RESIDENTIAL CONVENTIONAL BRACED WALLS (LATERAL LOAD RESISTING SYSTEM)

City of
SANTA ROSA
Planning & Economic
Development - Building Division

LAST UPDATED: 30 AUGUST 2023

THIS DRAWING DEPICTS MINIMUM CODE REQUIREMENTS PER THE 2022 CALIFORNIA CODE CYCLE - INFORMATION IS FOR REFERENCE ONLY AND IS NOT A SUBSTITUTE FOR ACCURATE DRAWINGS PREPARED FOR EACH PROPOSED CONSTRUCTION PROJECT

THE FOLLOWING ARE FREE INFORMATIONAL BROCHURES AND ADDITIONAL DESIGN AIDES AVAILABLE ONLINE
(NOT AFFILIATED WITH THE CITY OF SANTA ROSA; AVAILABILITY AND COST MAY CHANGE WITH NO NOTICE):

A BASIC INTRODUCTION TO WALL BRACING (GOOD EXPLANATIONS OF GENERAL CONCEPTS)
https://www.apawood.org/publication-search?q=f430&utm_source=JLC&utm_medium=native&utm_campaign=bracing&utm_content=f430

2018 IRC WALL BRACING WEBINAR SERIES (THE CALIFORNIA RESIDENTIAL CODE IS BASED ON THE INTERNATIONAL RESIDENTIAL CODE, BUT MAY CONTAIN DIFFERENT REQUIREMENTS THAN THOSE PRESENTED - SITE CONTAINS MORE IN-DEPTH EXPLANATIONS OF WALL BRACING)
https://www.apawood.org/2018-irc-wall-bracing-webinars?utm_source=JLC&utm_medium=native&utm_campaign=bracing&utm_content=webinar

APA WALL BRACING CALCULATOR (FREE SOFTWARE TO HELP WITH LATERAL DESIGN)
https://www.apawood.org/calculator?utm_source=JLC&utm_medium=native&utm_campaign=bracing&utm_content=calculator

FREE ACCESS TO CALIFORNIA CODES:
https://www.dgs.ca.gov/BSC/Codes#@ViewBag.JumpTo

FREE WEBSITES TO OBTAIN S_{DS} FOR A GIVEN PROJECT SITE:
https://hazards.atcouncil.org/#/
https://asce7hazardtool.online/

ABBREVIATIONS:

BTWN - BETWEEN

BWL - BRACED WALL LINE

CLG - CEILING

CRC - CALIFORNIA RESIDENTIAL CODE

FDN - FOUNDATION

IRC - INTERNATIONAL RESIDENTIAL CODE

SDC - SEISMIC DESIGN CATEGORY

S_{DS} - DESIGN EQRTHQUAKE SPECTRAL RESPONSE ACCELERATION PARAMETER AT SHORT PERIOD

TYP - TYPICAL

GENERAL RULES FOR CONFIGURING BRACED WALL PANELS:

USING CONVENTIONAL CONSTRUCTION FOR THE LATERAL DESIGN OF A RESIDENCE REQUIRES SPECIFIC PRESCRIPTIVE PARAMETERS THAT MUST BE FOLLOWED EXACTLY (SEE CRC SECTION R602.10). ANY ELEMENTS OF THE LATERAL BRACING SYSTEM THAT DO NOT MEET THE PRESCRIPTIVE REQUIREMENTS MUST BE DESIGNED BY A DESIGN PROFESSIONAL. (CRC R301.1.3)

