ALABAMA NEW CONSTRUCTION INSPECTION

By Michael Casey, ACI, MCI

TABLE OF CONTENTS

INTRODUCTION

Newly Constructed Home Inspection can be a great experience for the home inspector and their client as well as informative for the client and builder. As more and more homebuyers consider brand new homes the demand increases for new home inspections. Properly qualified home inspectors can fill this need. Essentially you are inspecting a home which has not been lived in yet, so it is not “used” and often nonperforming components and or systems will not be evident. Many times, it has not rained or rained enough to “test” the roof and water proofing components. These and other issues need to be considered when inspecting a newly constructed home.

Performing new construction inspections requires general working knowledge of the applicable building codes and local amendments to those codes. This book is based upon the single-family detached requirements of the 2018 International Residential Code (IRC), published by the International Code Council. The IRC is basically a mixing of the residential aspects of the National Building Code (BOCA), the Standard Building Code (SBCCI) and the Uniform Building Code (ICBO) all out of print as of 2000. Nearly all jurisdictions have adopted the IRC. Nearly all jurisdictions use the National Electrical Code (NEC) for electrical installations. This book will reference many typical requirements; however, we recommend that you obtain copies of the applicable codes to your area and purchase the *CodeCheck* book series or similar for further reference material. It is important to understand that home inspectors are NOT code enforcement officials, so Codes should not be referenced in home inspection reports. The reasons knowledge of codes is important to a home inspector are they are the minimum standard guidelines for building houses and an inspector should be knowledgeable of them so he/she does not report something as wrong which may be correct. Knowledge of newer construction components and systems is also important.

LEVELS OF INSPECTION

There are many levels of inspection available to the client. Most of the time the level of inspection depends upon the client’s budget. A minimal new construction inspection may only include one visit to the site, usually after completion and issuance of a “final” or “certificate of occupancy” from the local AHJ. A narrative report would then be created to document findings, about the same as a standard home inspection and the inspection and report should comply with Alabama Standards of Practice as written in 355-18-1-.01 AL Dept. of Finance, Construction Mgmt. Div., Admin. Code.

Some clients will desire more than minimal inspection. We call this “supplemental” inspection, meaning it is not a substitute for the municipal inspections required during construction and it is not a code compliance or compliance with the plans inspection. It is an inspection of the construction, by a qualified person, in stages (usually four visits), with a report of findings for each phase of inspection. These stages are: 1) underground and foundation, prior to concrete pour, 2) rough framing, electrical, plumbing and HVAC, insulation (optional), 4) building wrap prior to siding, 5) final, including roof.

Some clients will desire the utmost of service. This would include the above site visits and reports and usually several additional visits as called for by the client and consultant. This premium service also includes review of the project plans and specifications and inspection of the project for substantial compliance with the plans and specifications. The service does not include an analysis of design or engineering or architectural services.

AGREEMENTS

For a newly constructed and completed home a standard home inspection agreement applicable in your state should be utilized.

We recommend that you consult your attorney for guidance with professional services agreements and contracts. The below is an example of a services agreement previously used by the author for multiple supplemental inspection that included plan review, not a finished home inspection:

PROFESSIONAL SERVICES AGREEMENT

Mr. Client

RE: Supplemental inspection of Demolition Drive addition

At your request, we have briefly reviewed the project drawings dated_____by_____, architect. You have indicated that you desire to retain our services as secondary inspection personnel to provide visual review of the construction in progress for obvious discernable defects. We cannot warrant elimination of defects in the new construction but will warrant that inspections will be performed by qualified persons (ICC certified inspectors and/or licensed contractors) to the best of their ability.

We propose to provide construction progress inspections for the above referenced project: Underground and foundation steel, Structural frame and wrap, with plumbing and mechanical installed and insulation. Roof and exterior plaster. Final upon installation of interior finish. This type of inspection usually requires four to six visits per home. Our inspection would include a report of observations. We would require an approved set of municipally approved construction drawings be at the project for our reference. Our inspection would not include cosmetic items or finish blemishes. Our report would be sent directly to you, unless directed otherwise.

We agree to have in-force throughout our entire scope of work general liability insurance in the amount of $1million. A certificate of insurance is available upon request.

Our guidelines for inspection will be the applicable versions of the locally adopted Codes, the National Electrical Code and the approved construction drawings. The inspections would include observing for substantial compliance with the construction documents, Codes and construction standard of care. The inspections would not evaluate design of the structures, systems or components or lot lines and building placement. The following further breaks down the components of inspection:

1) Concrete, including steel placement and holdowns. Hardscape, including slope from structure and minimum 2-inch clearance from stucco weep screed.
2) Plumbing, including water supply and drain waste and vent and fuel gas piping. Proper slope of waste piping. Attachment and separation from wood for water supply lines.
3) Mechanical, including air-conditioning, furnace, ductwork, filters, registers (not system balance or adequacy).

4) Electrical, including cabling, devices, boxes and fittings (but not capacity adequacy).

5) Roofing/waterproofing, including underlayment, fastening, headlap, flashings.

6) Structural frame, including size of members, steel connectors, fastening, shear wall nailing, anchor bolts and holdowns (the previous are checked as shown on the plans, no engineering is performed by this firm). We do not inspect for plumb/level/true unless the defect is visually discernable.

7) Stucco/lath/wrap, including proper lap of building paper, window/door flashing, stucco thickness, weep screeds.

8) Insulation, including coverage.

Inspectors would also randomly check fireplaces and other ancillary components for substantial compliance with accepted standards.

We propose to provide the above-described services at the rate of $___ per site inspection (includes written report), payable when invoiced. If a specific site meeting is required, our rate is $___ per hour. If pre-construction plan review is desired, this service is $___. Please sign the below authorization if this proposal meets your approval.

If you have any questions, feel free to call. We look forward to working with you.

Sincerely

_____
Michael Casey
Michael Casey & Associates

Client Acceptance

_____
Signature

_____
Print name

_____
Title

As you can see, the above agreement can be modified to use in any situation. Consult with your attorney to determine what works best for you and your state.

REPORTING FORMS

Most new construction inspectors use narrative reports to describe their findings after each site visit. Once you create a basic form in your word processor it can be used again, or you can purchase commercially available inspection software. Some inspectors create NCR forms and write their findings at the site, giving copies to the client and sometimes the contractor.

