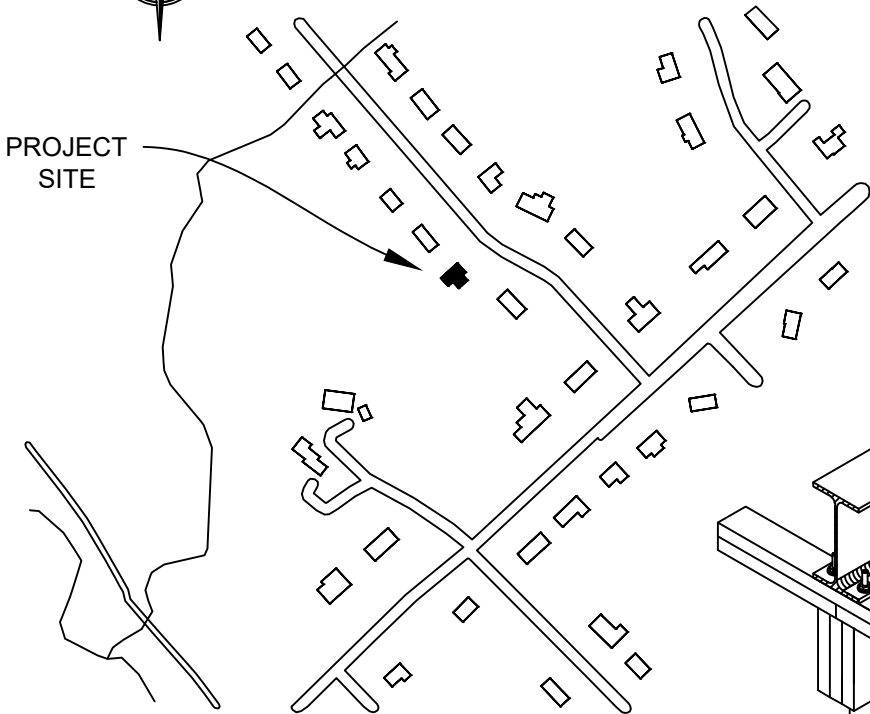


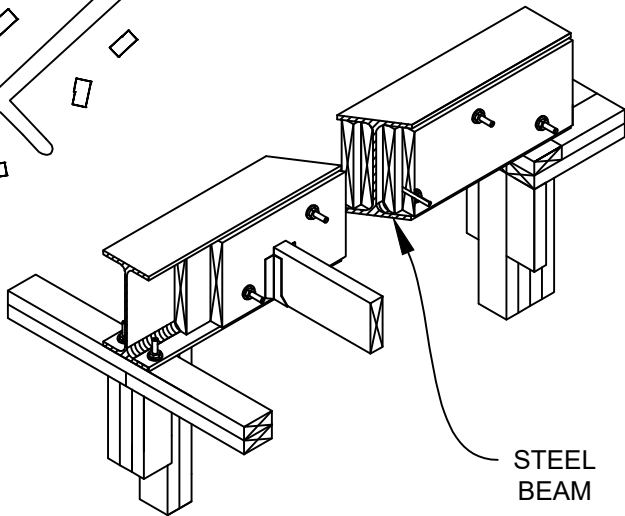
RESIDENTIAL LOAD-BEARING WALL OPENING ANALYSIS AND BEAM DESIGN

BRIDGEWATER, NJ | JULY 2026



UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN
CIVIL & ENVIRONMENTAL ENGINEERING
INDEPENDENT STRUCTURAL DESIGN PROJECT

OBJECTIVE: DESIGN A STRUCTURAL BEAM
SYSTEM TO REPLACE A LOAD-BEARING WALL
SEGMENT OF A RESIDENTIAL HOME WHILE
MAINTAINING ADEQUATE LOAD TRANSFER AND
CODE-COMPLIANT SUPPORT CONDITIONS.



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STRUCTURAL NOTES:

1. COMPLY WITH ALL APPLICABLE LOCAL BUILDING CODES.
2. ALL WORK TO BE PERMITTED / INSPECTED PER LOCAL JURISDICTION.
3. ALL CONNECTIONS TO BE DESIGNED BY OTHERS PER CALCS.
4. ALL BEARING SURFACES TO BE SHIMMED & GROUTED AS REQUIRED.
5. ALL FASTENERS TO BE ASTM A307 GALVANIZED STEEL.
6. ALL WOOD IN CONTACT WITH CONCRETE TO BE PT LUMBER.
7. ALL FRAMING LUMBER TO BE #2 GRADE OR BETTER.
8. ALL DIMENSIONS FOR LUMBER ARE NOMINAL.
9. ALL STRUCTURAL STEEL TO BE ASTM A992.
10. CONCRETE: 4,000 PSI @ 28 DAYS.
11. MINIMUM BEARING LENGTH: 3-1/2" UNLESS NOTED OTHERWISE.
12. FIELD VERIFY ALL DIMENSIONS BEFORE FABRICATION.
13. SEE ARCHITECTURAL DWGS FOR FINISH FLOOR & CEILING HEIGHTS.
14. DISCLAIMER: THIS IS A STUDENT PROJECT, NOT FOR CONSTRUCTION.
MUST BE REVIEWED BY A LICENSED STRUCTURAL ENGINEER.

REVISION TABLE

#	DESCRIPTION	DATE	BY
0	INITIAL ISSUE	7/18/26	R.L.

NAME:

RYAN LI

DRAWING #:

S-01

SHEET #:

1 of 23

RIDGE POST SUPPORTED BY
LAPPED 3-2x4 TEMP SUPPORT

EXISTING GIRDER/WALL
TO BE REMOVED

2-2x8 HEAD PIECE

2-2x4 VERTICAL
SHORES (48" O.C.)

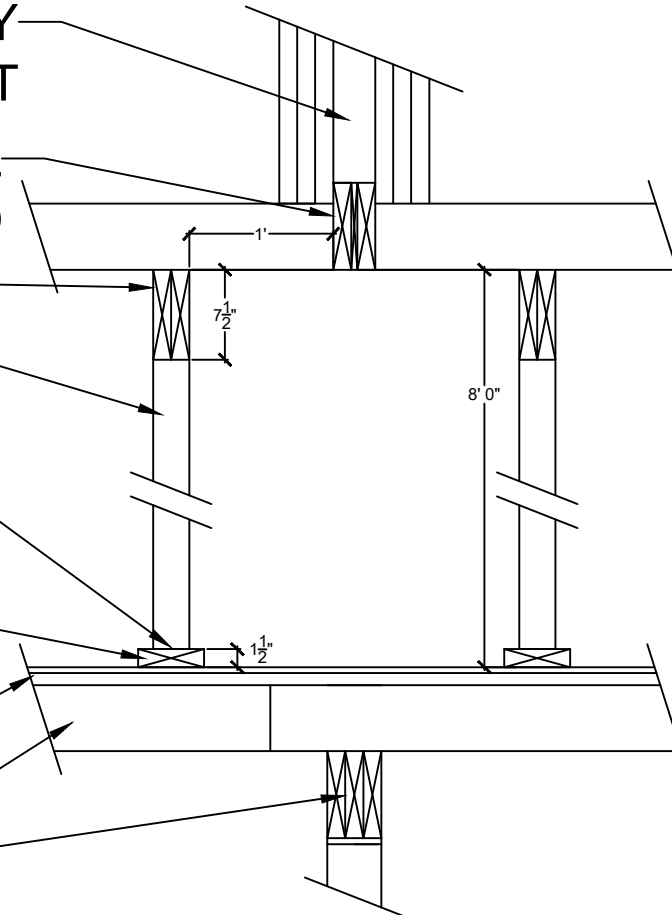
FOLDING WEDGES
(IF NECESSARY)

2x6 SOLE PLATE

SUBFLOOR

2x6 FLOOR JOISTS

3-2x8x8' GIRDER



CONTRACTOR TO PROVIDE AND INSTALL ALL TEMPORARY SHORING AS REQUIRED TO SUPPORT EXISTING STRUCTURE DURING DEMOLITION AND CONSTRUCTION. ALL SHORING TO BE DESIGNED AND SIZED BY OTHERS.

DEMOLITION & BEAM REPLACEMENT SEQUENCE:

1. INSTALL TEMPORARY SHORING WITH HEAD-PIECE, SOLE-PLATE, AND WEDGES TO SUPPORT EXISTING STRUCTURE.
2. SET UP DUST BARRIER AND PROTECT FLOORS.
3. REMOVE WALL FINISHES, THEN CAREFULLY REMOVE EXISTING BEAM / WALL. PROTECT ADJACENT JOISTS AND UTILITIES.
4. CLEAN AND LEVEL BEARING SURFACES; SHIM OR GROUT AS REQUIRED.
5. SLIDE NEW BEAM INTO POSITION, ENSURE LEVEL AND ALIGNED.
6. REATTACH JOISTS TO NEW BEAM USING HANGERS OR LEDGER BOARDS PER MFG SPECS.
7. REMOVE SHORING AFTER ALL CONNECTIONS ARE COMPLETE AND INSPECTED.
8. COMPLETE FINISHES (DRYWALL, TRIM, PAINT).

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9. SEE ARCHITECTURAL DWGS FOR FINISH FLOOR & CEILING HEIGHTS.
10. 2x6 CEILING JOISTS: ATTACH TO STEEL LEDGER W/ APPROVED HANGERS & 16d NAILS PER MFG SPECS.
11. MINIMUM BEARING LENGTH: 3-1/2" UNLESS NOTED OTHERWISE.

PROJECT:

RESIDENTIAL BEAM DESIGN - WALL OPENING

TITLE:

DEMOLITION PLAN

NAME:

RYAN LI

DATE:

7/18/2026

SHEET #:

2 of 23

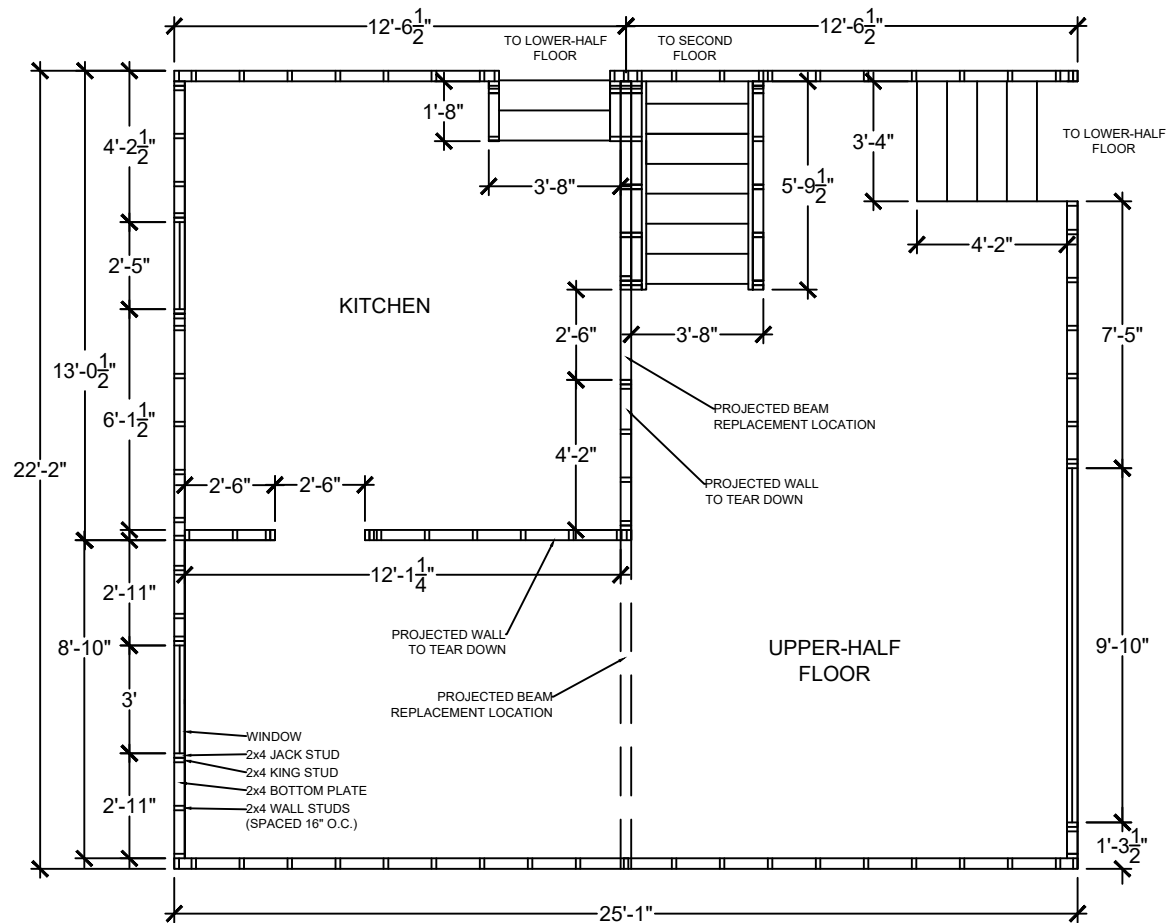
SCALE:

3/4" = 1'

DRAWING #:

S-02

DETAIL: B, E
SCALE: 3/16" = 1'



STRUCTURAL NOTES:

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PROJECT:

RESIDENTIAL BEAM DESIGN - WALL OPENING

TITLE:

UPPER-HALF
FLOOR LAYOUT

NAME:

RYAN LI

DATE:

7/12/2026

SHEET #:

3 of 23

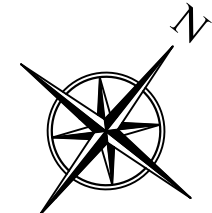
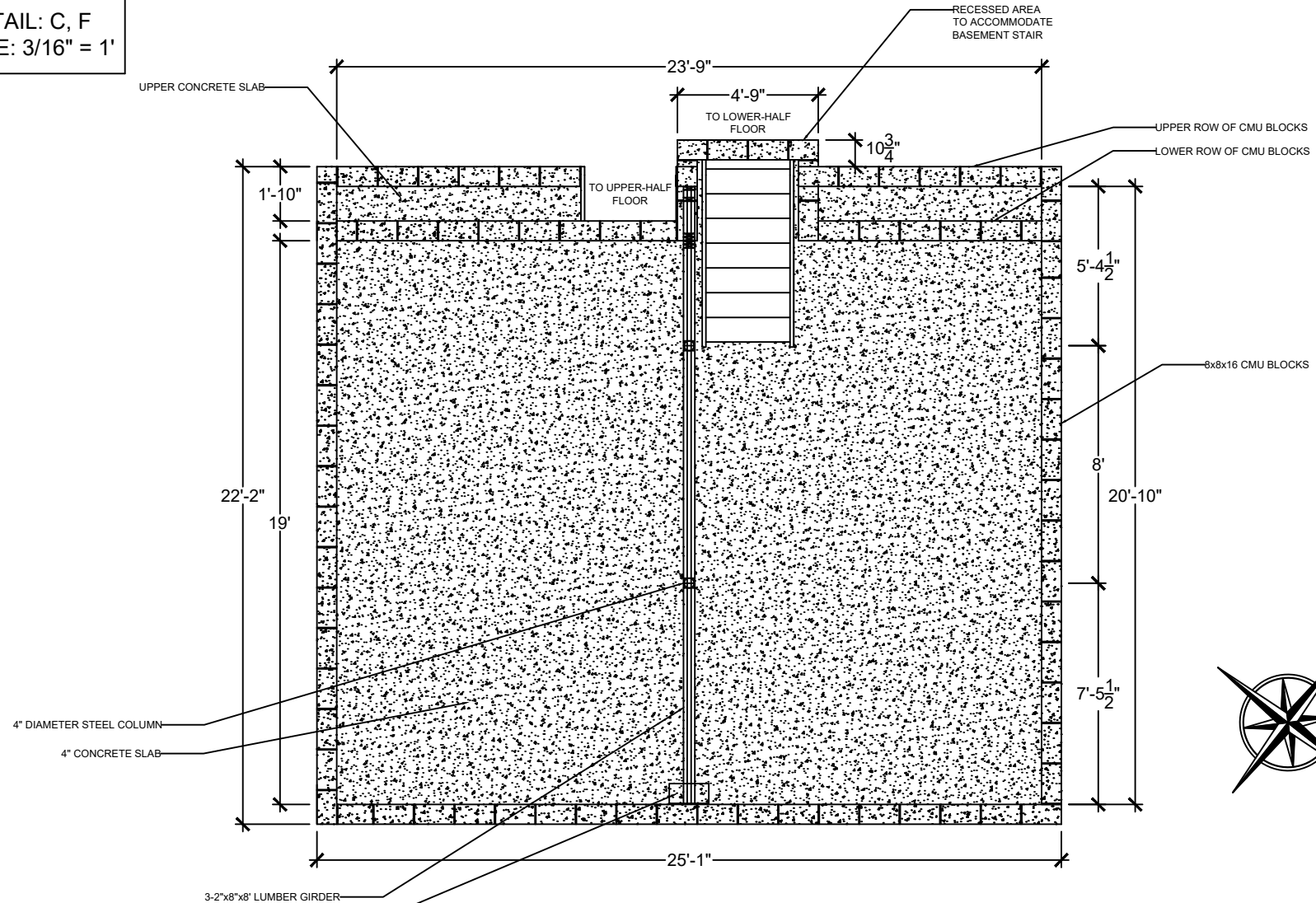
SCALE:

3/16" = 1'

DRAWING #:

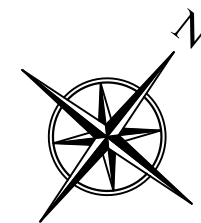
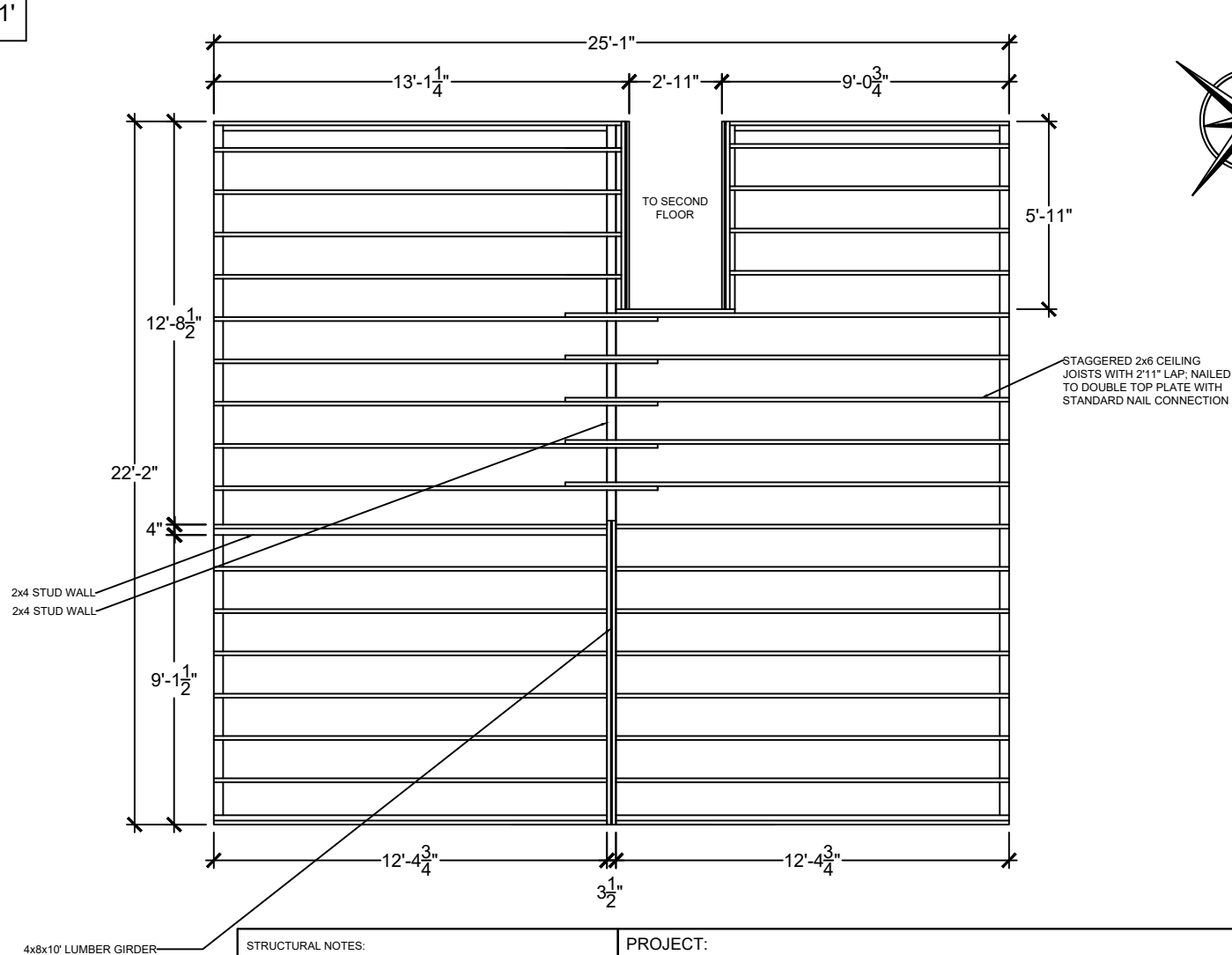
S-03

DETAIL: C, F
SCALE: 3/16" = 1'



STRUCTURAL NOTES: 1. COMPLY WITH ALL APPLICABLE LOCAL BUILDING CODES. 2. ALL CONNECTIONS TO BE DESIGNED BY OTHERS PER CALCS. 3. ALL BEARING SURFACES TO BE SHIMMED & GROUTED AS REQUIRED. 4. ALL FASTENERS TO BE ASTM A307 GALVANIZED STEEL. 5. ALL WOOD IN CONTACT WITH CONCRETE TO BE PT LUMBER. 6. ALL STRUCTURAL STEEL TO BE ASTM A992 7. CONCRETE: 4,000 PSI @ 28 DAYS. 8. FIELD VERIFY ALL DIMENSIONS BEFORE FABRICATION. 9. SEE ARCHITECTURAL DWGS FOR FINISH FLOOR & CEILING HEIGHTS. 10. 2x6 CEILING JOISTS: ATTACH TO STEEL LEDGER W/ APPROVED HANGERS & 16d NAILS PER MFG SPECS. 11. MINIMUM BEARING LENGTH: 3-1/2" UNLESS NOTED OTHERWISE.	PROJECT: RESIDENTIAL BEAM DESIGN - WALL OPENING		
	TITLE: FOUNDATION FLOOR LAYOUT	NAME: RYAN LI	DATE: 7/12/2026
		SHEET #: 4 of 23	SCALE: 3/16" = 1'
		DRAWING #: S-04	

DETAIL: A, D
SCALE: 3/16" = 1'



STRUCTURAL NOTES:

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PROJECT:

RESIDENTIAL BEAM DESIGN - WALL OPENING

TITLE:

EXISTING UPPER-HALF
CEILING FRAMING

NAME:

RYAN LI

DATE:

7/12/2026

SHEET #:

5 of 23

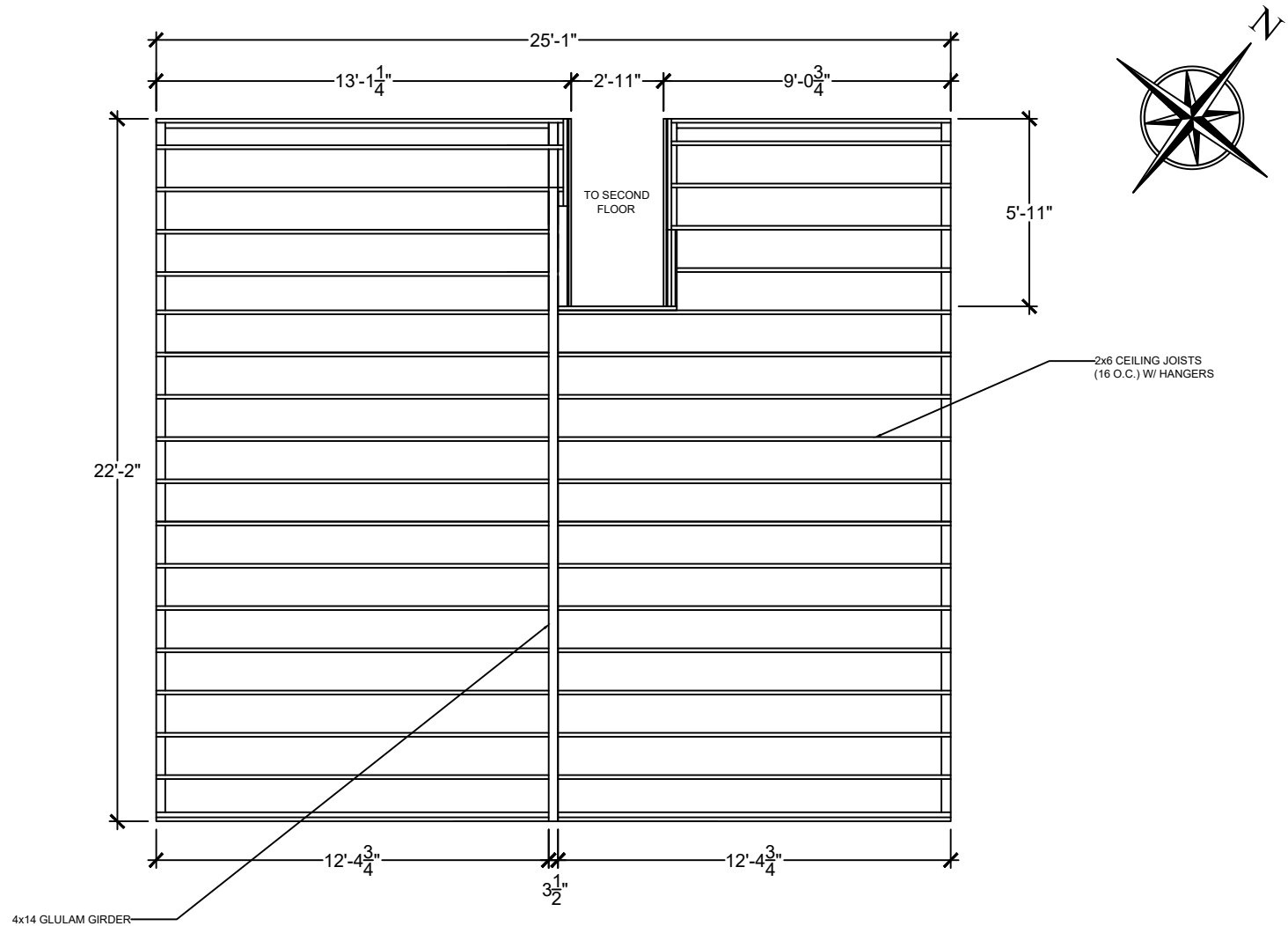
SCALE:

3/16" = 1'

DRAWING #:

S-10

DETAIL: G, K
SCALE: 3/16" = 1'



STRUCTURAL NOTES:

1. COMPLY WITH ALL APPLICABLE LOCAL BUILDING CODES.
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11. MINIMUM BEARING LENGTH: 3-1/2" UNLESS NOTED OTHERWISE.

PROJECT:

RESIDENTIAL BEAM DESIGN - WALL OPENING

TITLE:

GLULAM UPPER-HALF
CEILING FRAMING

NAME:

RYAN LI

DATE:

7/12/2026

SHEET #:

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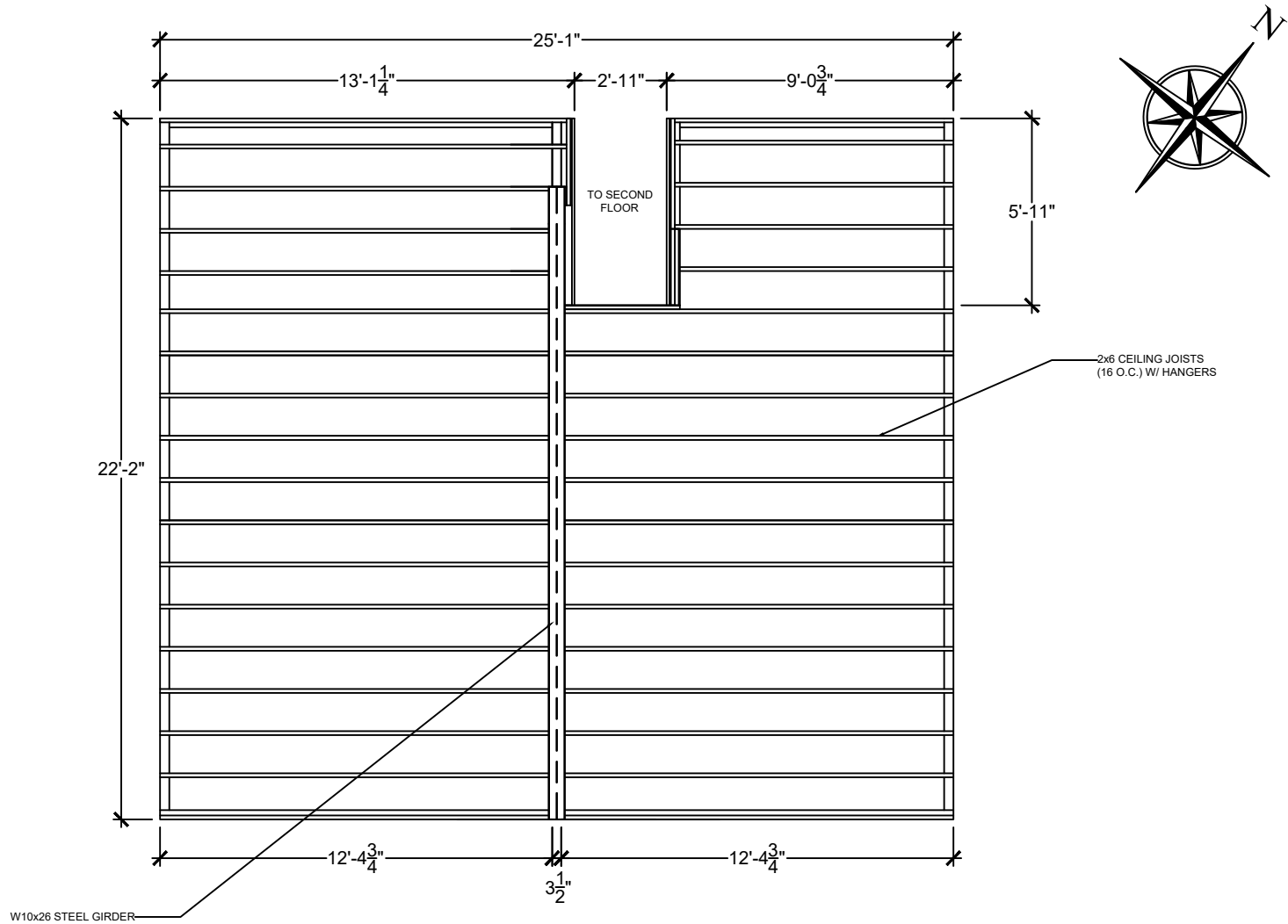
SCALE:

3/16" = 1'

DRAWING #:

S-11

DETAIL: N, R
SCALE: 3/16" = 1'



STRUCTURAL NOTES:

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PROJECT:

RESIDENTIAL BEAM DESIGN - WALL OPENING

TITLE:

STEEL UPPER-HALF
CEILING FRAMING

NAME:

RYAN LI

DATE:

7/15/2026

SHEET #:

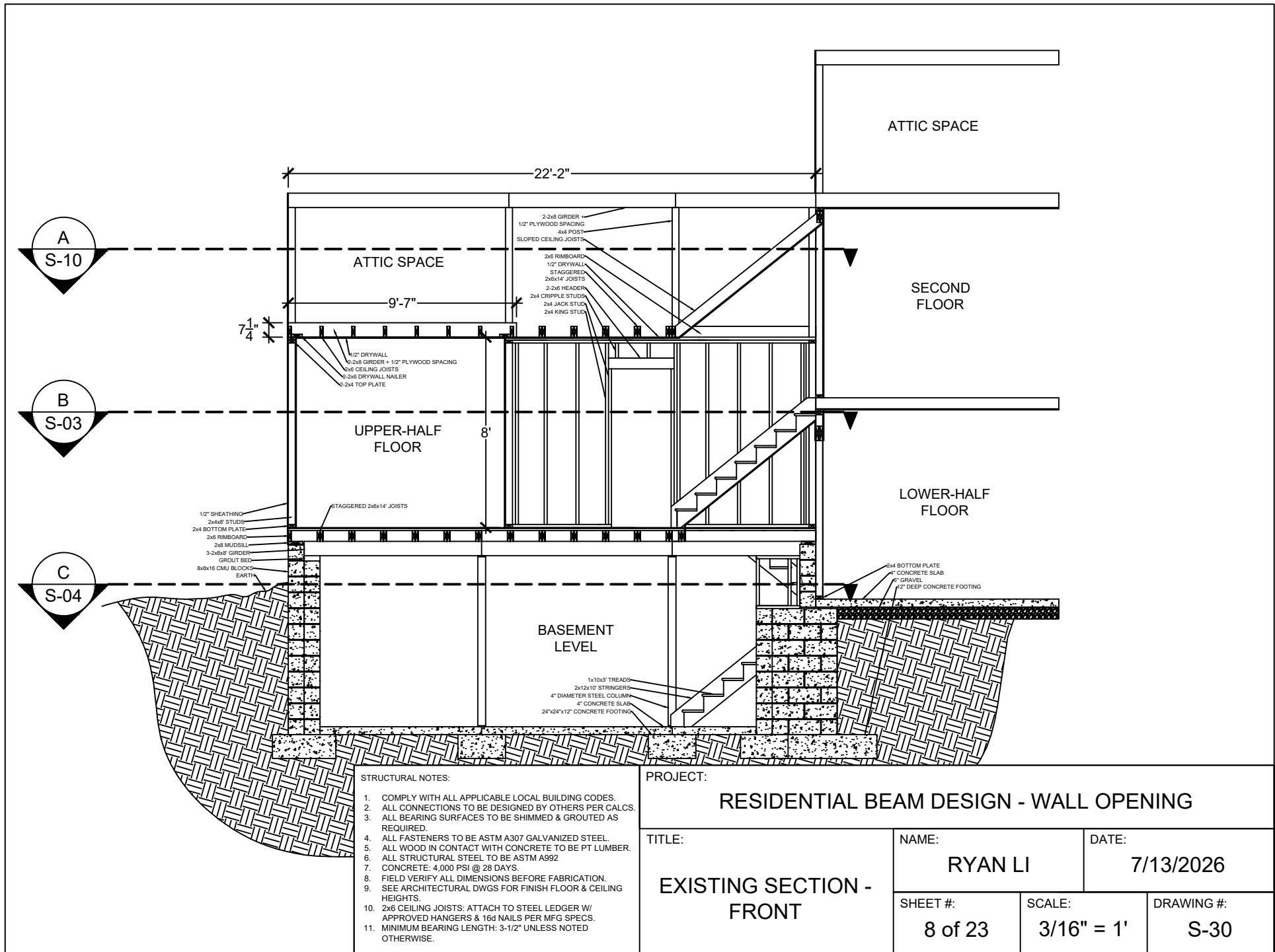
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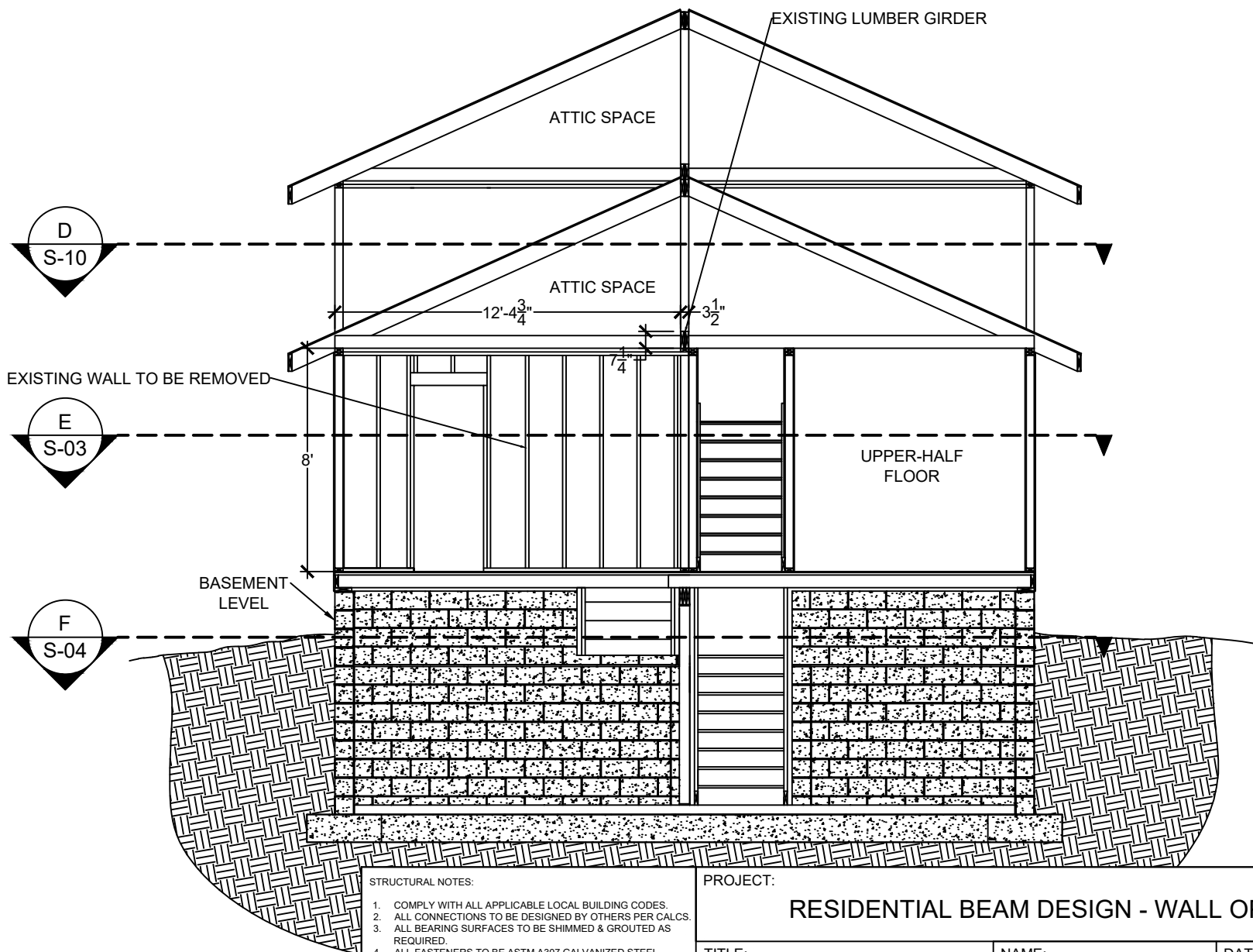
SCALE:

3/16" = 1'

DRAWING #:

S-12





STRUCTURAL NOTES:

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PROJECT:

RESIDENTIAL BEAM DESIGN - WALL OPENING

TITLE:

EXISTING SECTION -
SIDE

NAME:

RYAN LI

DATE:

7/13/2026

SHEET #:

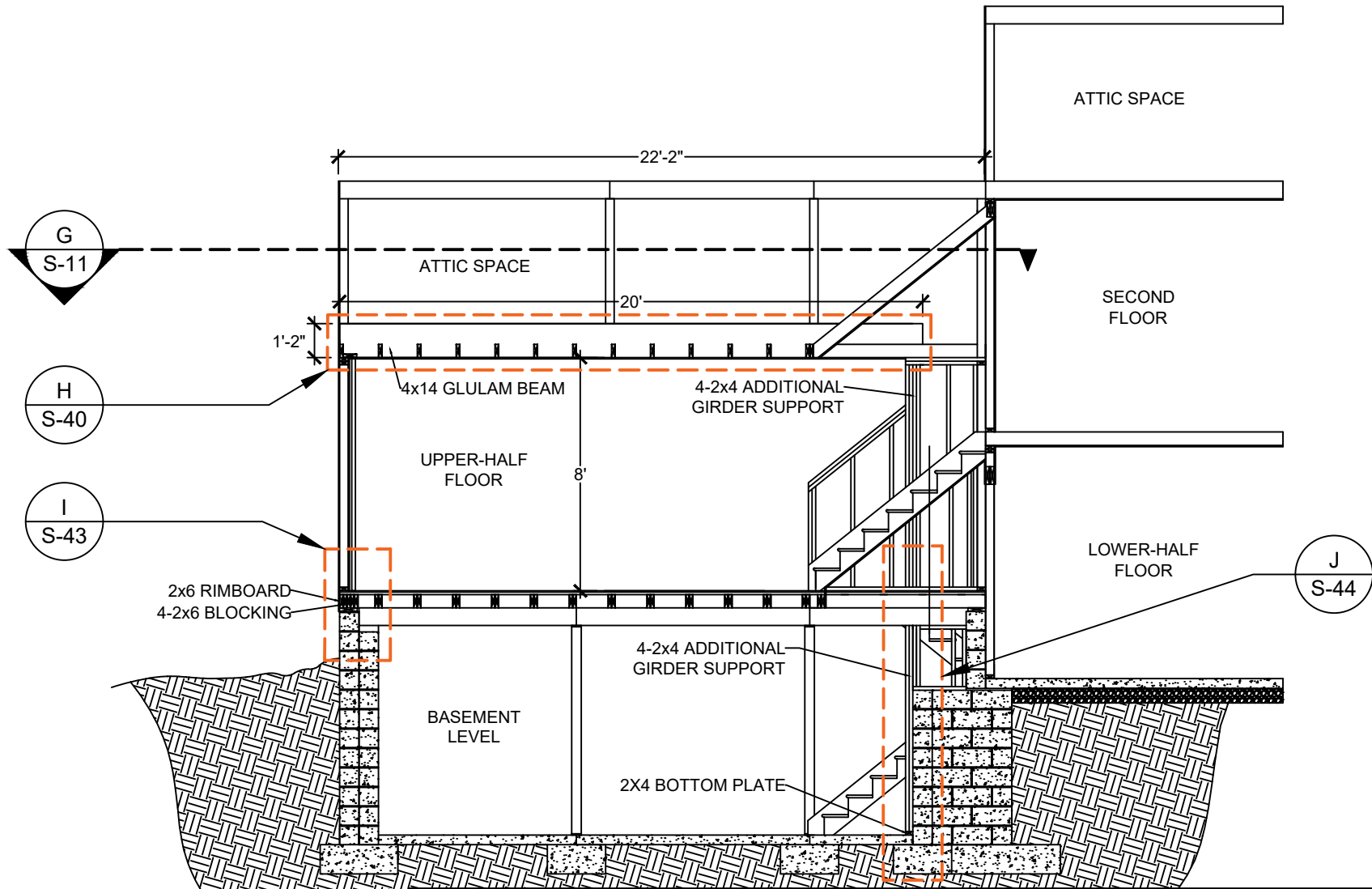
9 of 23

SCALE:

3/16" = 1'

DRAWING #:

S-31



STRUCTURAL NOTES:

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PROJECT:

RESIDENTIAL BEAM DESIGN - WALL OPENING

TITLE:

GLULAM SECTION -
FRONT

NAME:

RYAN LI

DATE:

7/13/2026

SHEET #:

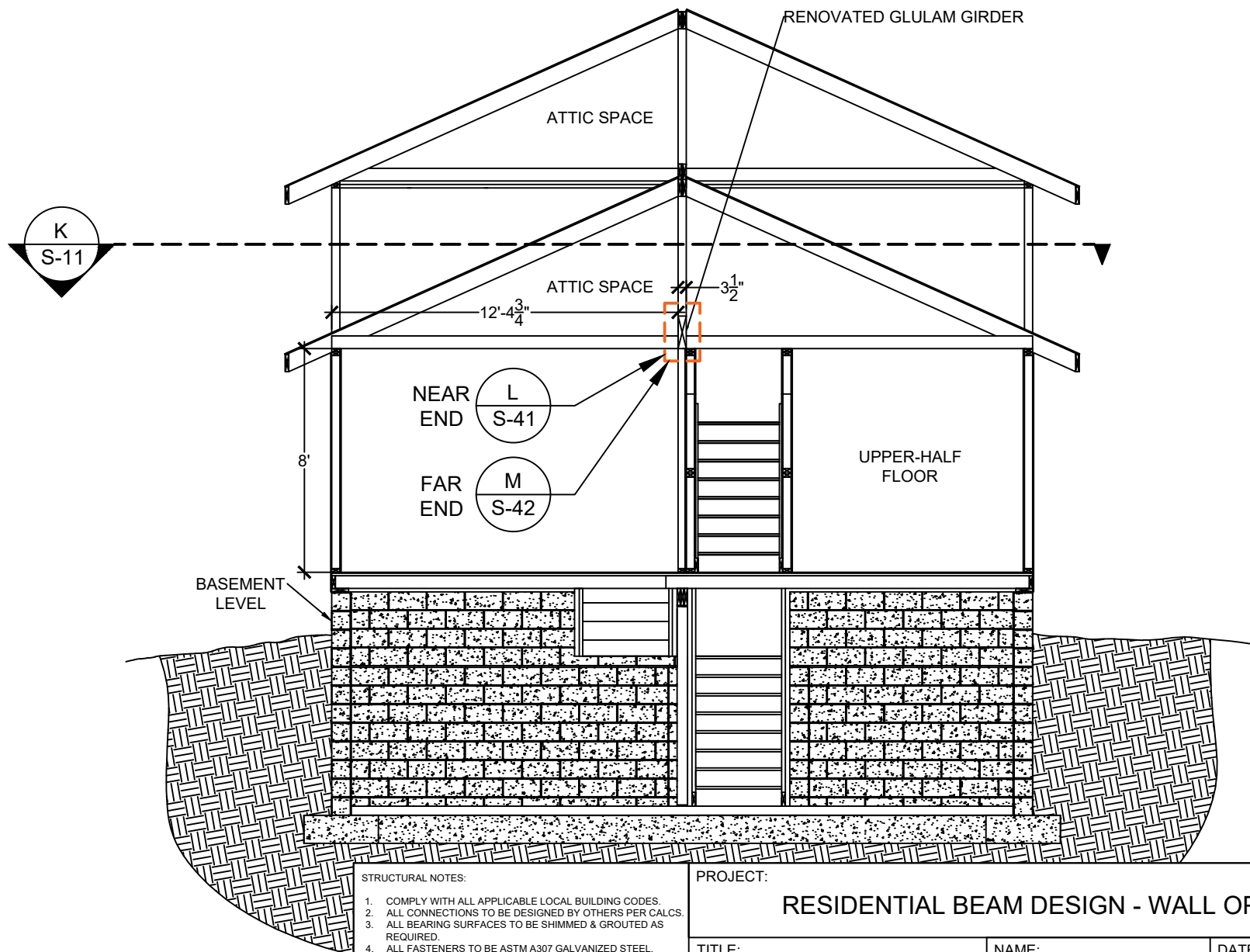
10 of 23

SCALE:

3/16" = 1'

DRAWING #:

S-32



STRUCTURAL NOTES:

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PROJECT:

RESIDENTIAL BEAM DESIGN - WALL OPENING

TITLE:

GLULAM SECTION -
SIDE

NAME:

RYAN LI

DATE:

7/14/2026

SHEET #:

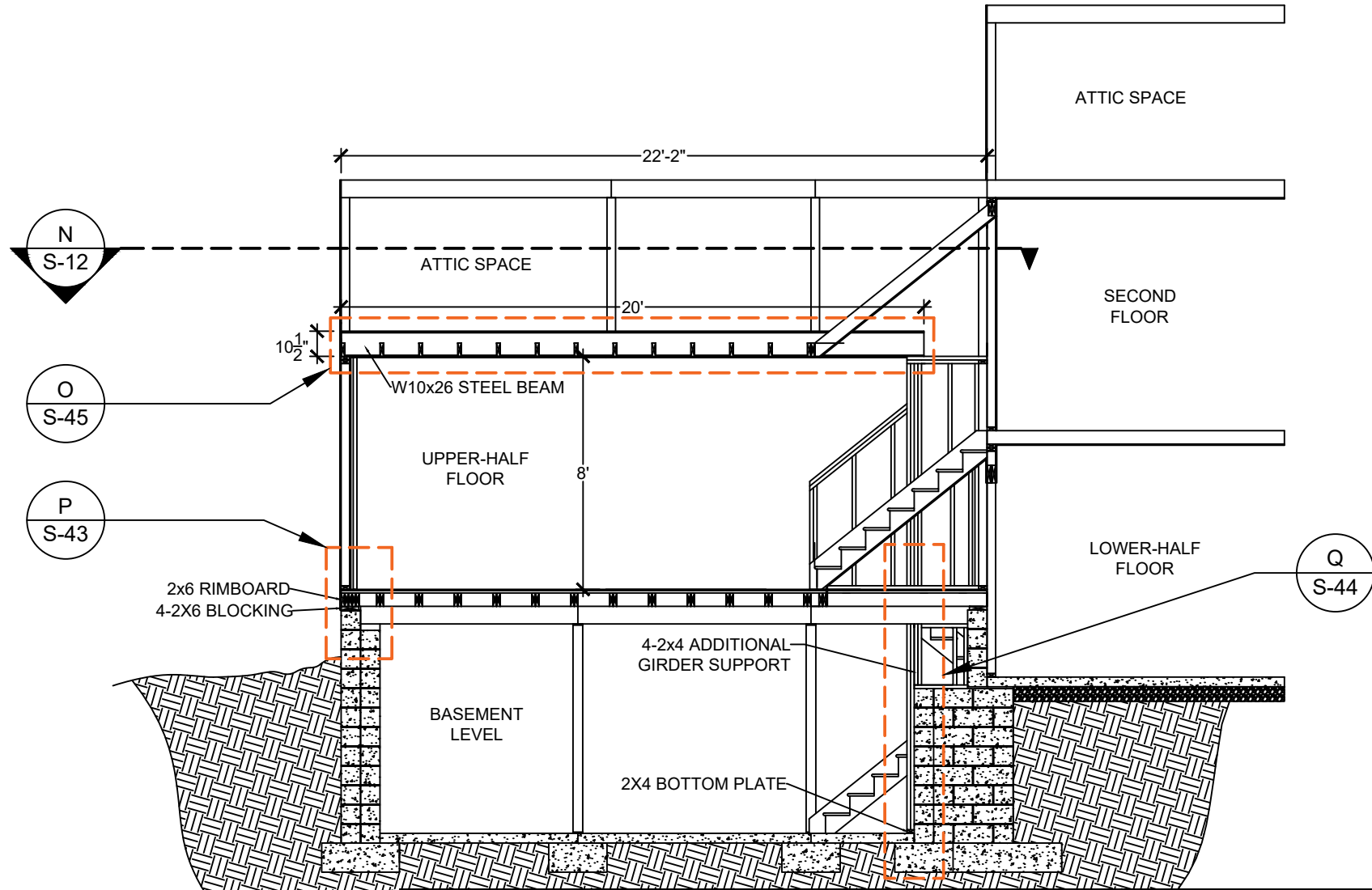
11 of 23

SCALE:

3/16" = 1'

DRAWING #:

S-33



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PROJECT:

RESIDENTIAL BEAM DESIGN - WALL OPENING

TITLE:

STEEL SECTION - FRONT

NAME:

RYAN LI

DATE:

7/14/2026

SHEET #:

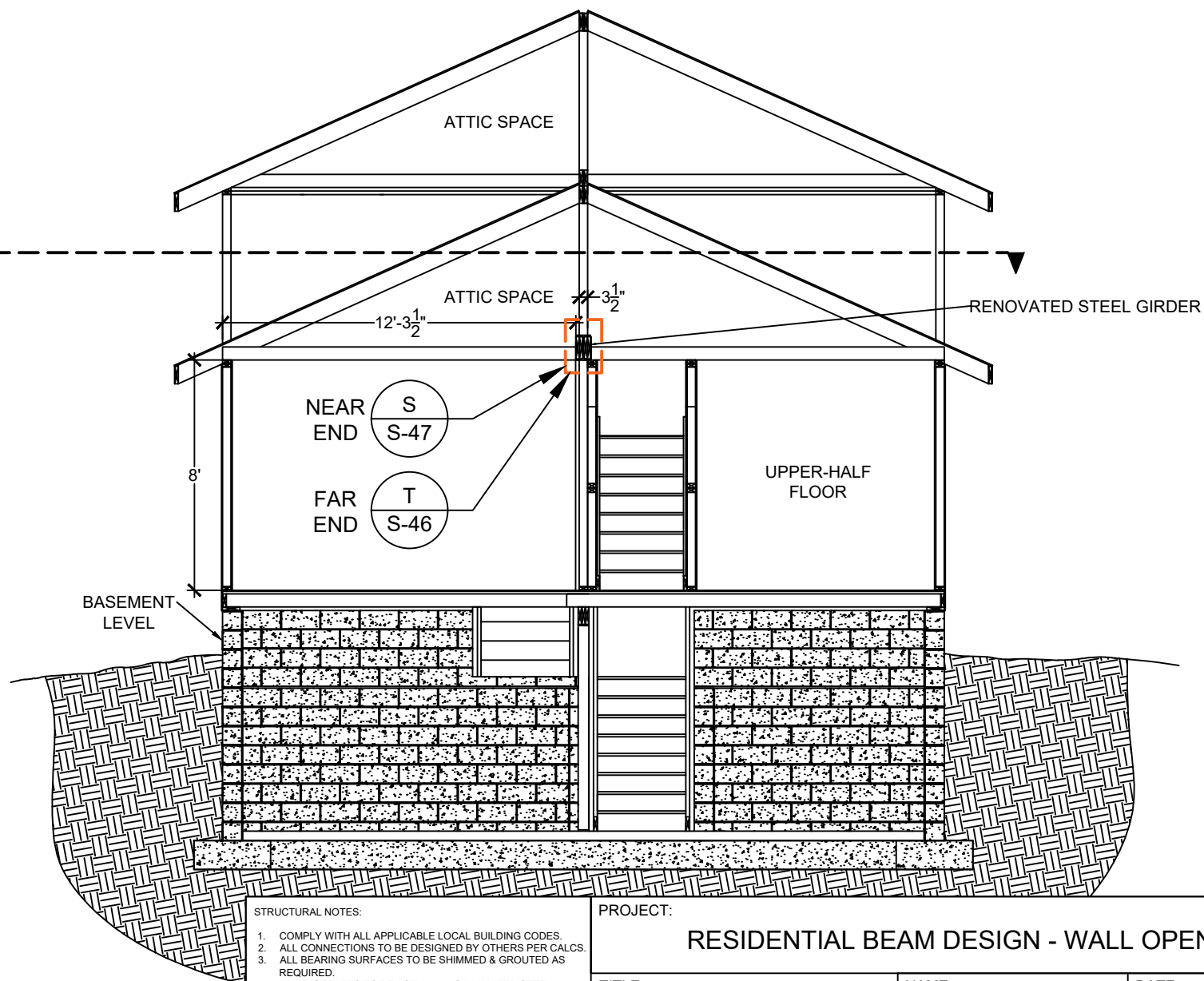
12 of 23

SCALE:

3/16" = 1'

DRAWING #:

S-34



STRUCTURAL NOTES:

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PROJECT:

RESIDENTIAL BEAM DESIGN - WALL OPENING

TITLE:

STEEL SECTION -
SIDE

NAME:

RYAN LI

DATE:

7/14/2026

SHEET #:

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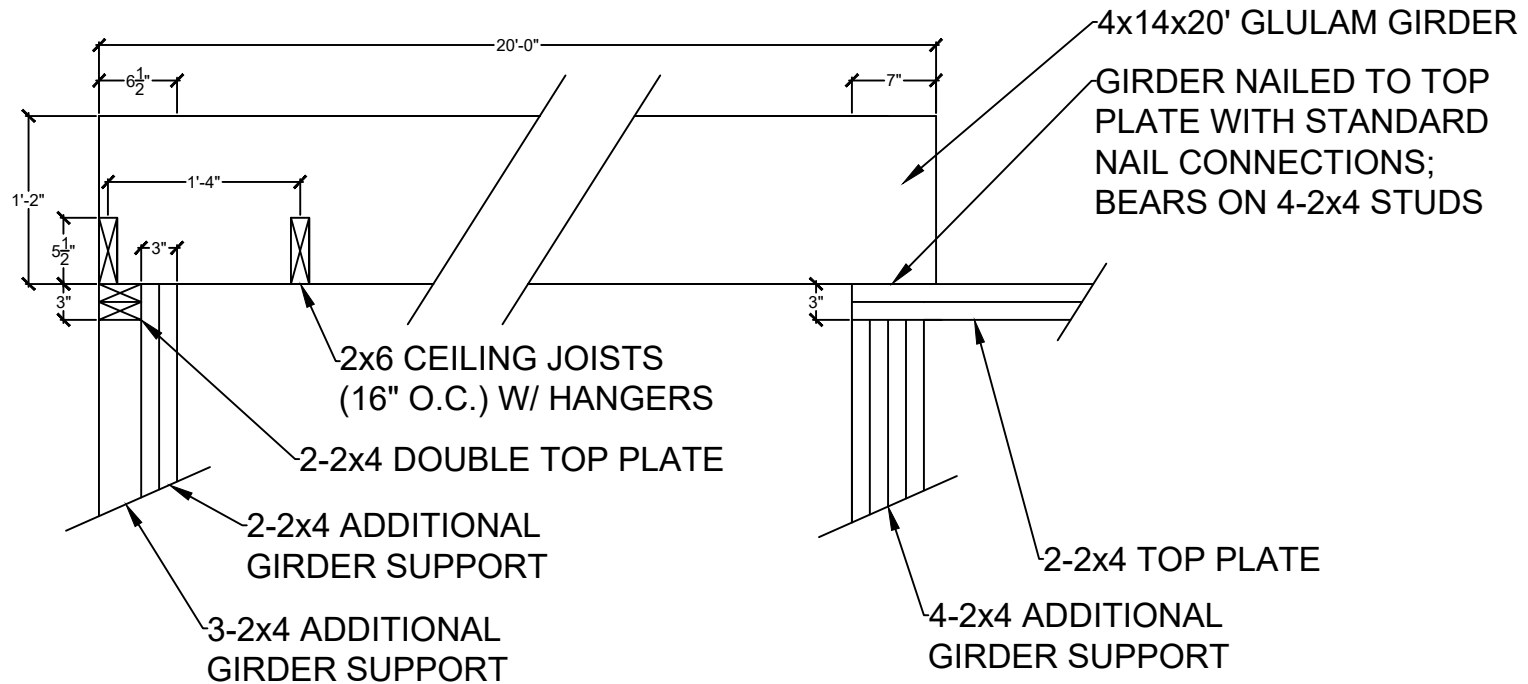
SCALE:

3/16" = 1'

DRAWING #:

S-35

DETAIL: H
SCALE: 1/2" = 1'



STRUCTURAL NOTES:

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PROJECT:

RESIDENTIAL BEAM DESIGN - WALL OPENING

TITLE:

GLULAM
CONNECTIONS -
FRONT

NAME:

RYAN LI

DATE:

7/12/2026

SHEET #:

14 of 23

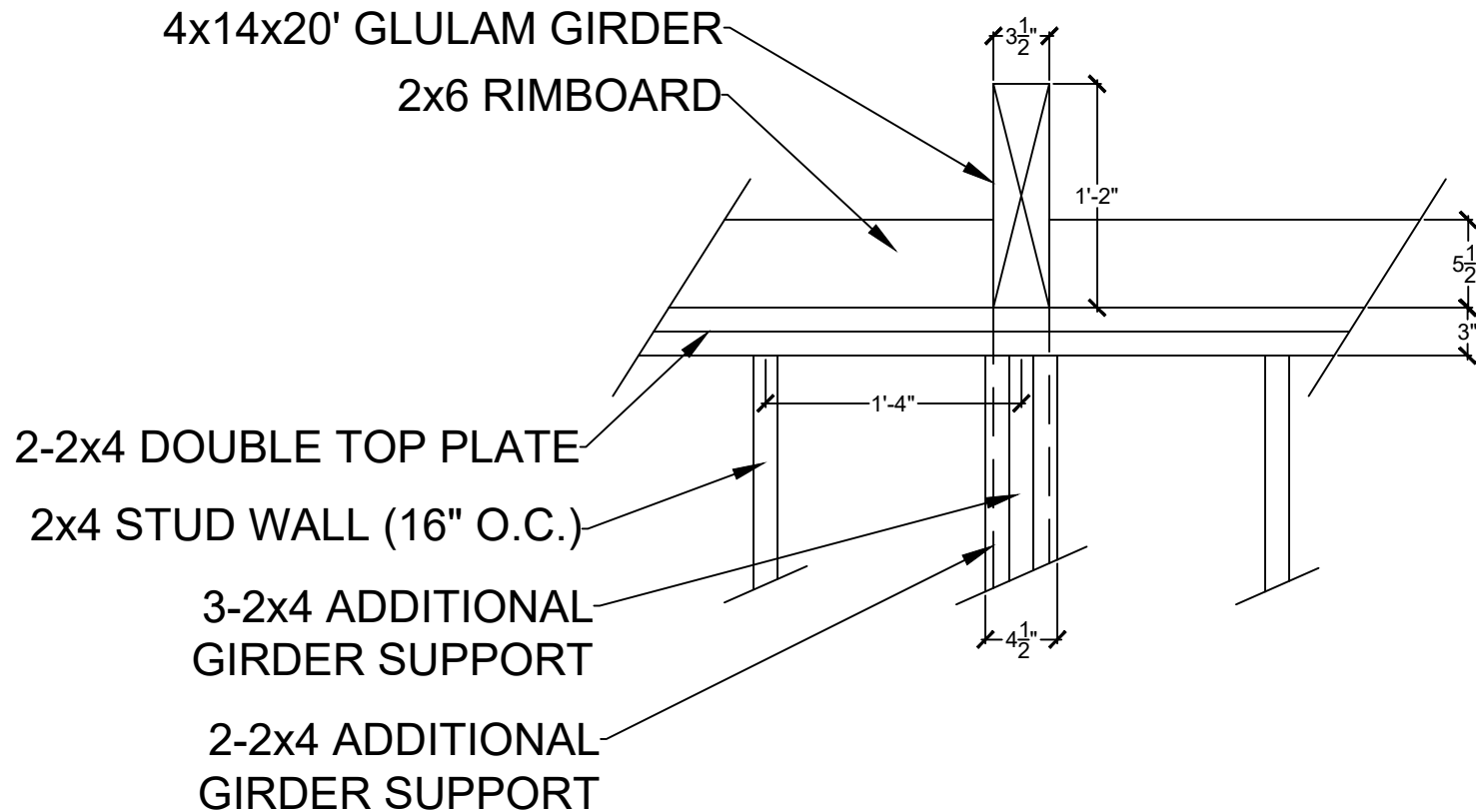
SCALE:

1/2" = 1'

DRAWING #:

S-40

DETAIL: L
SCALE: 1" = 1'



STRUCTURAL NOTES:

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11. MINIMUM BEARING LENGTH: 3'-1/2" UNLESS NOTED OTHERWISE.

PROJECT:

RESIDENTIAL BEAM DESIGN - WALL OPENING

TITLE:

GLULAM
CONNECTIONS -
SIDE

NAME:

RYAN LI

DATE:

7/12/2026

SHEET #:

15 of 23

SCALE:

1" = 1'

DRAWING #:

S-41

DETAIL: M
SCALE: 1" = 1'

4"x14"x20' GLULAM GIRDER
2x6 CEILING
JOISTS (16" O.C.)

BEAM SCREWED
DOWN TO TOP PLATE

2-2x4 DOUBLE TOP PLATE
DRYWALL

2x4 STUD WALL
(16" O.C.)

2-2x4 DOUBLE
TOP PLATE

4-2x4 ADDITIONAL
GIRDER SUPPORT

2x4 STUD WALL
(16" O.C.)

STRUCTURAL NOTES:

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11. MINIMUM BEARING LENGTH: 3-1/2" UNLESS NOTED OTHERWISE.

PROJECT:

RESIDENTIAL BEAM DESIGN - WALL OPENING

TITLE:

GLULAM BEAM TO
STUD CONNECTION

NAME:

RYAN LI

DATE:

7/13/2026

SHEET #:

16 of 23

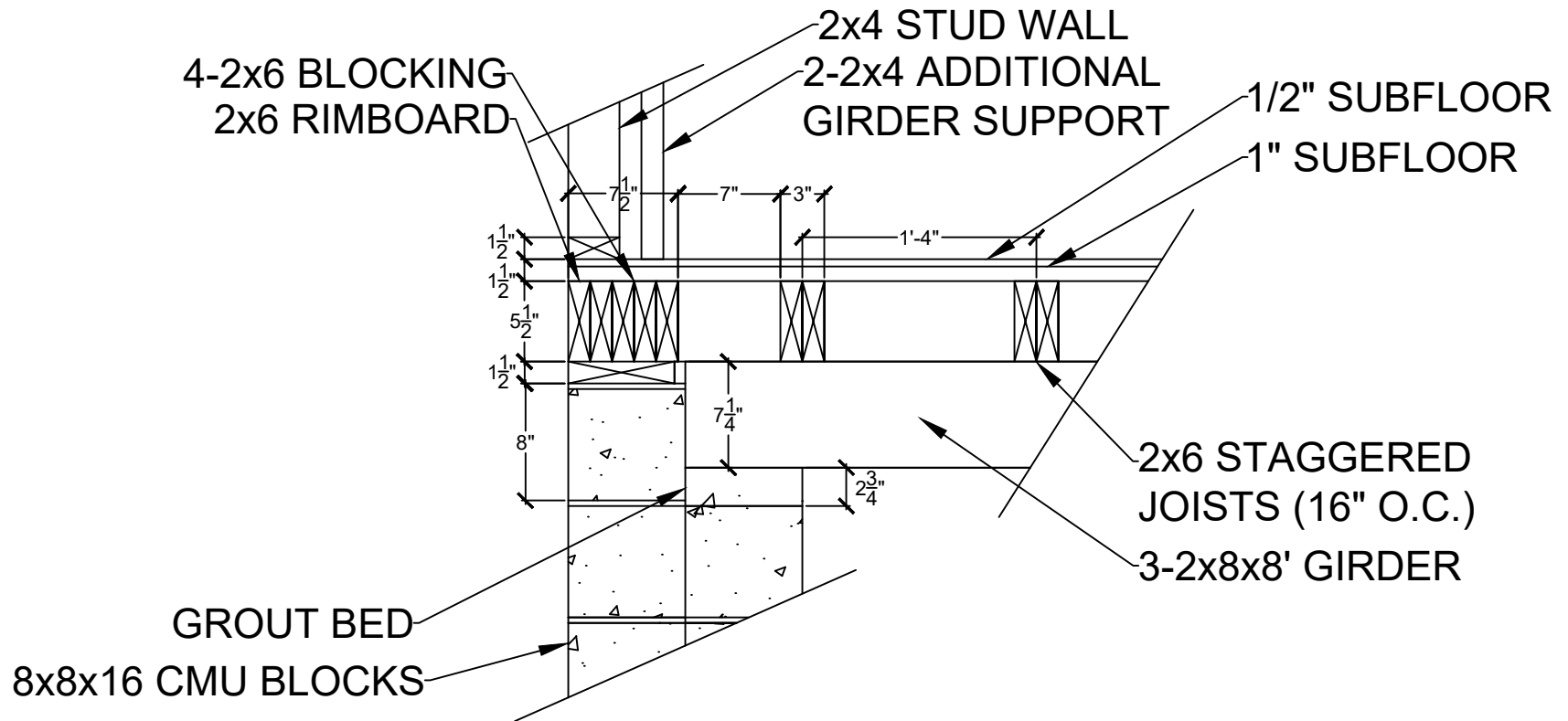
SCALE:

1" = 1'

DRAWING #:

S-42

DETAIL: I, P
SCALE: 1" = 1'



STRUCTURAL NOTES:

1. COMPLY WITH ALL APPLICABLE LOCAL BUILDING CODES.
2. ALL CONNECTIONS TO BE DESIGNED BY OTHERS PER CALCS.
3. ALL BEARING SURFACES TO BE SHIMMED & GROUTED AS REQUIRED.
4. ALL FASTENERS TO BE ASTM A307 GALVANIZED STEEL.
5. ALL WOOD IN CONTACT WITH CONCRETE TO BE PT LUMBER.
6. ALL STRUCTURAL STEEL TO BE ASTM A992
7. CONCRETE: 4,000 PSI @ 28 DAYS.
8. FIELD VERIFY ALL DIMENSIONS BEFORE FABRICATION.
9. SEE ARCHITECTURAL DWGS FOR FINISH FLOOR & CEILING HEIGHTS.
10. 2x6 CEILING JOISTS: ATTACH TO STEEL LEDGER W/ APPROVED HANGERS & 16d NAILS PER MFG SPECS.
11. MINIMUM BEARING LENGTH: 3-1/2" UNLESS NOTED OTHERWISE.

PROJECT:

RESIDENTIAL BEAM DESIGN - WALL OPENING

TITLE:

GLULAM/STEEL
ADDITIONAL SUPPORT
DETAIL

NAME:

RYAN LI

DATE:

7/12/2026

SHEET #:

17 of 23

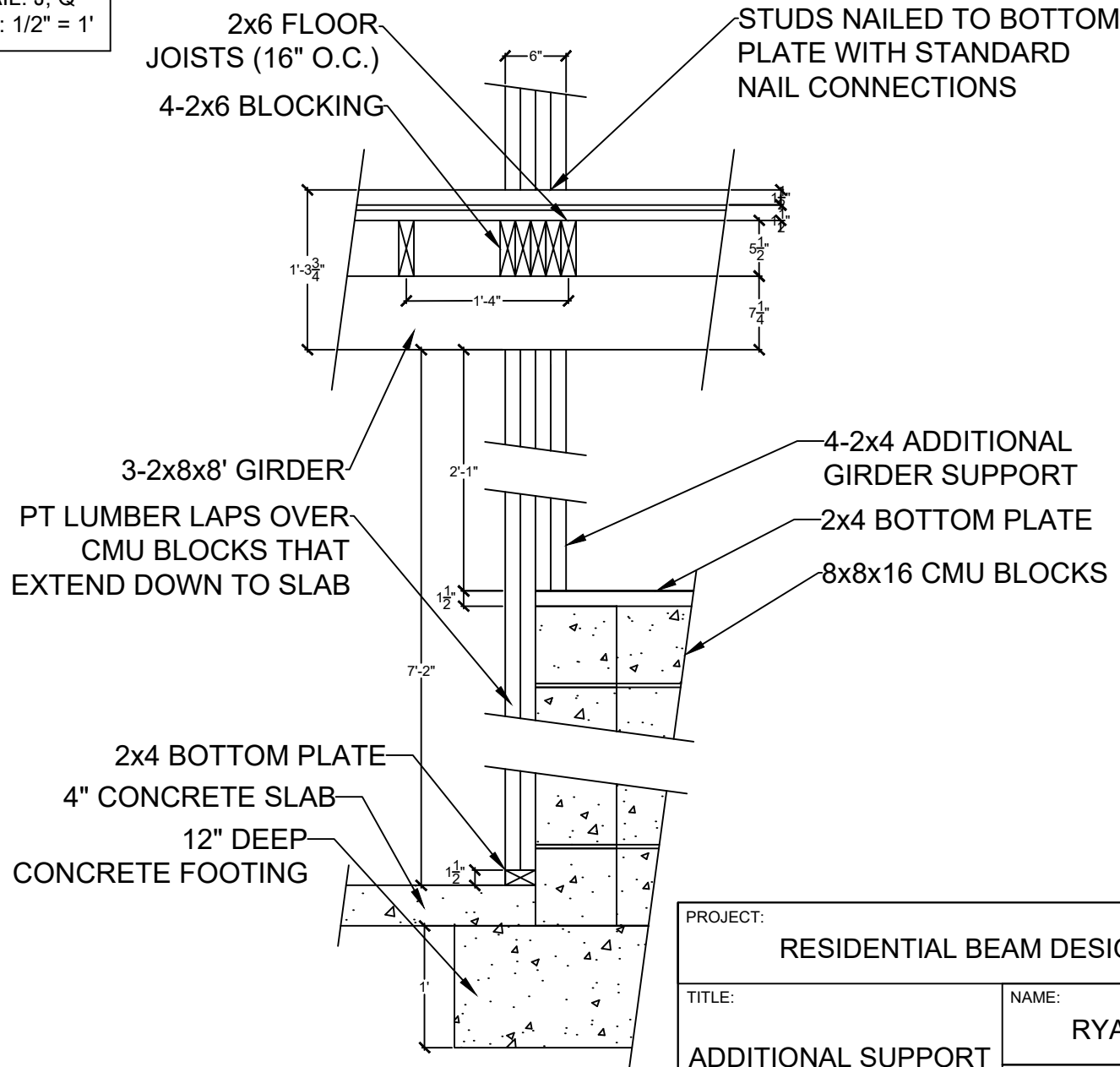
SCALE:

1" = 1'

DRAWING #:

S-43

DETAIL: J, Q
SCALE: 1/2" = 1'



STRUCTURAL NOTES:

1. COMPLY WITH ALL APPLICABLE LOCAL BUILDING CODES.
2. ALL CONNECTIONS TO BE DESIGNED BY OTHERS PER CALCS.
3. ALL BEARING SURFACES TO BE SHIMMED & GROUTED AS REQUIRED.
4. ALL FASTENERS TO BE ASTM A307 GALVANIZED STEEL.
5. ALL WOOD IN CONTACT WITH CONCRETE TO BE PT LUMBER.
6. ALL STRUCTURAL STEEL TO BE ASTM A992
7. CONCRETE: 4,000 PSI @ 28 DAYS.
8. FIELD VERIFY ALL DIMENSIONS BEFORE FABRICATION.
9. SEE ARCHITECTURAL DWGS FOR FINISH FLOOR & CEILING HEIGHTS.
10. 2x6 CEILING JOISTS: ATTACH TO STEEL LEDGER W/ APPROVED HANGERS & 16d NAILS PER MFG SPECS.
11. MINIMUM BEARING LENGTH: 3-1/2" UNLESS NOTED OTHERWISE.

PROJECT:

RESIDENTIAL BEAM DESIGN - WALL OPENING

TITLE:

ADDITIONAL SUPPORT
DETAIL

NAME:

RYAN LI

DATE:

7/12/2026

SHEET #:

18 of 23

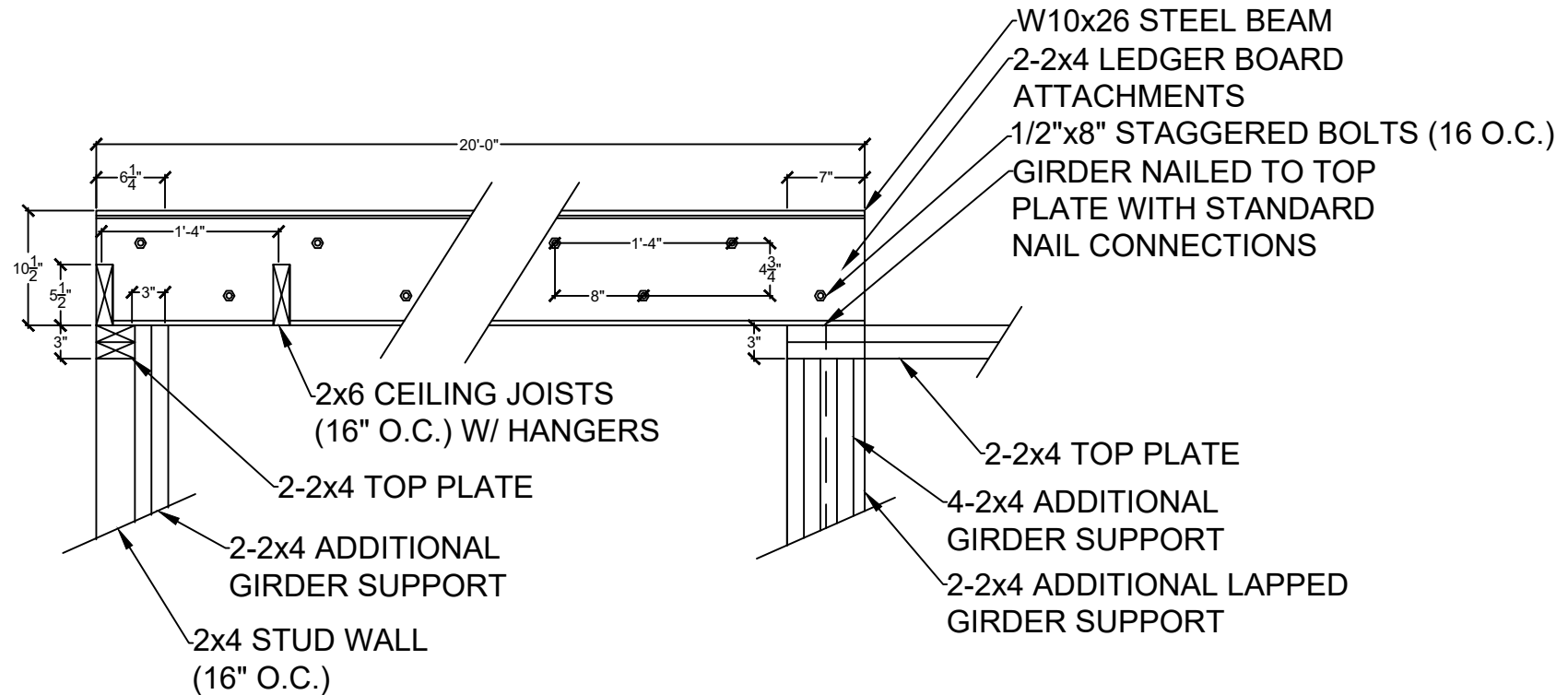
SCALE:

1/2" = 1'

DRAWING #:

S-44

DETAIL: O
SCALE: 3/4" = 1'



STRUCTURAL NOTES:

1. COMPLY WITH ALL APPLICABLE LOCAL BUILDING CODES.
2. ALL CONNECTIONS TO BE DESIGNED BY OTHERS PER CALCS.
3. ALL BEARING SURFACES TO BE SHIMMED & GROUTED AS REQUIRED.
4. ALL FASTENERS TO BE ASTM A307 GALVANIZED STEEL.
5. ALL WOOD IN CONTACT WITH CONCRETE TO BE PT LUMBER.
6. ALL STRUCTURAL STEEL TO BE ASTM A992
7. CONCRETE: 4,000 PSI @ 28 DAYS.
8. FIELD VERIFY ALL DIMENSIONS BEFORE FABRICATION.
9. SEE ARCHITECTURAL DWGS FOR FINISH FLOOR & CEILING HEIGHTS.
10. 2x6 CEILING JOISTS: ATTACH TO STEEL LEDGER W/ APPROVED HANGERS & 16d NAILS PER MFG SPECS.
11. MINIMUM BEARING LENGTH: 3-1/2" UNLESS NOTED OTHERWISE.

PROJECT:

RESIDENTIAL BEAM DESIGN - WALL OPENING

TITLE:

STEEL CONNECTIONS -
FRONT

NAME:

RYAN LI

DATE:

7/12/2026

SHEET #:

19 of 23

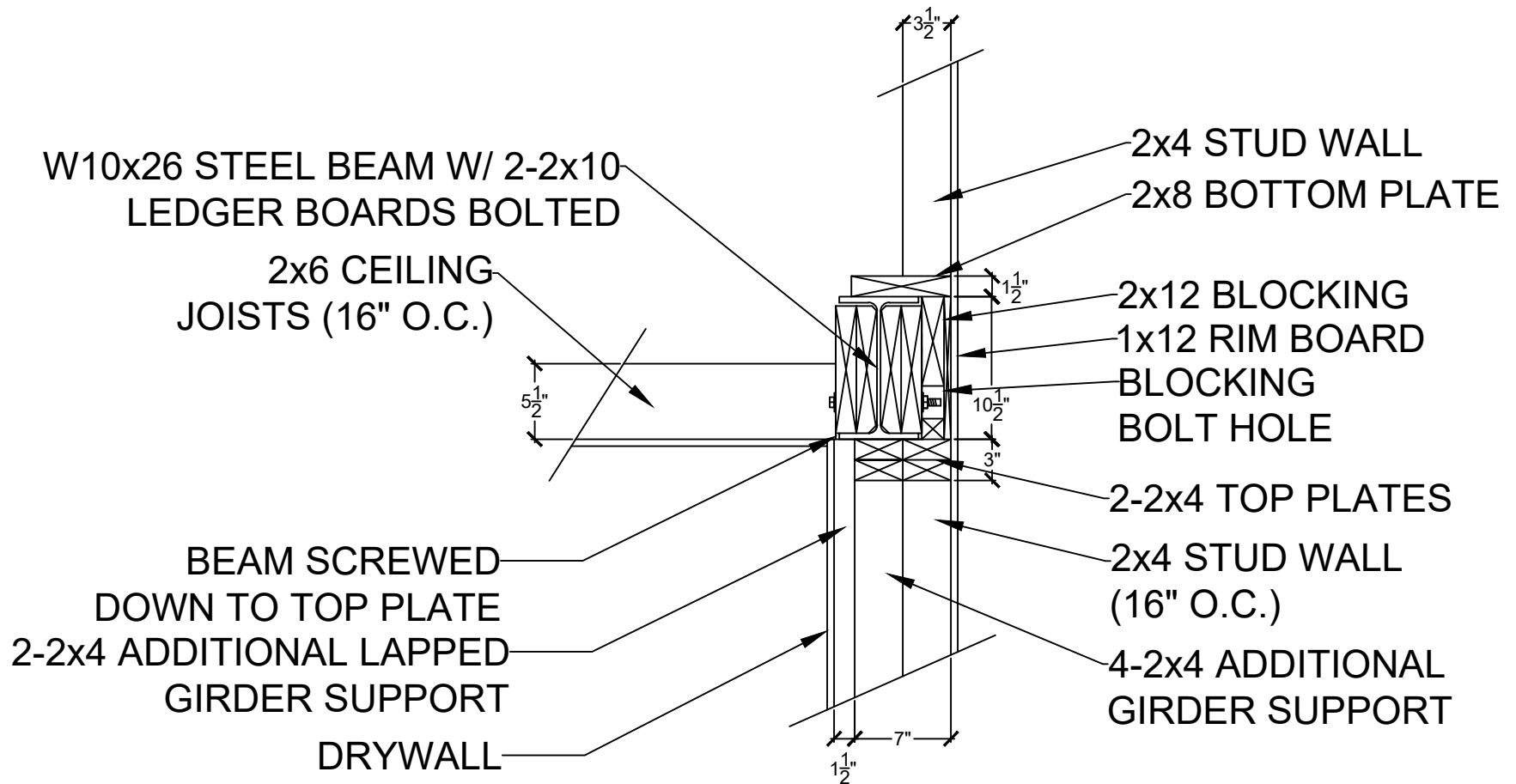
SCALE:

3/4" = 1'

DRAWING #:

S-45

DETAIL: T
SCALE: 1" = 1'



STRUCTURAL NOTES:

1. COMPLY WITH ALL APPLICABLE LOCAL BUILDING CODES.
2. ALL CONNECTIONS TO BE DESIGNED BY OTHERS PER CALCS.
3. ALL BEARING SURFACES TO BE SHIMMED & GROUTED AS REQUIRED.
4. ALL FASTENERS TO BE ASTM A307 GALVANIZED STEEL.
5. ALL WOOD IN CONTACT WITH CONCRETE TO BE PT LUMBER.
6. ALL STRUCTURAL STEEL TO BE ASTM A992
7. CONCRETE: 4,000 PSI @ 28 DAYS.
8. FIELD VERIFY ALL DIMENSIONS BEFORE FABRICATION.
9. SEE ARCHITECTURAL DWGS FOR FINISH FLOOR & CEILING HEIGHTS.
10. 2x6 CEILING JOISTS: ATTACH TO STEEL LEDGER W/ APPROVED HANGERS & 16d NAILS PER MFG SPECS.
11. MINIMUM BEARING LENGTH: 3-1/2" UNLESS NOTED OTHERWISE.

