCE



| | | | | | |
|---|---|--|---|-------------------|-----------------|
|  | STANDARD DRAWING | FIRE - RESISTANCE RATED SOFFIT ASSEMBLY | APPROVED BY:  | | |
| | CITY OF HOUSTON DEPARTMENT OF PUBLIC WORKS & ENGINEERING | | 1002 WASHINGTON AVE., HOUSTON, TEXAS 77002 | BUILDING OFFICIAL | DATE: 2-15-2015 |

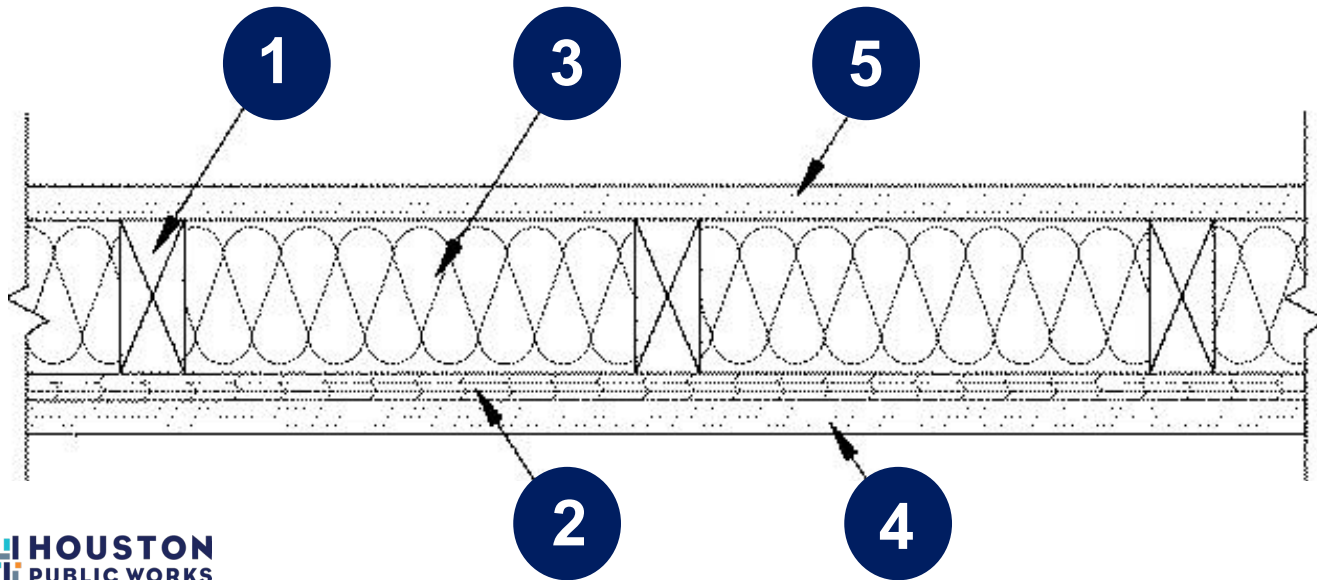
FIRE-RESISTANCE RATED ASSEMBLIES



Underwriters Laboratories (UL) Design No. 344 (October 07, 2020)

Bearing Wall Rating: 1 Hour

Finish Rating: 26 Minutes



1. Wood Studs

- Size: 2 x 4 inches
- Spacing: 24 inches on center

2. Wood Structural Panel Sheathing

- Thickness: 15/32 inch
- Width: 4 feet

3. Batts and Blankets

- Thickness: 3-1/2 inches
- Density: 0.70 pounds per cubic foot

4. External Gypsum Board (Layer 1)

- Thickness: 5/8 inch
- Width: 4 feet

5. Internal Gypsum Board (Layer 2)

- Thickness: 5/8 inch
- Width: 4 feet

COMMON FIREWALL CHALLENGES IN RESIDENTIAL CONSTRUCTION

COMMON ISSUES

- Using improper or non-rated materials or assemblies
- Interruptions, offsets, or other framing mistakes
- Improper terminations, or lack of approved firestopping
- Inadequate penetration sealing for electrical, plumbing, or HVAC
- Lack of inspection awareness



“My contractor forgot to install the 5/8” type X gypsum board on the exterior side of my firewall per the Underwriters Laboratories (UL) design and the Hardie siding has now been installed...”