Decide what is best for you and use that system. At times, a simple fill-in form will satisfy the needs of the client. The following is a copy of a form the author used on a new construction inspection project of new homes. The client was the developer who wanted supplemental inspection. Our services did not include plan review or roofs. Use this form as a guide for creating your own custom form. This form works best when a blank is used for field work and the comments are input into a master in a computer. Landscape style format allows the most room for comments. The form below was reprinted with permission of A1 Property Inspections.

FIELD REPORT

CLIENT: _____ **PROJECT:** _____ **ADDRESS:** _____ **DATE:** _____

WEATHER: _____ **INSPECTORS:** _____ **FAXED TO:** _____

Note: Open items to be corrected, initialed and dated prior to concealment.

Observation of window wrap,flashings,decks,foundations,rough HVAC,plumbing,electrical,foundation steel,framing,chimneys,shower tile,concrete pour,backfill drainage.

LOTS: 6 7 8 9 10 11 29 30 34 35 44 45 46 47 48 49 50 51 52 53

ITEM #	LOT #	TRADE	COMPONENTS	OBSERVATIONS	LOCATION	CORRECTION DATE	SIGNED OFF
1.							
2.							
3.							
4.							
5.							
6.							
7.							
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19.							
20.							
21.							
22.							

There are several other types of forms available for use as guidance for creating your own custom reporting forms. Another example is shown below:

CONCRETE INSPECTION CHECKLIST

rior to Placing

___ 1. Check against the approved plans for:
- _____(a) Placement, design and size of footings.
- _____(b) Required sizes of steel.
- _____(c) Dimensions.

___ 2. See that adequate borings or excavations are made to verify foundation design.

___ 3. Recheck the load tests for soil-bearing capacity.

___ 4. Verify location of joints in advance.

___ 5. Verify that water and debris have been removed from the excavation.

___ 6. Make sure the special inspector is on the job when continuous inspection is necessary.

___ 7. Verify that the following are shown on the plans and conform to the code:
- _____(a) Footings
- _____(b) Foundations
- _____(c) Girders
- _____(d) Beams
- _____(e) One-way slabs
- _____(f) Two-way slabs
- _____(g) Ribbed slabs
- _____(h) Flat slabs

___ 8. See that joints occur as shown on the approved plans.

___ 9. Check the following:
- _____(a) Thickness of footings and foundations
- _____(b) Temperature-shrinkage reinforcement for one-way slabs
- _____(c) Limiting dimensions of ribbed slabs
- _____(d) Thickness of two-way slabs
- _____(e) Locations of construction joints
- _____(f) Embedment of pipes

___ 10. In inspecting columns, check the following:
- _____(a) Spacing
- _____(b) Reinforcement
- _____(c) Lateral ties
- _____(d) Connections

___ 11. In checking special columns, watch for:
- _____(a) Splicing, spacing and size of bars in spirally reinforced columns.
- _____(b) Number, size, spacing and splicing in tied columns.
- _____(c) Load on metal core, splices and connections in composite columns.
- _____(d) Loads, splices and connections in combination columns.

_____ 12. Check reinforced concrete walls for:
- _____(a) Ratio of height to thickness.
- _____(b) Maximum height.
- _____(c) Minimum thickness.
- _____(d) Minimum reinforcement.
- _____(e) Special reinforcement shown on the plan.

_____ 13. Review the contractor's procedure for tilt-up construction to determine conformance of:
- _____(a) Location of pickup points.
- _____(b) Strength of concrete.
- _____(c) Separation of precast sections from casting bed.
- _____(d) Provision for bracing and connecting.

_____ 14. Make sure of conformance on lift-slab construction for the following:
- _____(a) Adequate lifting equipment and accessories
- _____(b) Competent operators
- _____(c) Satisfactory base anchorage
- _____(d) Safety provisions for bracing
- _____(e) Adequate connections

_____ 15. Make sure that forms for pneumatically placed concrete are true and sufficiently braced.

_____ 16. In inspecting pneumatically placed concrete, make sure that bases of concrete or masonry are clean and moist.

_____ 17. See that adequate equipment for pneumatically placed concrete is provided and that code requirements for materials and procedure are met.