PROJECT:

RESIDENTIAL BEAM DESIGN - WALL OPENING

TITLE:

STEEL & STUD
CONNECTION - SIDE

NAME:

RYAN LI

DATE:

7/12/2026

SHEET #:

20 of 23

SCALE:

1" = 1'

DRAWING #:

S-46

DETAIL: S
SCALE: 1" = 1'

W10x26 STEEL BEAM W/ 2-2x10
LEDGER BOARDS BOLTED

2x6 RIMBOARD

BEAM SCREWED
DOWN TO TOP PLATE

2-2x4 TOP PLATE

2x4 STUD WALL
(16" O.C.)

3-2x4 ADDITIONAL
GIRDER SUPPORT

U
S-48

1'-4"

4'- $\frac{1}{2}$ "

5'- $\frac{1}{2}$ "
3"

STRUCTURAL NOTES:

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6. ALL STRUCTURAL STEEL TO BE ASTM A992
7. CONCRETE: 4,000 PSI @ 28 DAYS.
8. FIELD VERIFY ALL DIMENSIONS BEFORE FABRICATION.
9. SEE ARCHITECTURAL DWGS FOR FINISH FLOOR & CEILING HEIGHTS.
10. 2x6 CEILING JOISTS: ATTACH TO STEEL LEDGER W/ APPROVED HANGERS & 16d NAILS PER MFG SPECS.
11. MINIMUM BEARING LENGTH: 3-1/2" UNLESS NOTED OTHERWISE.

PROJECT:

RESIDENTIAL BEAM DESIGN - WALL OPENING

TITLE:

STEEL GIRDER
BEARING

NAME:

RYAN LI

DATE:

7/12/2026

SHEET #:

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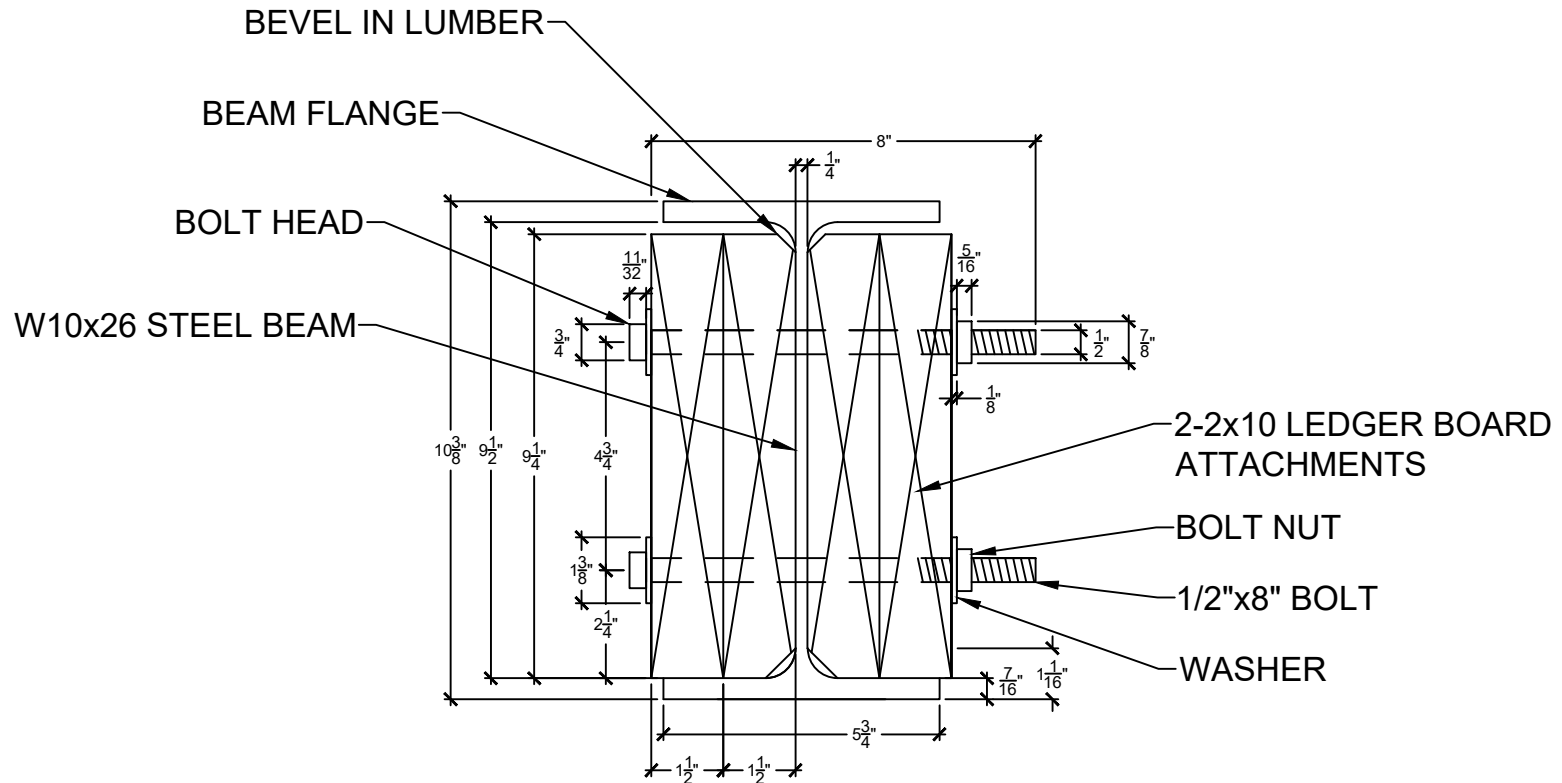
SCALE:

1" = 1'

DRAWING #:

S-47

DETAIL: U
SCALE: 3" = 1'



STRUCTURAL NOTES:

1. COMPLY WITH ALL APPLICABLE LOCAL BUILDING CODES.
2. ALL CONNECTIONS TO BE DESIGNED BY OTHERS PER CALCS.
3. ALL BEARING SURFACES TO BE SHIMMED & GROUTED AS REQUIRED.
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5. ALL WOOD IN CONTACT WITH CONCRETE TO BE PT LUMBER.
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7. CONCRETE: 4,000 PSI @ 28 DAYS.
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10. 2x6 CEILING JOISTS: ATTACH TO STEEL LEDGER W/ APPROVED HANGERS & 16d NAILS PER MFG SPECS.
11. MINIMUM BEARING LENGTH: 3-1/2" UNLESS NOTED OTHERWISE.

PROJECT:

RESIDENTIAL BEAM DESIGN - WALL OPENING

TITLE:

STEEL BEAM
FABRICATION DETAILS

NAME:

RYAN LI

DATE:

7/12/2026

SHEET #:

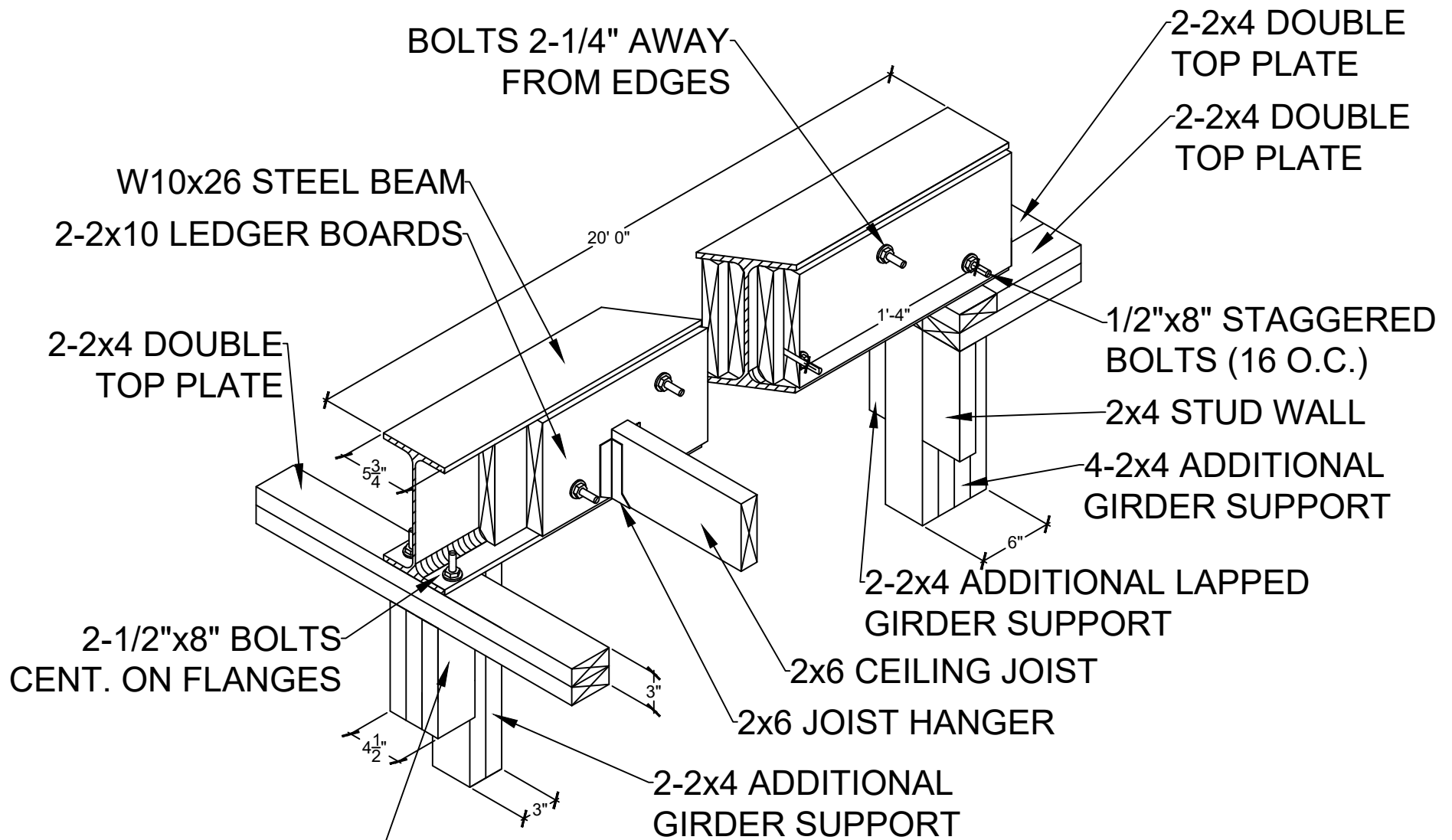
22 of 23

SCALE:

3" = 1'

DRAWING #:

S-48



STRUCTURAL NOTES:

1. COMPLY WITH ALL APPLICABLE LOCAL BUILDING CODES.
2. ALL CONNECTIONS TO BE DESIGNED BY OTHERS PER CALCS.
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4. ALL FASTENERS TO BE ASTM A307 GALVANIZED STEEL.
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6. ALL STRUCTURAL STEEL TO BE ASTM A992
7. CONCRETE: 4,000 PSI @ 28 DAYS.
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9. SEE ARCHITECTURAL DWGS FOR FINISH FLOOR & CEILING HEIGHTS.
10. 2x6 CEILING JOISTS: ATTACH TO STEEL LEDGER W/ APPROVED HANGERS & 16d NAILS PER MFG SPECS.
11. MINIMUM BEARING LENGTH: 3-1/2" UNLESS NOTED OTHERWISE.

PROJECT:

RESIDENTIAL BEAM DESIGN - WALL OPENING

TITLE:

STEEL BEAM
ISOMETRIC DRAWING

NAME:

RYAN LI

DATE:

7/17/2026

SHEET #:

23 of 23

SCALE:

1" = 1'

DRAWING #:

S-49