FIRE-RESISTANCE RATED ASSEMBLIES

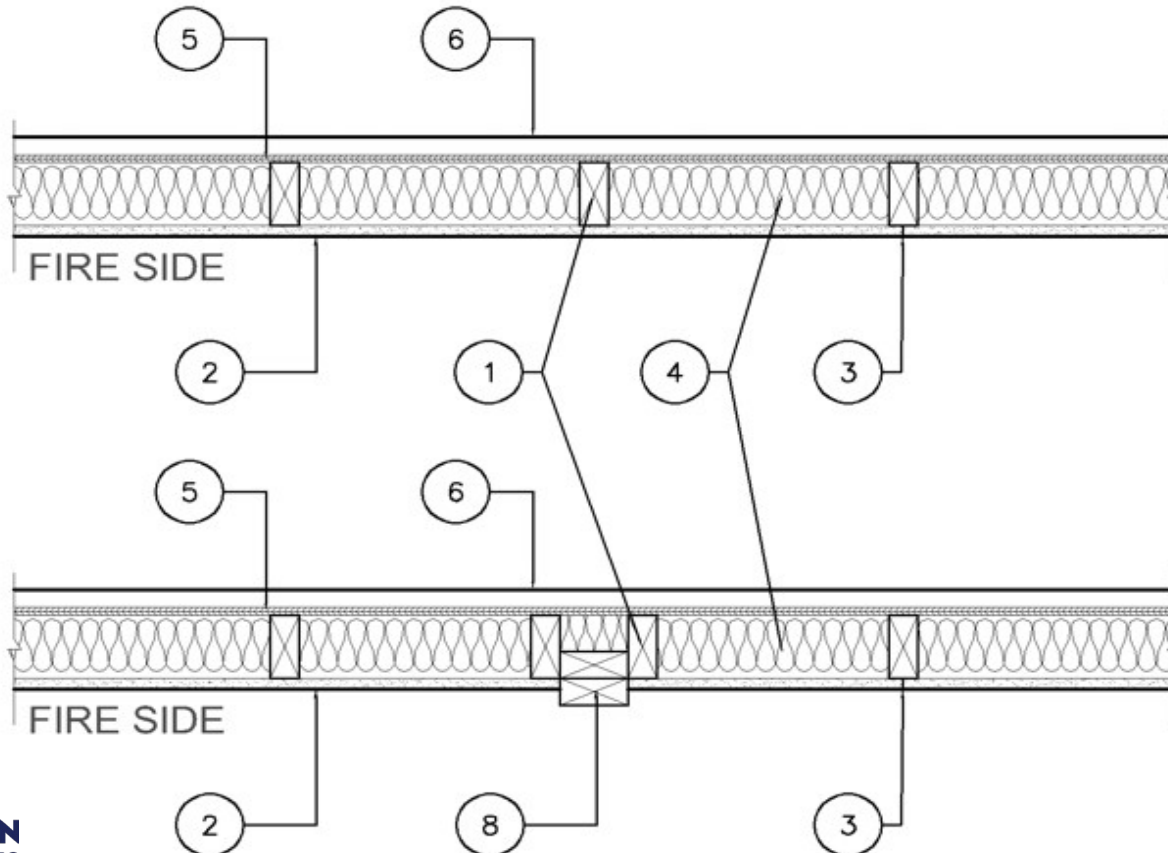


Underwriters Laboratories (UL) Design No. U356 (April 01, 2025)

Bearing Wall Rating: 1 Hour Rating Exposed to Fire on Interior Face Only

Bearing Wall Rating: 1 Hour Rating Exposed to Fire on Exterior Face (See Item 6E)

Finish Rating – 23 Minutes or 25 Minutes (See Item 2C)