_____ 18. Check structurally used plain concrete for strength and thickness.

_____ 19. Verify that the materials conform to the plans and standards.

Workmanship

_____ 20. Be sure that conditions for transporting, identification and storage are met before pouring.

_____ 21. Verify that ready-mixed concrete was made under approved plant control.

_____ 22. Make sure materials are identified as complying with appropriate standards.

_____ 23. Make sure that forms are true, tight, properly braced, oiled or wetted, and cleaned of debris.

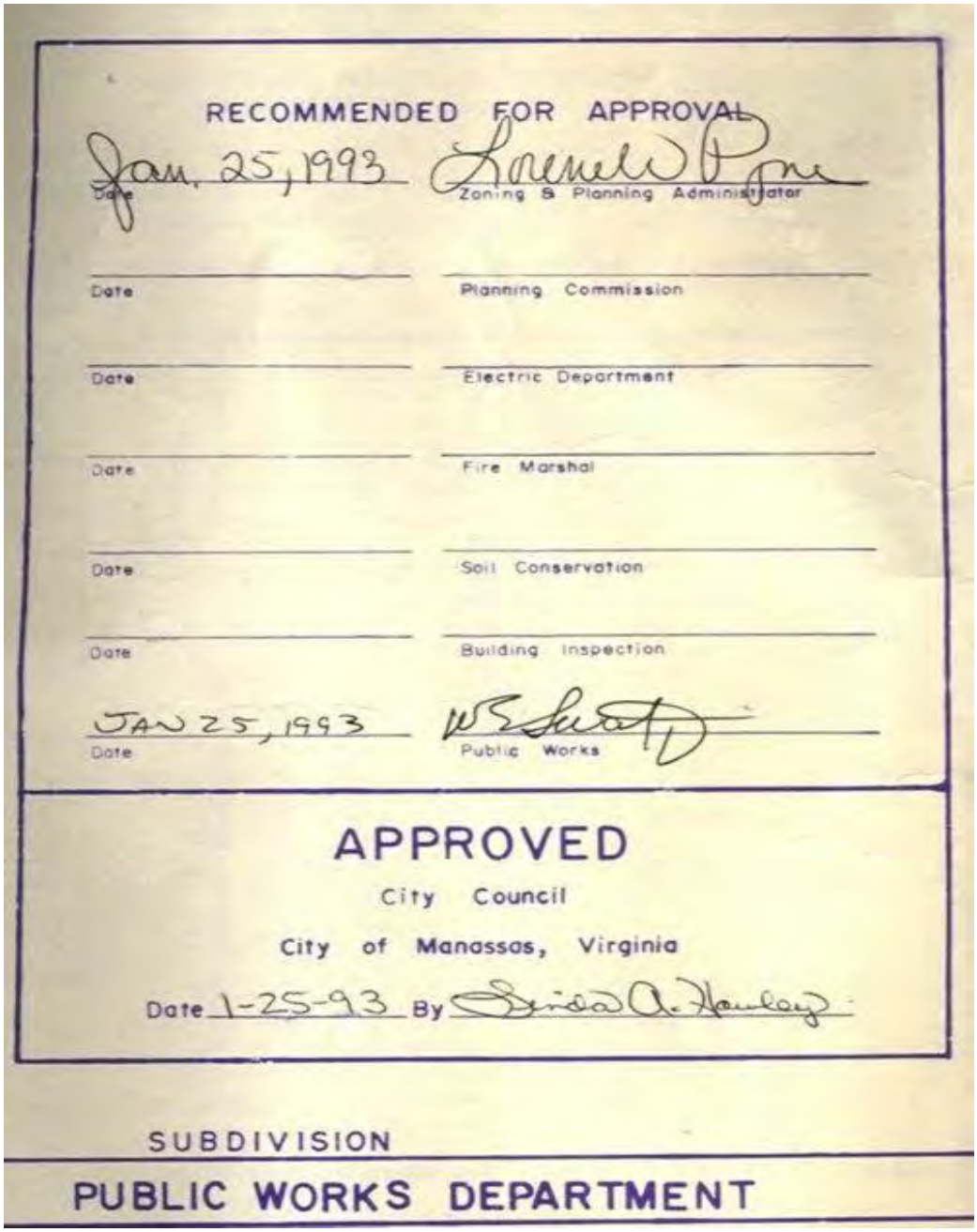
_____ 24. Make sure that forms are adequate to resist pressure, properly shored, and of proper size and material, without openings or holes.

(Continued)

The above checklist is typical of that used by a municipal code official, not private construction inspectors, but is a good guide for our use.

BASIC CONSTRUCTION DOCUMENTS

If you are retained to review the construction documents (or even if not) basic skills in plan reading are necessary for new construction inspection if they are available. Many times, you may visit the site and need to verify construction that may appear questionable, or simply different. Most inspectors have found it beneficial to make at least a brief review of the plans for basic construction methods, and to be capable of viewing these details in the field. Be sure that the plans you are reviewing are the municipality approved drawings, usually denoted by the type of stamp shown below.