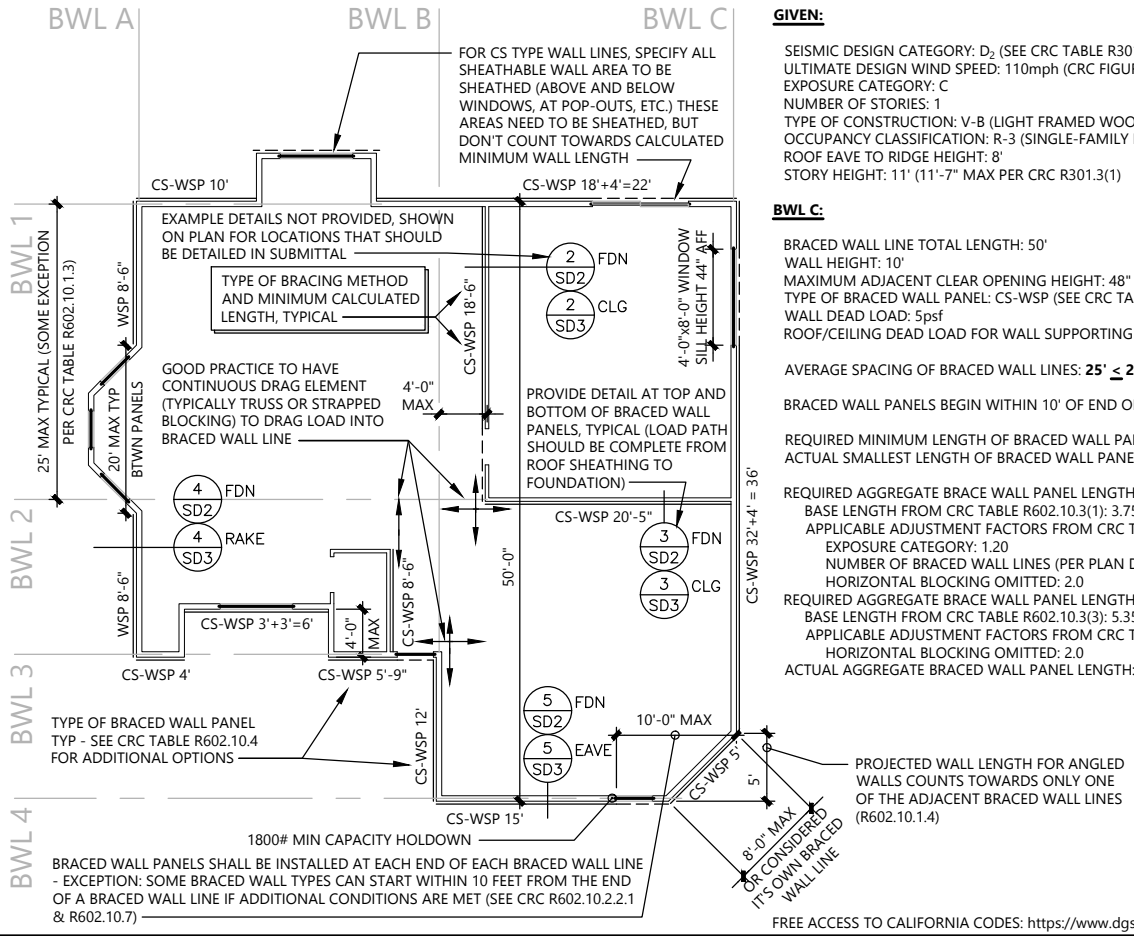
TO DESIGN THE LATERAL-LOAD-RESISTING-SYSTEM, PERFORM THE REQUIRED "CALCULATIONS"/CHECKS FOR EACH BRACED WALL LINE. SEE THE EXAMPLE "CALCULATION" AND PLAN BELOW FOR MORE INFORMATION ON HOW TO DETERMINE THE REQUIRED AGGREGATE BRACED WALL PANEL LENGTH, MINIMUM INDIVIDUAL BRACED PANEL LENGTH, SPACING BETWEEN PARALLEL BRACED WALL LINES, PROXIMITY OF BRACED WALL PANELS FROM PERPENDICULAR BRACED WALLS, ETC.) BE SURE TO CHECK THE CODE FOR ALL ADJUSTMENT FACTORS THAT APPLY TO YOUR PROJECT (FOR FULL LIST, SEE CRC TABLES R602.10.3(2) AND R602.10.3(4)).

SEE THE "ADDITIONAL REQUIREMENTS FOR BRACED WALL PANELS" SECTION OF THIS HANDOUT FOR ADDITIONAL REQUIREMENTS.

FOR SANTA ROSA, THE FOLLOWING ASSUMPTIONS SHOULD BE MADE (UNLESS DIRECTED OTHERWISE BY A DESIGN PROFESSIONAL). THESE ASSUMPTIONS SHOULD BE SPECIFIED ON THE COVER PAGE OF THE PLANS:

LATERAL BRACING SYSTEM: CONVENTIONAL CONSTRUCTION
ULTIMATE DESIGN WIND SPEED (3-SECOND GUST): 95mph (CRC FIGURE R301.2(2))
EXPOSURE CATEGORY: B or C (SEE "DEFINITIONS" SECTION OF THIS HANDOUT, AND CHOOSE THE APPLICABLE CATEGORY FOR YOUR PROJECT)

EXAMPLE BRACED WALL PLAN



EXAMPLE "CALCULATION" FOR A CONVENTIONALLY BRACED WALL LINE:

GIVEN:

SEISMIC DESIGN CATEGORY: D_2 (SEE CRC TABLE R301.2.2.1.1 AND SECTION R301.2.2.1.2)
ULTIMATE DESIGN WIND SPEED: 110mph (CRC FIGURE R301.2(2))
EXPOSURE CATEGORY: C
NUMBER OF STORIES: 1
TYPE OF CONSTRUCTION: V-B (LIGHT FRAMED WOOD)
OCCUPANCY CLASSIFICATION: R-3 (SINGLE-FAMILY RESIDENCE)
ROOF EAVE TO RIDGE HEIGHT: 8'
STORY HEIGHT: 11' (11'-7" MAX PER CRC R301.3(1))