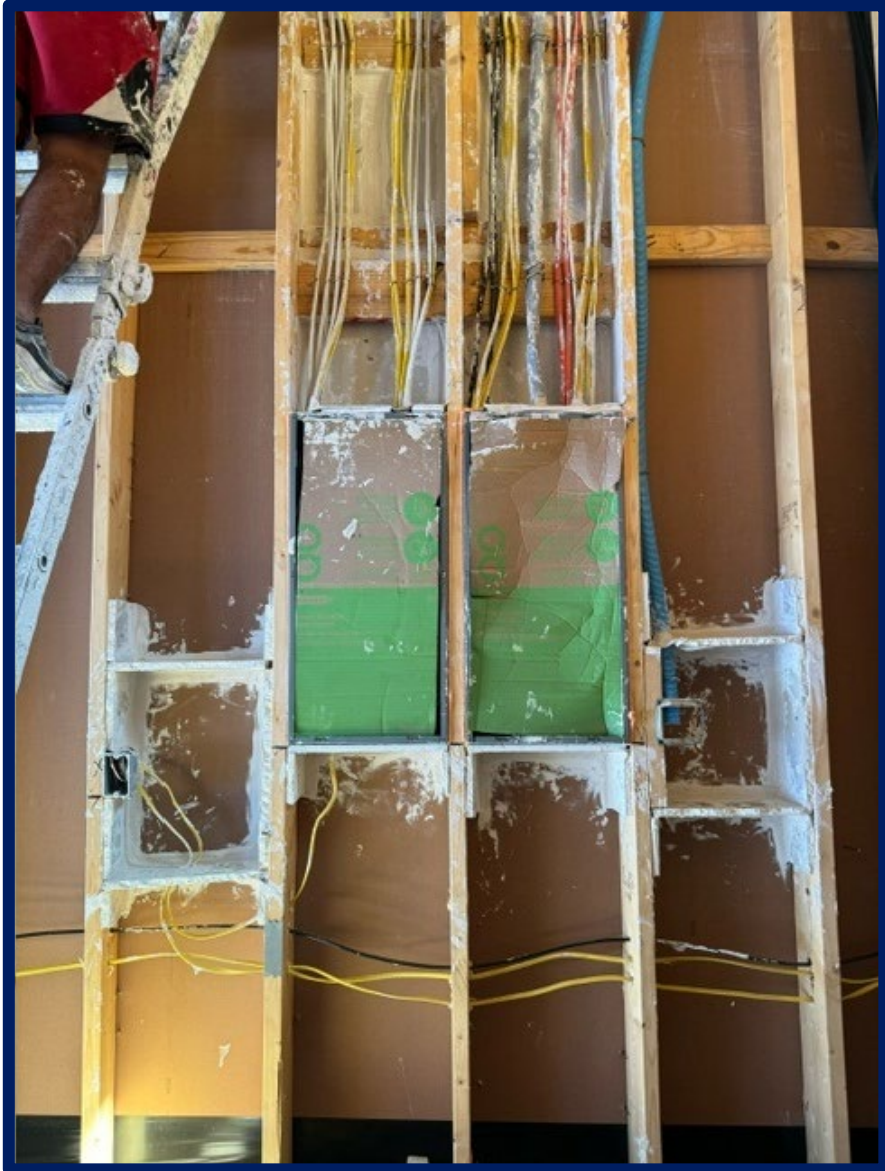
5. Wood Structural Panel Sheathing

- Minimum 7/16 inch thick, 4 feet wide
- C-D grade plywood or “Sheathing”
- Joints backed with 2 x 4-inch wood blocking
- Attached with cement-coated nails
 - 6-inch spacing along edges
 - 12-inch spacing in the center of the panel

6. Exterior Facings (*installed according to manufacturer instructions*)

- A. Vinyl Siding:** Rigid vinyl, flame spread rating ≤ 20
- B. Particle Board Siding:** Hardboard, panel or lap
- C. Wood Lap Siding:** Rated wood siding with textured or grooved finish
- D. Cement Stucco:** 3/8 to 3/4 inch thick
- E. Brick Veneer:** 4-inch brick, 1-inch air space
- F. Exterior Insulation and Finish System (EIFS):** 1-inch foamed plastic with UL label
- G. Siding:** Aluminum or steel
- H. Fiber-Cement Siding:** Smooth or patterned panel/lap

COMMON FIREWALL ISSUES



R302.4.2 Membrane penetrations. Membrane penetrations shall comply with Section R302.4.1. Where walls are required to have a fire-resistance rating, recessed fixtures shall be installed so that the required fire-resistance rating will not be reduced.