RECOMMENDED FOR APPROVAL

Jan. 25, 1993 — Date — Zoning & Planning Administrator

Date — Planning Commission

Date — Electric Department

Date — Fire Marshal

Date — Soil Conservation

Date — Building Inspection

JAN 25, 1993 — Date — Public Works

APPROVED

City Council

City of Manassas, Virginia

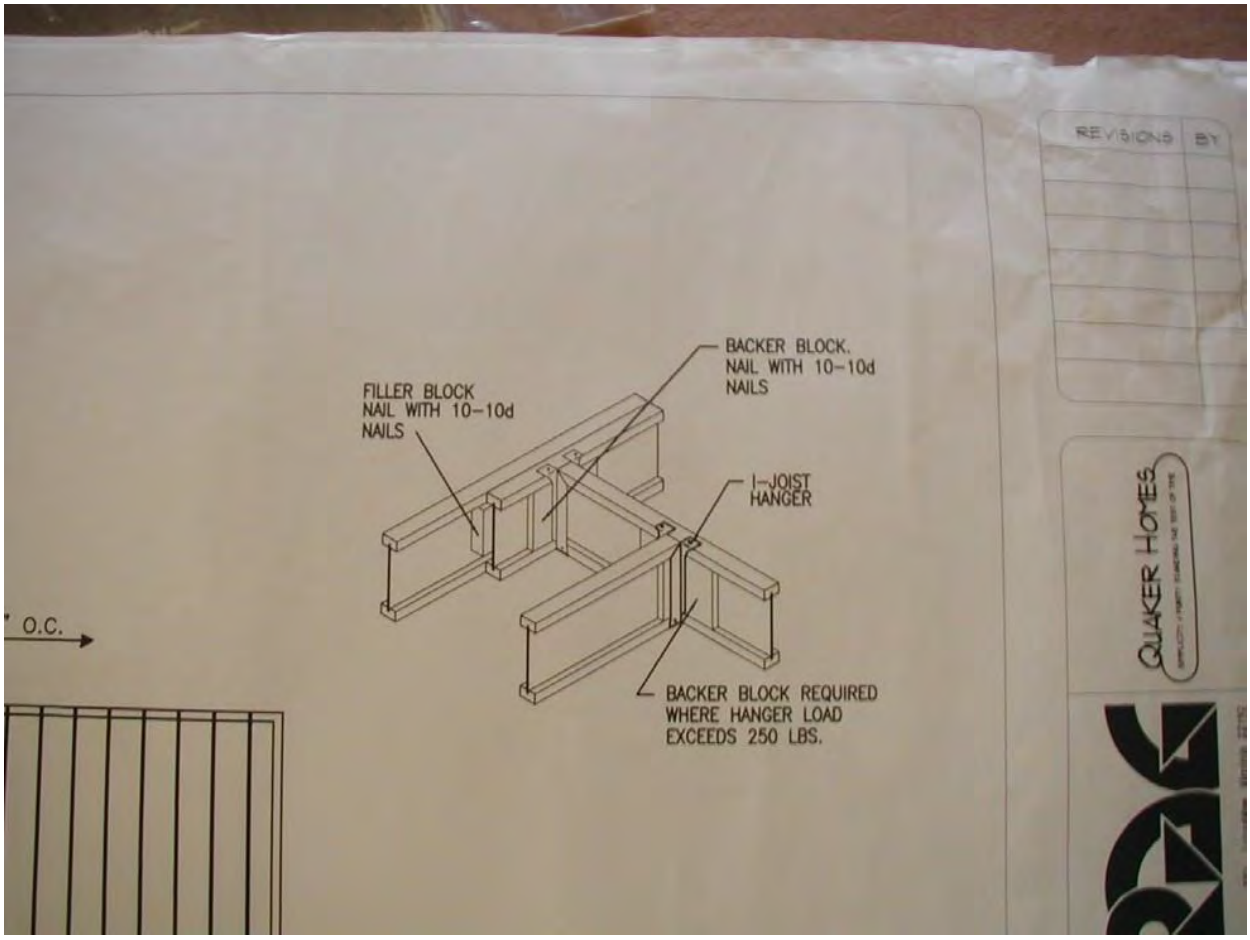
Date 1-25-93 By

SUBDIVISION

PUBLIC WORKS DEPARTMENT

When reviewing the project documents, pay particular attention to the structural details. These details will usually illustrate the proper method of installing a specific material, such as I-joists in the detail below. This detail specifies “squash blocks” or “web stiffeners” at required locations to help support heavy parts of the building.

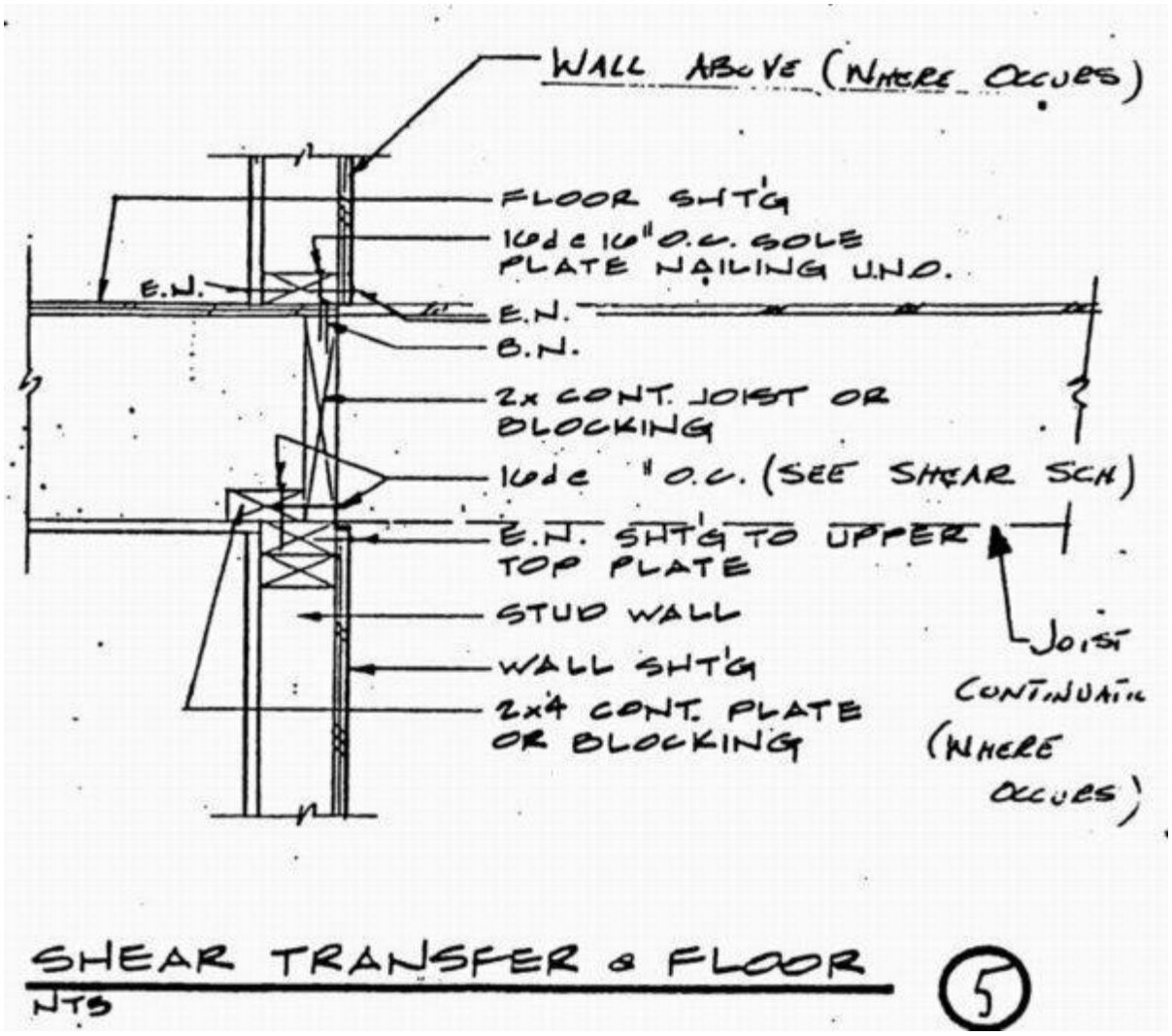
This type of detail is often overlooked in the construction process or considered superfluous by the construction crew. However, missing this type of bracing can have a detrimental effect on the structure in the long term.



The detail below is typical for construction where there are high winds and/or the possibility of significant seismic event. The nailing and blocking required will help transfer forces to the foundation and help prevent excessive movement in the building.

This type of detail is part of an entire system of load transfer. Note the detail indicates “see shear schedule.” This table is part of the construction documents and will note the frequency and type of nailing required for standard construction components, such as plywood sheathing, roof sheathing, and so on. Be sure to review these tables along with the details, as nailing may be more intense than standard minimums in the building code.

We recommend that you spend some time to be familiar with the documents prior to the inspection, if you are retained to do so. Half an hour or so spent with the plans can make you remarkably familiar with what to expect at the site, and mentally prepared to observe for missing or mis-installed components at the site. Allow at least an hour (or more if a complicated or large building) in the inspection budget for plan review.



UNDERGROUND AND FOUNDATION INSPECTION

The contractor or client should call and advise you about when the foundation trenches will be dug, the reinforcing steel installed (if applicable) and the underground plumbing and electrical will be completed. You need to get to the site prior to concrete placement to observe the installed construction.
Common areas of observation are:

1) Depth of footings, placement of footings.

2) Installation of reinforcing steel, placement, size and lapping.