BWL C:

BRACED WALL LINE TOTAL LENGTH: 50'
WALL HEIGHT: 10'
MAXIMUM ADJACENT CLEAR OPENING HEIGHT: 48"
TYPE OF BRACED WALL PANEL: CS-WSP (SEE CRC TABLE R602.10.4 FOR ADDITIONAL TYPES)
WALL DEAD LOAD: 5psf
ROOF/CEILING DEAD LOAD FOR WALL SUPPORTING 1-STORY BUILDING: 15psf

AVERAGE SPACING OF BRACED WALL LINES: **25' < 25'** (CRC TABLE R602.10.1.3)

BRACED WALL PANELS BEGIN WITHIN 10' OF END OF BRACED WALL PANEL (CRC R602.10.7)

REQUIRED MINIMUM LENGTH OF BRACED WALL PANEL TYPE (CRC TABLE R602.10.5): **30"**
ACTUAL SMALLEST LENGTH OF BRACED WALL PANEL USED FOR CALCULATION: **48"**

REQUIRED AGGREGATE BRACE WALL PANEL LENGTH - WIND: **11.7' MIN**
- BASE LENGTH FROM CRC TABLE R602.10.3(1): 3.75'
- APPLICABLE ADJUSTMENT FACTORS FROM CRC TABLE R602.10.3(2):
  - EXPOSURE CATEGORY: 1.20
  - NUMBER OF BRACED WALL LINES (PER PLAN DIRECTION): 1.30
  - HORIZONTAL BLOCKING OMITTED: 2.0

REQUIRED AGGREGATE BRACE WALL PANEL LENGTH - SEISMIC: **10.7' MIN**
- BASE LENGTH FROM CRC TABLE R602.10.3(3): 5.35'
- APPLICABLE ADJUSTMENT FACTORS FROM CRC TABLE R602.10.3(4):
  - HORIZONTAL BLOCKING OMITTED: 2.0

ACTUAL AGGREGATE BRACED WALL PANEL LENGTH: **41'**

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DEFINITIONS:

BRACED WALL LINE: A STRAIGHT LINE THROUGH THE BUILDING PLAN THAT REPRESENTS THE LOCATION OF THE LATERAL RESISTANCE PROVIDED BY THE WALL BRACING

BRACED WALL LINE, CONTINUOUSLY SHEATHED: A BRACED WALL LINE WITH STRUCTURAL SHEATHING APPLIED TO ALL SHEATHABLE SURFACES INCLUDING THE AREA ABOVE AND BELOW OPENINGS

BRACED WALL PANEL: A FULL-HEIGHT SECTION OF WALL CONSTRUCTED TO RESIST IN-PLANE SHEAR LOADS THROUGH INTERACTION OF FRAMING MEMBERS, SHEATHING MATERIAL, AND ANCHORS. THE PANEL'S LENGTH MEETS THE REQUIREMENTS OF ITS PARTICULAR BRACING METHOD, AND CONTRIBUTES TOWARD THE TOTAL AMOUNT OF BRACING REQUIRED ALONG ITS BRACED WALL LINE IN ACCORDANCE WITH SECTION R602.10.5.1

DESIGN PROFESSIONAL: CALIFORNIA LICENSED ARCHITECT, CIVIL ENGINEER, OR STRUCTURAL ENGINEER

EXPOSURE CATEGORY B: STRUCTURES LOCATED WHERE THE GROUND SURFACE ROUGHNESS, AS DEFINED BY "SURFACE ROUGHNESS B," PREVAILS IN THE UPWIND DIRECTION FOR A DISTANCE GREATER THAN 1500 FEET

EXPOSURE CATEGORY C: STRUCTURES LOCATED WHERE NEITHER EXPOSURE CATEGORY B NOR EXPOSURE CATEGORY D APPLY

EXPOSURE CATEGORY D: STRUCTURES LOCATED WHERE GROUND SURFACE ROUGHNESS, AS DEFINED BY "SURFACE ROUGHNESS D," PREVAILS IN THE UPWIND DIRECTION FOR A DISTANCE GREATER THAN 5000 FEET

STORY HEIGHT: THE VERTICAL DISTANCE FROM TOP TO TOP OF TWO SUCCESSIVE TIERS OF BEAMS OR FINISHED FLOOR SURFACES; AND, FOR THE TOPMOST STORY, FROM THE TOP OF THE FLOOR FINISH TO THE TOP OF THE CEILING JOISTS OR, WHERE THERE IS NOT A CEILING, TO THE TOP OF THE ROOF RAFTERS

SURFACE ROUGHNESS B: URBAN AND SUBURBAN AREAS, WOODED AREAS, OR OTHER TERRAIN WITH NUMEROUS CLOSELY SPACED OBSTRUCTIONS HAVING THE SIZE OF SINGLE-FAMILY DWELLINGS OR LARGER