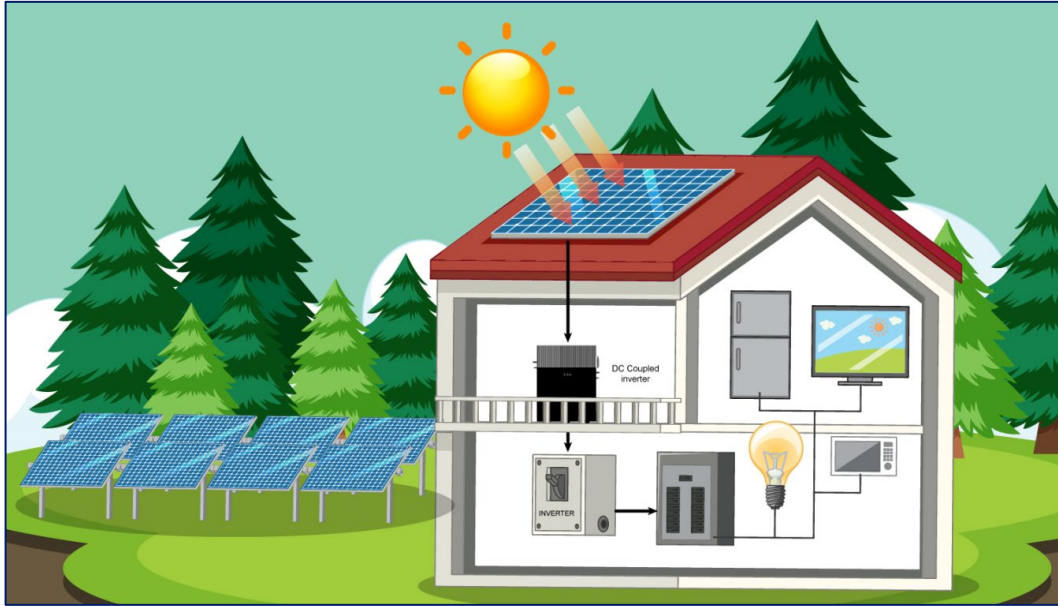
Exceptions:

1. Membrane penetrations of not more than 2-hour fire-resistance-rated walls and partitions by steel electrical boxes that do not exceed 16 square inches (0.0103 m²) in area provided that the aggregate area of the openings through the membrane does not exceed 100 square inches (0.0645 m²) in any 100 square feet (9.29 m²) of wall area. The annular space between the wall membrane and the box shall not exceed 1/8 inch (3.1 mm).

RESIDENTIAL SOLAR AND ENERGY STORAGE SYSTEM (ESS) 101

2021 International Residential Code

SOLAR PHOTOVOLTAIC (PV) SYSTEMS



Solar system installations are regulated by the Houston Construction Code

Solar requirements are found in both the Houston Fire and Residential codes



CODE SECTIONS

Residential Solar Energy

IRC
Section R324

REQUIREMENTS

- Solar systems shall be *listed, labeled*, and installed per Residential Code
- Rooftop-mounted systems shall be designed per Section R324
- Ground-mounted systems are required to be designed per Section R301
- Includes requirements for equipment access, pathways, setbacks, and escape window clearances

2021 INTERNATIONAL FIRE CODE (IFC): ELECTRICAL ENERGY STORAGE SYSTEM (ESS)

- Entire section reformatted and replaced to encompass additional types of ESS technologies
- Includes specific protection requirements for each battery type and addresses thermal runaway
- New requirements for ESS retrofitting/repurposing and mobile ESS operations

| Code Cycle | Energy Storage Requirements | | | |
|------------|--------------------------------|----------|----------------------|--|
| | NFPA 1 | IFC | IRC (Residential) | IBC (Commercial Buildings) |
| 2015 | Few | Few | Nonexistent | Table 509 "Incidental Uses" (separation and/or protection) otherwise points to IFC |
| 2018 | Moderate | Moderate | Moderate | Table 509 "Incidental Uses" (separation and/or protection) otherwise points to IFC |
| 2021 | Strict – points to NFPA 855 | Strict | Strict | Points to IFC |



Photo courtesy of Getty Images

Battery storage systems and other types of energy storage systems are regulated in Section 1207.