3) Installation of anchor bolts and holdowns or straps.

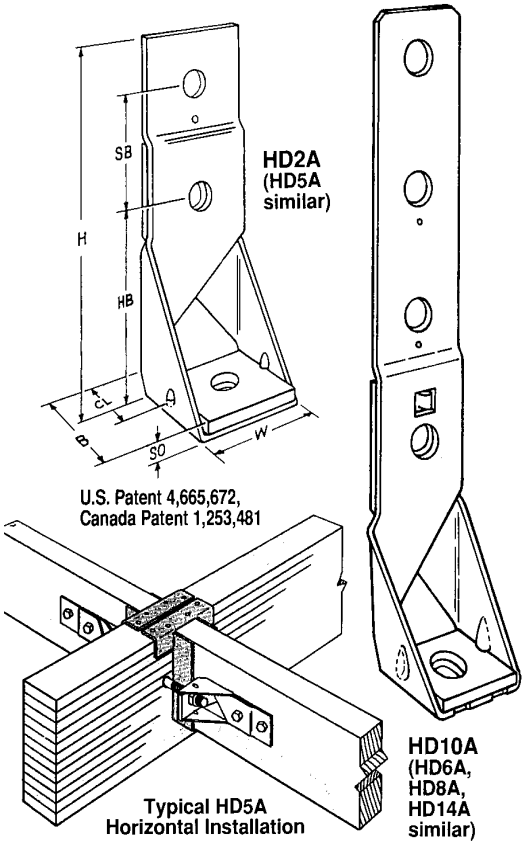
4) Size, installation, and drain support and slope.

5) Installation of any UG electrical.

Nearly all of the above items will be specified in the project drawings, particularly the reinforcing and hold-down steel. Hold-down steel is typically placed at corners of the building and at posts at shear-walls. Typical holdown steel shown below and next page:

SIMPSON Strong-Tie CONNECTORS

Other HD models are available; request F-HD/HDA and contact Simpson for pricing information.



HDA/HD HOLDOWNS

Holdowns are used to transfer tension loads between floors, to tie purlins to masonry or concrete, etc. The HD2A is an excellent device to tie wood wall sections to vertical concrete or masonry. Use HDAs for overturn requirements and other applications to transfer loads. All HDAs and HDs are self-jigging, ensuring code-required minimum 7 bolt dia. spacing from end of wood member.

HD6A, sized for 4x walls, provides load capacity between the HD5A and 8A.

HD8A and HD10A's seat design allows greater installation adjustability. An overall width of 3¼″ provides an easy fit in a standard 4x wall.

HDA SPECIAL FEATURES:

- Single piece non-welded design results in higher capacity.
- Load Transfer Plate eliminates the need for a seat washer.
- Fewer inspection problems.

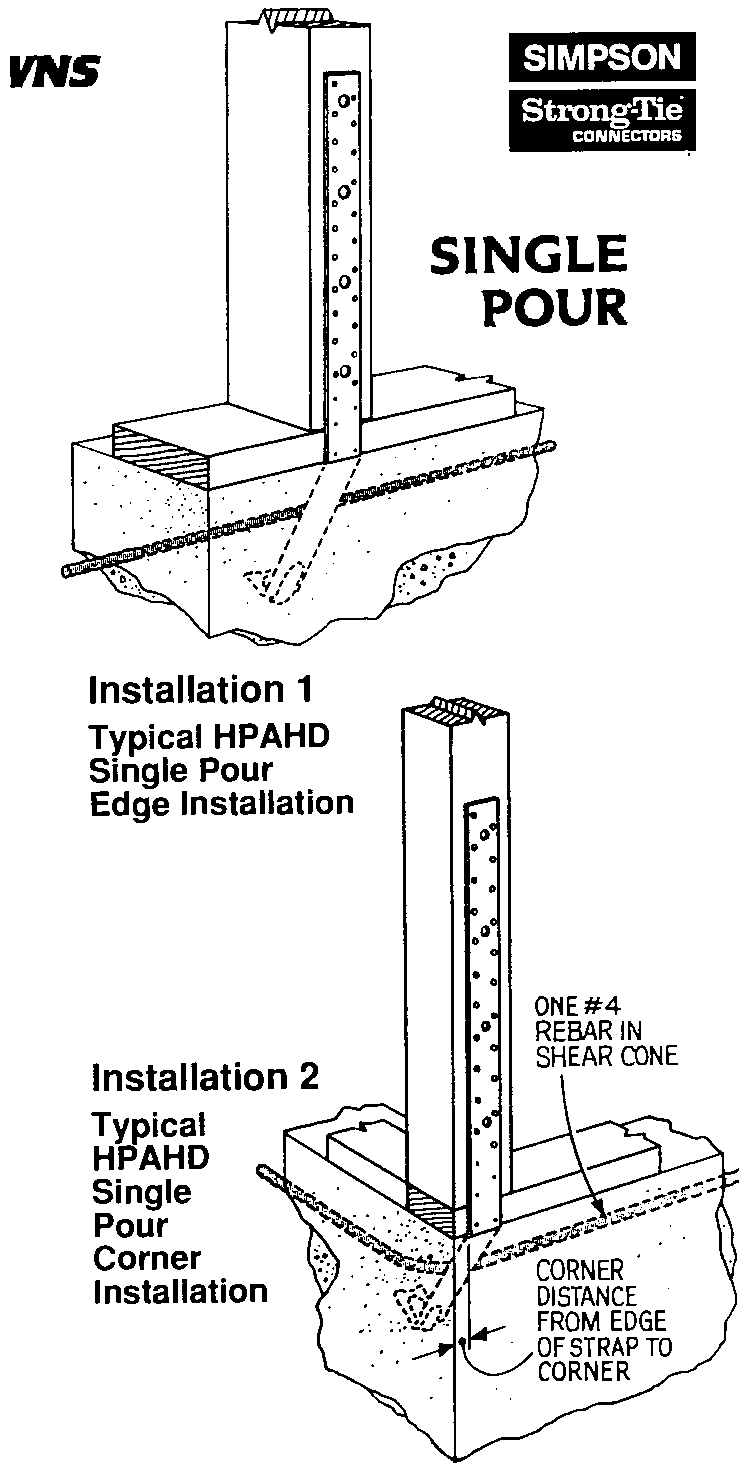
MATERIAL: See table

FINISH: HD2A, 5A, 6A, 8A, 10A—galvanized. HD8A may be ordered HDG; check with factory. HD14A, HD15 and HD20A—Simpson gray paint

INSTALLATION: ▪ Use all specified fasteners. See General Notes.