SURFACE ROUGHNESS C: OPEN TERRAIN WITH SCATTERED OBSTRUCTIONS HAVING HEIGHTS GENERALLY LESS THAN 30 FEET; THIS CATEGORY INCLUDES FLAT OPEN COUNTRY AND GRASSLANDS

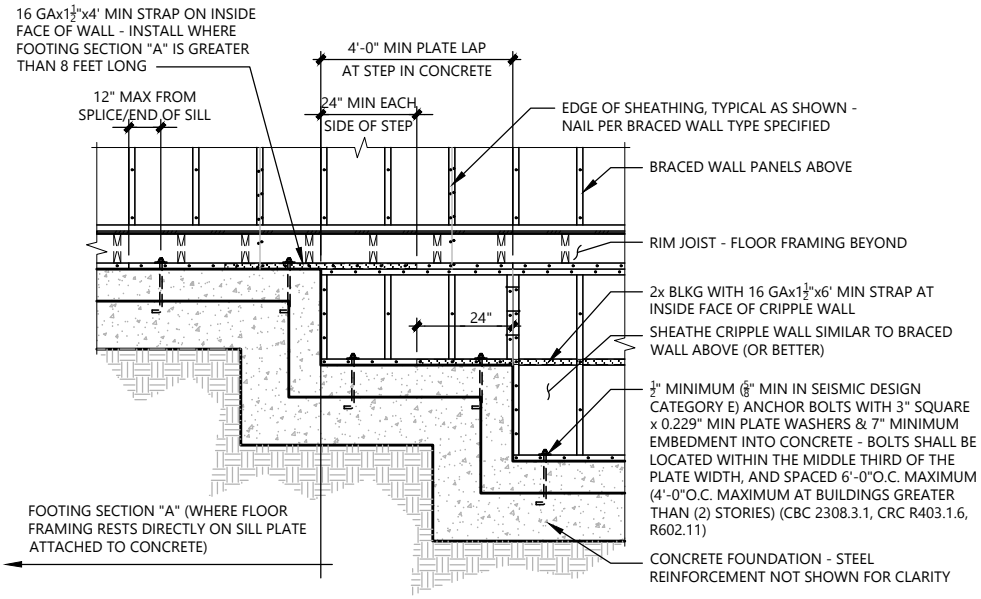
SURFACE ROUGHNESS D: FLAT, UNOBSTRUCTED AREAS AND WATER SURFACES; THIS CATEGORY INCLUDES SMOOTH MUD FLATS, SALT FLATS, AND UNBROKEN ICE

SEISMIC DESIGN CATEGORY DETERMINATION (BASED ON CRC TABLE R301.2.2.1.1)

CALCULATED S_{DS}	SEISMIC DESIGN CATEGORY
$S_{DS} \leq 0.17g$	A
$0.17g < S_{DS} \leq 0.33g$	B
$0.33g < S_{DS} \leq 0.50g$	C
$0.50g < S_{DS} \leq 0.67g$	D_0
$0.67g < S_{DS} \leq 0.83g$	D_1
$0.83g < S_{DS} \leq 1.25g$	D_2
$1.25g < S_{DS}$	E

ADDITIONAL REQUIREMENTS FOR BRACED WALL PANELS:

1. BRACED WALL LINES WITH A LENGTH OF 16 FEET OR LESS SHALL HAVE NOT LESS THAN TWO BRACED WALL PANELS OF ANY LENGTH, OR ONE BRACED WALL PANEL EQUAL TO 48 INCHES OR MORE. BRACED WALL LINES GREATER THAN 16 FEET SHALL HAVE NOT LESS THAN TWO BRACED WALL PANELS. (CRC R602.10.2.3)
2. BRACED WALL LINES ARE TO BE CONNECTED TO FOUNDATIONS, FLOOR AND ROOF FRAMING PER CRC R602.10.8.
3. PLATE WASHERS, NOT LESS THAN 0.229 INCH BY 3 INCHES BY 3 INCHES IN SIZE, SHALL BE PROVIDED BETWEEN THE FOUNDATION SILL PLATE AND THE NUT EXCEPT WHERE APPROVED ANCHOR STRAPS ARE USED. THE HOLE IN THE PLATE WASHER IS PERMITTED TO BE DIAGONALLY SLOTTED WITH A WIDTH OF UP TO $\frac{3}{16}$ INCH LARGER THAN THE BOLT DIAMETER AND A SLOT LENGTH NOT TO EXCEED $1\frac{3}{4}$ INCHES, PROVIDED A STANDARD CUT WASHER IS PLACED BETWEEN THE PLATE WASHER AND THE NUT. (CRC R602.11.1)
4. AT CRIPPLE WALLS LOCATED UNDER BRACED WALL PANELS, SEE DETAIL "A" BELOW.



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