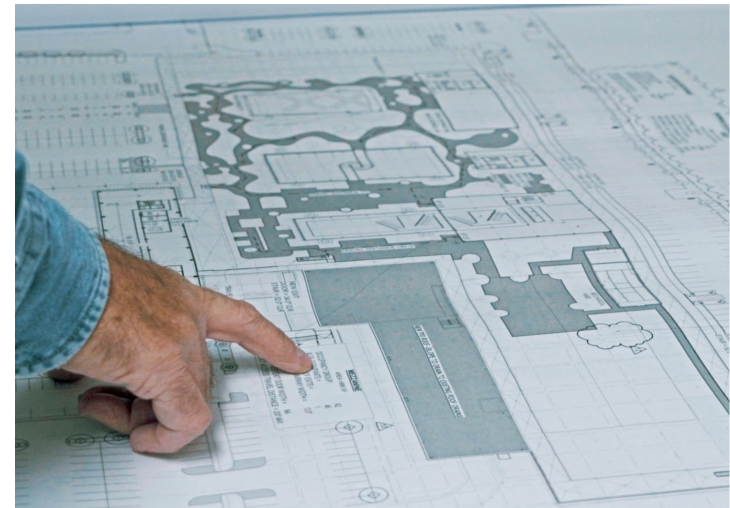
SUMMARY OF ENERGY STORAGE SYSTEM (ESS) REQUIREMENTS

| Design Requirement | International Fire Code (IFC) | International Residential Code (IRC) | International Building Code (IBC) | National Electrical Code (NEC) |
|-----------------------------------|--|--------------------------------------|-----------------------------------|--|
| Minimum Capacity | 20 kWh | 1 kWh | — | 1 kWh |
| Maximum Capacity (nonresidential) | 600 kWh | — | — | — |
| Maximum Capacity (residential) | 40 kWh within utility closets, basements, and storage or utility spaces 80 kWh in garages, accessory structures, on exterior walls, or outdoors on the ground | | — | — |
| Key Code Sections | | | | |
| Product Listing & Testing | 1207.1.5 1207.3.1 | R328.2 | — | 706.5 |
| Labeling, Signage, & Marking | 1207.4.8 | R328.11 | — | 705.10, 705.12 706.4, 706.15(C), 706.21 |
| Explosion Control | 1207.6.1, 1207.6.3 | R328.9 | Reference to IFC | 706.20 |
| Fire Detection | 1207.5.4 | R328.7 R314 | 907.2.23 | — |
| Fire Suppression | 1207.5.5 | — | — | — |
| Spacing & Installation Req's | 1207.4 1205.1 – 1205.3 1207.5.6 – 1207.5.8 1207.7 – 1207.9 1207.11 | R328.3.1 R328.4 R328.4 | 1010.2.9.2 | 706.20(C) |
| Documentation Required | 1207.1.3, 1207.1.4 1207.2.1.2 | R328.11 | — | — |
| Disconnects | 1207.4.1 | — | — | 705.20 706.15, 706.16 |

PLAN REQUIREMENTS AND DETAILS FOR SOLAR AND ENERGY STORAGE SYSTEMS (ESS) PROJECTS

PLAN REQUIREMENTS

- The Plan Review Department is responsible for ensuring that plans comply with all applicable building codes
- New solar and Energy Storage System (ESS) projects require plan approval before purchasing a permit
- The following depicts the minimum plan submittal requirements for solar and ESS scopes of work



SOLAR / ENERGY STORAGE SYSTEM (ESS) GUIDELINE (CE-1198)



BUILDING CODE ENFORCEMENT
SOLAR PHOTOVOLTAIC PANEL
PERMIT & INSPECTION GUIDE AND CHECKLIST

PURPOSE

This guide is intended to identify requirements associated with the plan review and inspection process related to the installation of solar photovoltaic systems and serve as a checklist prior to submission to the Plan Review group.

PERMIT REQUIREMENTS

Prior to application, verify deed restrictions with the civic association or county real property records regarding placement of solar panels on the subject property. At minimum, structural and electrical building permits are required for installation of any photovoltaic system. Both permits are issued under the same project/permit number. After approval is received from plan review, the building permits may be obtained. A registered licensed electrician must purchase the electrical building permit. Properties located in the Flood Plain, a historic district, or within designated areas near an airport will be subject to additional requirements.

NOTICE: In addition to City of Houston requirements, an application for interconnection must be submitted directly to Center Point Energy for approval and subsequent inspection approval prior to the start of installation.