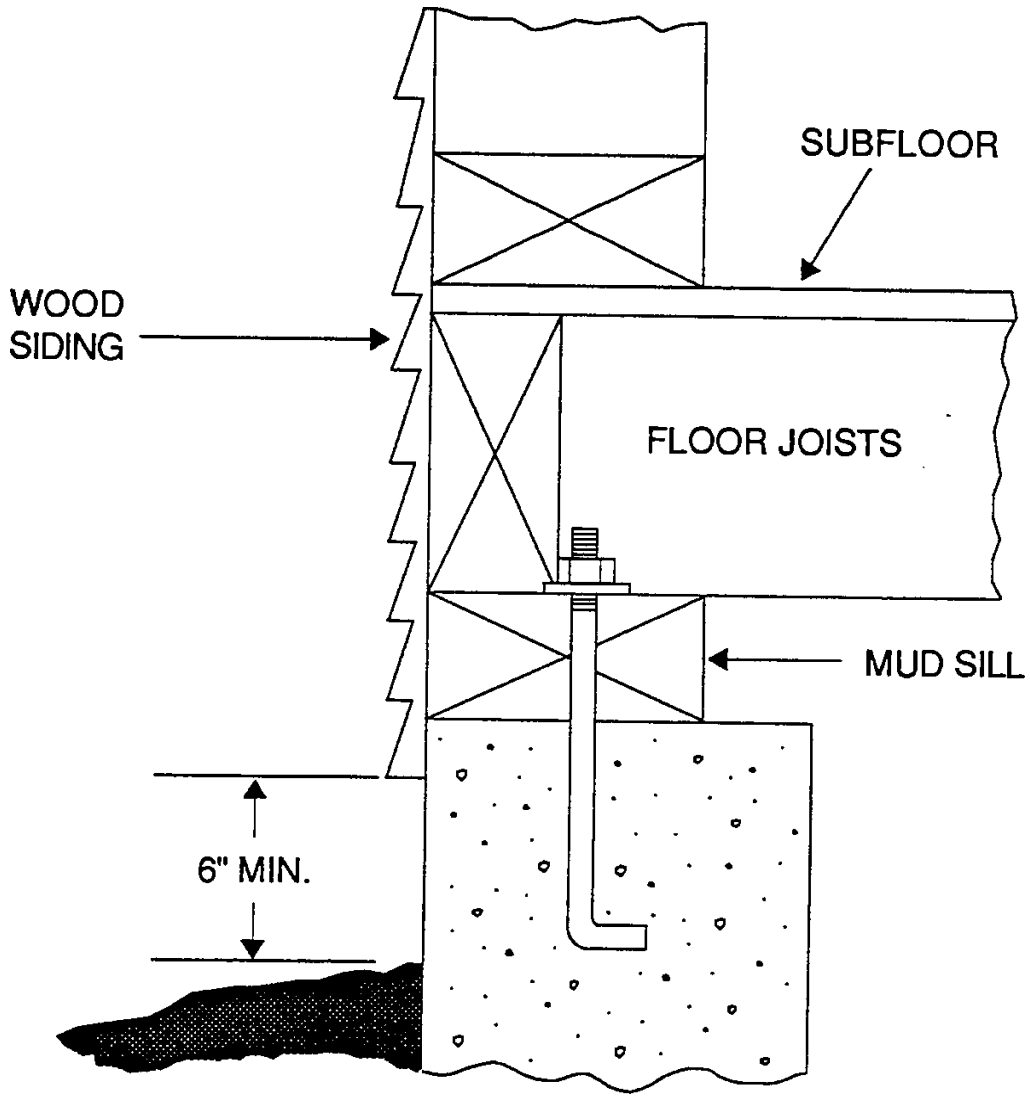
- Bolt holes shall be a minimum of 1/32″ to a maximum of 1/16″ larger than the bolt diameter (per 1991 NDS, section 8.1.2.1.).
- Standard washers are required between the base plate and anchor nut (HD15 only), and on stud bolts opposite the holdown. The Load Transfer Plate is an integral part of the HDA Holdown and no washer is required.
- See SSTB Anchor Bolts and Additional Anchorage Design for anchorage options. The design engineer may specify any alternate anchorage calculated to resist the tension load for your specific job.
- Locate on wood member to maintain a minimum distance of seven bolt diameters from the end of the member to the centerline of the first bolt hole (HDAs and HDs are self-jigging; minimum required distance is automatically maintained).
- To tie double 2x members together, the designer must determine the fasteners required to bind members to act as one unit without splitting.

CODES: BOCA, ICBO, SBCCI Nos. NER-393, NER-469; City of L.A. Nos. RR 22086, 24818, 25158 (all codes are for HD2A, 5A, 8A, 10A, 20A and HD15 models).



The above steel components are typically used to create load paths to the foundation and to hold buildings to the foundation in high wind or earthquake prone areas. Check your local codes for requirements in your area. These straps are also used to connect floors together and beams/purlins together. The most popular use is building to foundation for the HD and PAHD series.

Anchor bolt requirements vary by locality, the minimum being ½-inch bolts embedded 7-inches into masonry or concrete every 6-feet (closer intervals in wind and or seismic areas). Anchor straps may be used as long as they provide the equivalent anchorage to bolts. There must be an anchor bolt or strap within 12-inches of the end of each sill plate section. Typical anchor bolt section below:



Note that anchor bolts should be located so the minimum distance to the edge of the concrete is 1-3/4 inches. Occasionally the design professional will require that the bottom of the anchor bolt to loop under a length of reinforcing steel, usually a #3 or #4 size bar. Reinforcing steel, when required, is specified in the drawings. Slabs on grade may use reinforcing steel bars or steel mesh, usually called "6-6-10-10" which refers to the spacing and wire size. Most jurisdictions require minimum #4 horizontal bars at the top and bottom of the footings in seismic or wind zones. Check the drawings for steel requirements if you have been retained to inspect reinforcing steel.

Typical reinforcing steel sizes below:

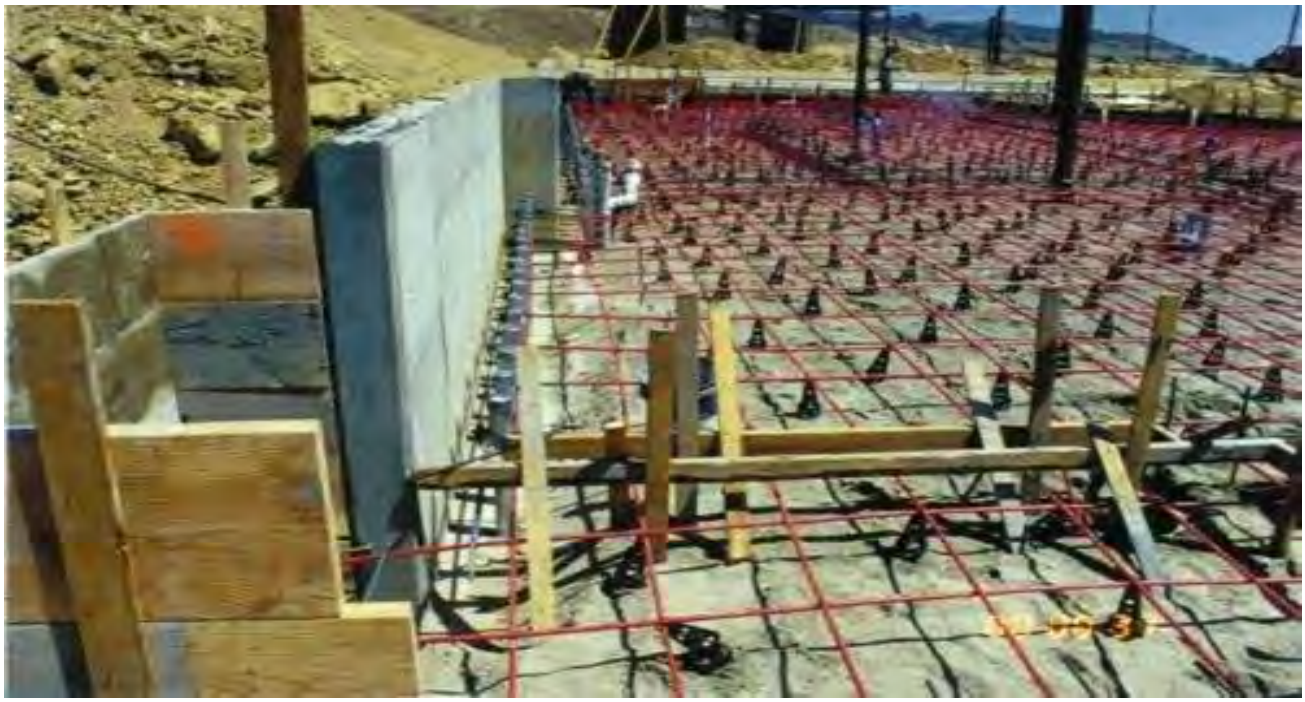
ASTM STANDARD REINFORCING BARS			
BAR SIZE DESIGNATION	AREA* SQ. INCHES	WEIGHT POUNDS PER FT.	DIAMETER* INCHES
#3	.11	.376	.375
#4	.20	.668	.500
#5	.31	1.043	.625
#6	.44	1.502	.750
#7	.60	2.044	.875
#8	.79	2.670	1.000
#9	1.00	3.400	1.128
#10	1.27	4.303	1.270
#11	1.56	5.313	1.410
#14	2.25	7.650	1.693
#18	4.00	13.600	2.257

Current ASTM Specifications cover bar sizes #14 and #18 in A615 Grade 60 and in A706 only.

*Nominal dimensions.

Generally, reinforcing steel should be lapped minimum 12-inches at joints and wired. The steel should be raised on special “dobies” or “chairs” (not rocks) at the bottom of the trenches to provide at least 3-inches clearance to soil. Clearance for reinforcing steel at the sides of the footing/wall (masonry or concrete) range from minimum 2-inches to 5-inches or more. When multiple bars are installed in close proximity the space between them must be large enough for concrete aggregate to pass, generally ¾- inch.

Any excavations for foundations should be free of debris and roots.



Post-tensioned foundation in progress. Note plumbing pipe supports (wood). These will be removed during the concrete placement. They are in place to prevent pipe damage during placement of the cable runs and other work.

Typical forms installed for footing and foundation wall installation. Slab will be placed later. All form boards must be removed once concrete is cured.

Typical reinforcing steel installed prior to concrete. Laps are wired together.

Concrete slab placement in progress using pump truck.

When inspecting the underground construction, be sure that any plumbing penetrations of the foundation walls are sleeved and that any vertical plumbing projections (water and waste) through a slab are wrapped (usually foam) to prevent direct contact with concrete. Any underground electrical should be encased in plastic watertight conduit unless rated for direct burial.

Pipes in trenches near footings should not be within 45-degrees of the bottom of the footing (within the cone of influence of the footing).