APPLICATION & SUBMITTAL PROCESS

The application process and the submittal of plans must be done electronically. The Building Permit Application must be completed via [iPermits](#). A Declaration Supporting Building Permit Application (for individual or business entity depending on ownership) is required to be uploaded. The document must be signed by the property owner and will be validated against HCAD records. If ownership does not match HCAD, applicants must also upload proof of ownership. (<https://www.houstonpermittingcenter.org/media/2391/download> or <https://www.houstonpermittingcenter.org/media/2386/download>) A plan review fee (25% of the permit fee) must be paid once the application is finalized.

All the required plans and documents must be uploaded and submitted via [ProjectDox](#). Please refer to [the Solar Panel Only Electronic Plan Review \(EPR\) Submittal Guide](#) for complete instructions and procedures.

DRAWING PACKAGE CONTENTS

At minimum the submittal package shall include, but not be limited to the following information:

- A plan cover sheet, index of plans, and a code analysis sheet listing the applicable codes & standards: e.g., 2021 IRC or 2021 IBC (not both), and 2023 NEC, 2021 IFC, 2021 IEBC, 2021 IECC, 2021 UMC, 2021 UPC, 2021 ISPSC and associated Houston Amendments, Code Words, and HFD Life Safety Bureau Standards.
- A site or plot plan drawn to scale based on a survey of the property and showing the size and location of new construction and existing structures showing distances to all property/lot lines. In addition, easements, setbacks, exterior equipment and pads, and storage batteries, etc., shall be shown. This information may be obtained from the survey included with homeowner closing documents. There shall be no encroachment into easements by the new scope of work (solar panels, rack/rail systems, and equipment).
- Documents marked preliminary or not for construction are unacceptable and returned without review. All documents in the submitted review package shall be ready for construction, and shall not include alternates, options or preliminary designs. At minimum, the plans shall include, but not be limited to:
 - Roof plan drawn to scale with 1) the layout of solar panels and existing roof penetrations, chimneys, vents, etc., and 2) raftering & mounting locations clearly identified (relative to roof rafters) with a cross-section anchorage detail with anchorage specifications clearly identified. Provide a note of the total square footage of the roof planes upon which have solar panels identified.
 - Structural letters, calculations, plans, details, manufacturer installation instructions for rails, racks, attachments, etc., nationally recognized certifications, and other related documents designed and sealed by a Texas Professional Engineer (PE) to address the added loads of the product used as well as anchorage of panels to the existing structure, as well as detailed structural design of new foundations or structures located at grade. (Refer to Exhibit 8)

solarpanels@houstontx.gov

832.394.8840

<https://bit.ly/3p78nZ>

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revised: March 2024

Form: CE-1198



BUILDING CODE ENFORCEMENT
SOLAR PHOTOVOLTAIC PANEL
PERMIT & INSPECTION GUIDE AND CHECKLIST

- NOTE:** Where the manufacturer cut/installation sheets document options, the engineer or installer shall designate the specific code compliant product(s) to be installed.
- A sealed Texas engineers' letter shall be provided indicating the existing structure with the proposed solar system complies with applicable building code structural requirements, or Texas engineer sealed, signed and dated plans shall identify additional framing needed for compliance with minimum structural design provisions of Houston Building or Residential code. Reference appropriate code and handout CE-1110. <https://www.houstonpermittingcenter.org/media/2121/download>
- For residential buildings or structures constructed to the 2021 IRC plans shall show compliance with the appropriate minimum wind speed design for the specific address as specified by Table R301.2(1), footnote n., and <https://asce7hazardtool.online/> (include the printout of the results). All roofing and equipment assemblies must comply with the appropriate minimum wind design for the appropriate code applicable.
- For residential buildings or structures constructed to the 2021 IBC the plans shall show compliance with the appropriate minimum wind speed design for the specific address as specified by Section 1609.3 and <https://asce7hazardtool.online/> (include the printout of the results). All roofing and equipment assemblies must comply with the appropriate minimum wind design for the code used. (Do not combine with IRC)
- Plans details shall document compliance with applicable code provisions of the IRC or IBC. For example, general notes indicating "work to comply with 2021 IRC" is not appropriate or acceptable.
- The structural design shall be engineered in accordance with Texas Engineering Practice Act regulations and as specifically required by the Houston Building Official, whichever is more restrictive. All engineered sheets shall be sealed, signed and dated by a Texas licensed engineer.
- Electrical plans shall be prepared and signed/sealed by either a licensed electrician or a Texas engineer and show compliance with NEC Article 690, and the panels shall be listed for compliance with UL Standard 1703 and include, but not be limited to the following:

| | | |
|---|--|--|
| <input type="checkbox"/> Panel Layout | <input type="checkbox"/> Grounding Points | <input type="checkbox"/> Charge Controllers |
| <input type="checkbox"/> Panel Access Pathway Layout | <input type="checkbox"/> Conductor Size & Type | <input type="checkbox"/> Disconnect Size & Type |
| <input type="checkbox"/> Mounting Structure & Anchors | <input type="checkbox"/> Conductor Insulation Type | <input type="checkbox"/> Inverter Size & Type |
| <input type="checkbox"/> Roof Penetrations | <input type="checkbox"/> Current Labels & Markings | <input type="checkbox"/> Battery(ies) Size & Type & weight |
| | <input type="checkbox"/> Over Current Protection | <input type="checkbox"/> One-Line Diagram |
- Specification sheets with approved logos for all solar and associated solar electrical equipment showing listing by a recognized testing laboratory.
- Labeling and placards as required in NEC Article 690, 691 & Article 705: Interconnect Electrical Power Production Systems.

Note: Compliance with 2023 NEC Article 705 Interconnect Electrical Power Production Systems must be incorporated into the electrical design.
- Dimensioned roof layout plans showing roof access, required pathways, and spacing requirements compliant with 2021 IFC, Section 1205, Solar Photovoltaic Power Systems.
- Main breaker side tap conductors, minimum #6AWG or #4ALUM.
- Calculation/Tabulations to show how system was sized.

NOTE: NEW solar module products/systems not previously permitted, nor considered mainstream and/or missing labeling/listings or Code approvals may require an Alternative Method submittal noted in City Handout CE-1103: <https://www.houstonpermittingcenter.org/media/981/download>

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<https://bit.ly/3p78nZ>

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revised: March 2024

Form: CE-1198



Scan the QR code or visit the link below to access the full guideline: bit.ly/48fyaYw

SOLARAPP+ PROCESS FOR SOLAR-ONLY PROJECTS

SOLARAPP+ PERMITS

SolarAPP+ | **BENEFITS**

SHORTER Project Timelines
A typical SolarAPP+ project is permitted, installed, and inspected around 13 business days sooner than traditional projects
Based on differences in median durations

Staff Time SAVINGS
NREL estimates SolarAPP+ saved around 9,900 hours of jurisdiction staff time through automated permit reviews in 2022

Potential Inspection BENEFITS
(further research required)
SolarAPP+ projects have been about 29% less likely to fail inspections than traditional projects
Based on data from 12 jurisdictions

Image Courtesy of National Renewable Energy Laboratory

SOLARAPP+ GUIDELINE (CE-1410)



BUILDING CODE ENFORCEMENT SOLAR APP+ APPLICATION GUIDELINES

1. [Register for SolarAPP+](#) – An approved Solar company registered with the state of Texas must create a SolarAPP+ account with the National Renewable Energy Laboratory (NREL).

Reference: [SolarAPP+ \(nrel.gov\)](#) (Note all question on Solar APP+ web applications are to be referred to SolarAPP+)

2. [Registered installer company will sign in to SolarAPP+](#) – To begin the process for obtaining approved plans, documents, and checklist, the solar company will complete the Solar APP+ application process. Once a project gets approved, SolarAPP will generate an Approval ID number ([SA2022-XXX-XXX-X1A](#)) along with two (2) approval documents for applicants to upload on City of Houston iPermits Portal with the following nomenclature:

1. SA2022-XXX-XXX-X1A (Approval ID Number, last letter denotes version)
2. SXXXX-XXXX-X-X-XXX-A (Approved Installation/Plans Document)
3. SXXXX-XXXX-X-X-XXX-A (Approved Checklist)

Applicants will need all these documents and information to continue the permitting process through City of Houston iPermits Portal on **step 4**.

3. The Texas registered Solar company needs to also register with the Building Code Enforcement's (BCE) Electrical Inspections section:

- a. Applicant needs to present their Electrical State License Registration to the City of Houston.
 - i. See ([Form CE-1189](#))
- b. Create an *iPermits Portal* user profile.
- c. Contact Maher Khansa (Maher.Khansa@houstontx.gov) to receive a City of Houston Solar APP+ registration number.
- d. The Solar APP+ is currently **only** for **Residential** projects.

1. Applicants will create a project on iPermits Portal for the Solar APP+ project to receive structure and electrical inspections.

iPermits Portal: https://www.pdinet.pd.houstontx.gov/ilms_online_permits/default.asp

Applicants will need to upload the following documents to the iPermits Portal document page, these documents can be viewed on the ILMS client 550 screen (viewing limited to Internal Use Only):

1. A Declaration of Support for individual or business entity, 550 screen label: [Declaration of Support](#)
2. SA2022-XXXX-XXX-X1A (Approval Document) 550 screen label: [SolarAPP+ Field Inspection Checklist](#)
3. SXXXX-XXXX-X-X-XXX (Approval Uploads) 550 screen label: [SolarAPP+ Pre-authorization](#)

5. Once a project number is generated in step 4, the electrical contractor will need to upload the **One-line Diagram** and pay for the **SU** permits (Solar Panel permit), and then call for the electrical inspection.

6. The licensed Solar Installation Company or Electrical Contractor shall schedule an inspection at the time of the completion of the work. The Inspector will verify "Approval Plan/Installation Documents", "Approval Checklist" and "One-line diagram" and will verify the installation matches the approved documents.

CACD@houstontx.gov

832.394.9011

bit.ly/3p78ntZ



BUILDING CODE ENFORCEMENT SOLAR APP+ APPLICATION GUIDELINES

7. For structural inspections, the Contractor must contact an approved Third-party Special Inspector. The Special Inspector will provide a special inspection letter certifying that the completed installation conforms to the city approved design.

- a. The special inspection letter may be submitted to the field inspector during the final field inspection or to the Structural Inspections Office at 1002 Washington Avenue 4th Floor, Houston, TX 77002.
- b. Maher Khansa also coordinates the approved companies and inspectors for special inspections and can provide a list of approved Third-party Special Inspectors, if requested.

Helpful Contact Information

| | | |
|------------------------|----------------|--|
| Structural Inspections | (832) 394-8840 | structural.inspections@houstontx.gov |
| Electrical Inspections | (832) 394-8860 | hpcelectricalsection@houstontx.gov |

General FAQ

- [What is SolarAPP+? - SolarAPP+ Knowledge Base \(solar-app.org\)](#)
- [What projects qualify to be submitted in SolarAPP+? - SolarAPP+ Knowledge Base \(solar-app.org\)](#)
- [How is compliance checked by the portal during the permitting process? - SolarAPP+ Knowledge Base \(solar-app.org\)](#)
- [How is compliance checked by the portal during the permitting process? - SolarAPP+ Knowledge Base \(solar-app.org\)](#)

FAQ For Solar Installers

- [How do I submit a project through SolarAPP+? - SolarAPP+ Knowledge Base \(solar-app.org\)](#)
- What types of systems are not eligible for SolarAPP+ review?
To see which systems are eligible, please refer to the Eligibility Checklists
- [Is there a limit on system size SolarAPP+ can review? - SolarAPP+ Knowledge Base \(solar-app.org\)](#)
- [How do I make changes to approved plans? - SolarAPP+ Knowledge Base \(solar-app.org\)](#)

Notes:

Reference production project numbers: (22094656/6003-24062943)

CACD@houstontx.gov

832.394.9011

bit.ly/3p78ntZ



Scan the QR code or visit the link below to access the full guideline:
bit.ly/3SxBSFH

SOLARAPP+ RESOURCES

- SolarAPP+ Guide: <https://bit.ly/3SxBSFH>
- EPR User Guide: <https://bit.ly/4koAqBZ>
- ASCE 7 Windspeed: <https://bit.ly/4mK27Xj>
- SolarAPP+ Information: <https://bit.ly/3FkW9vn>
- Qualifying Projects: <https://bit.ly/3ZdhUE0>
- SolarAPP+ FAQs: <https://bit.ly/4jDf6XU>

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 askHPC@houstontx.gov

QUESTION & ANSWER

You Have Questions, We are here to help !!!



thank you!



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