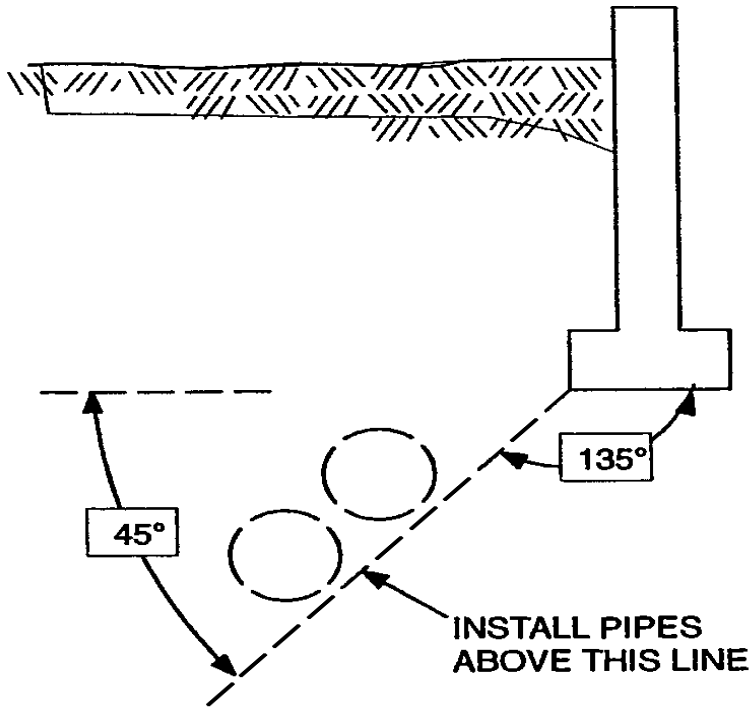


FIGURE P2603.7
PIPE LOCATION WITH RESPECT TO FOOTINGS

Pipes in trenches should be fully supported the entire length (not rocks) per sections 2604.1 and 2605.1 of the IRC. All drainpipes should properly slope to drain, generally minimum ¼-inch per foot towards the point of termination. Be sure all drainpipes are properly dry or wet vented where applicable. Additionally, you should be familiar with the minimum size drainpipes for common plumbing fixtures and maximum distance from trap to vent. Tables from the IRC itemizing these requirements are listed on the following pages. There are also many exceptions to the Codes and some configurations may require alternative venting. When in doubt consult your Code reference materials, project drawings or local building official.

Typical pipes in trench prior to concrete placement. Note pipes wrapped where contact with concrete might occur.

The pipes in the above photograph are not properly supported or braced to resist movement when concrete is installed. Usually, pieces of rebar are used to brace piping against movement. The plumber may not be completed with the installation, but it would be best to note the conditions observed on the day of the inspection. If you were called to inspect underground, that should be interpreted the job is ready for concrete.

TABLE P3201.7
SIZE OF TRAPS AND TRAP ARMS FOR PLUMBING FIXTURES

PLUMBING FIXTURE	TRAP SIZE MINIMUM (inches)
Bathtub (with or without shower head and/or whirlpool attachments)	$1^1/_2$
Bidet	$1^1/_4$
Clothes washer standpipe	2
Dishwasher (on separate trap)	$1^1/_2$
Floor drain	2
Kitchen sink (one or two traps, with or without dishwasher and garbage grinder)	$1^1/_2$
Laundry tub (one or more compartments)	$1^1/_2$
Lavatory	$1^1/_4$
Shower	2
Water closet	1

For SI: 1 inch = 25.4 mm.

NOTE: Consult fixture standards for trap dimensions of specific bowls.

TABLE P3105.1
MAXIMUM DISTANCE OF FIXTURE TRAP FROM VENT

SIZE OF TRAP (inches)	SLOPE (inch per foot)	DISTANCE FROM TRAP (feet)
$1^1/_4$	$^1/_4$	5
$1^1/_2$	$^1/_4$	6
2	$^1/_4$	8
3	$^1/_4$	12
4	$^1/_8$	16

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 inch per foot = 0.0833 mm/m.

Once the underground is inspected the project is ready for installation of moisture barrier (plastic sheeting), if required and concrete and/or masonry footings and foundation and slab. Some inspectors offer concrete inspection services, such as slump testing and observation of pour and finish. Most clients will not desire this service. We have found it beneficial to refer concrete inspection to a civil engineer or ICC certified reinforced concrete/masonry inspector.

Some inspectors also observe waterproofing of the foundation walls. This usually requires an additional visit to the site as backfill occurs soon after waterproofing and first floor joists are installed. Any foundation wall that retains earth and encloses habitable or usable space below grade is required to be waterproofed. Inspection of the waterproofing depends upon the system utilized. Consult the manufacturer's specifications for installation methods. The IRC also requires that foundation drains be installed when there is usable space below grade. These drains shall be placed at or below the floor of the space to be protected and discharge by gravity or pump.

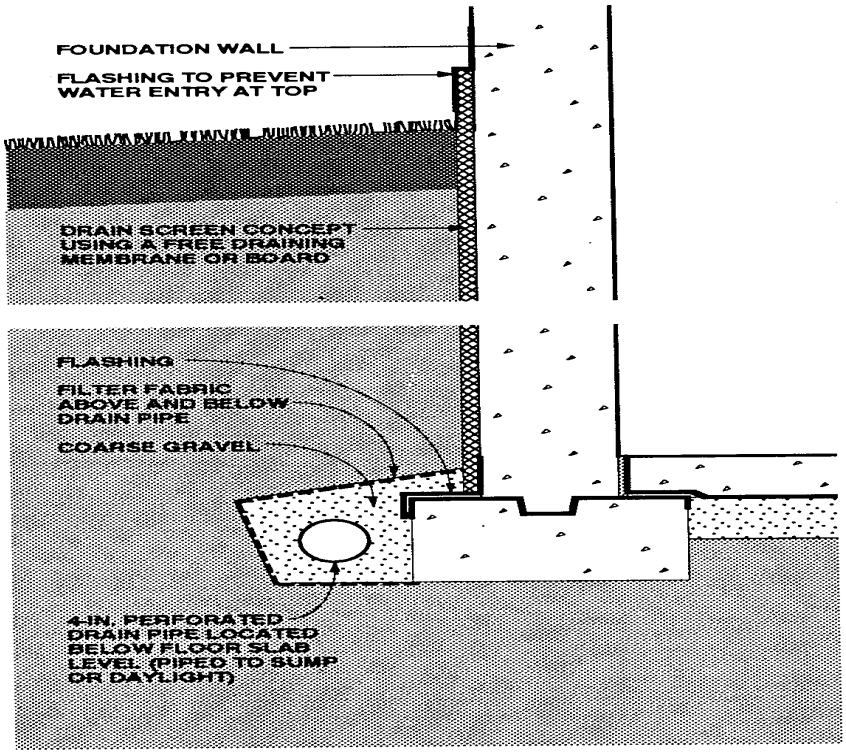


Figure 2-3: Drain Screen Concept Using a Free-Draining Board or Membrane

Typical foundation drain installation. The holes in the pipe should face downward and no gutter downspouts shall connect to the foundation drain.

If your project is being constructed with a raised floor and crawlspace, be sure there are adequate provisions for crawlspace ventilation. Adequate ventilation is 1 square inch per 150 square feet of underfloor area and there should be vents within 3-feet of each corner. Note that there are ventilation reduction factors when a vapor retarder is installed on the soil in the crawl, generally 1/1500. Also be aware most new buildings will have conditioned or sealed and unvented crawlspaces and or attics.

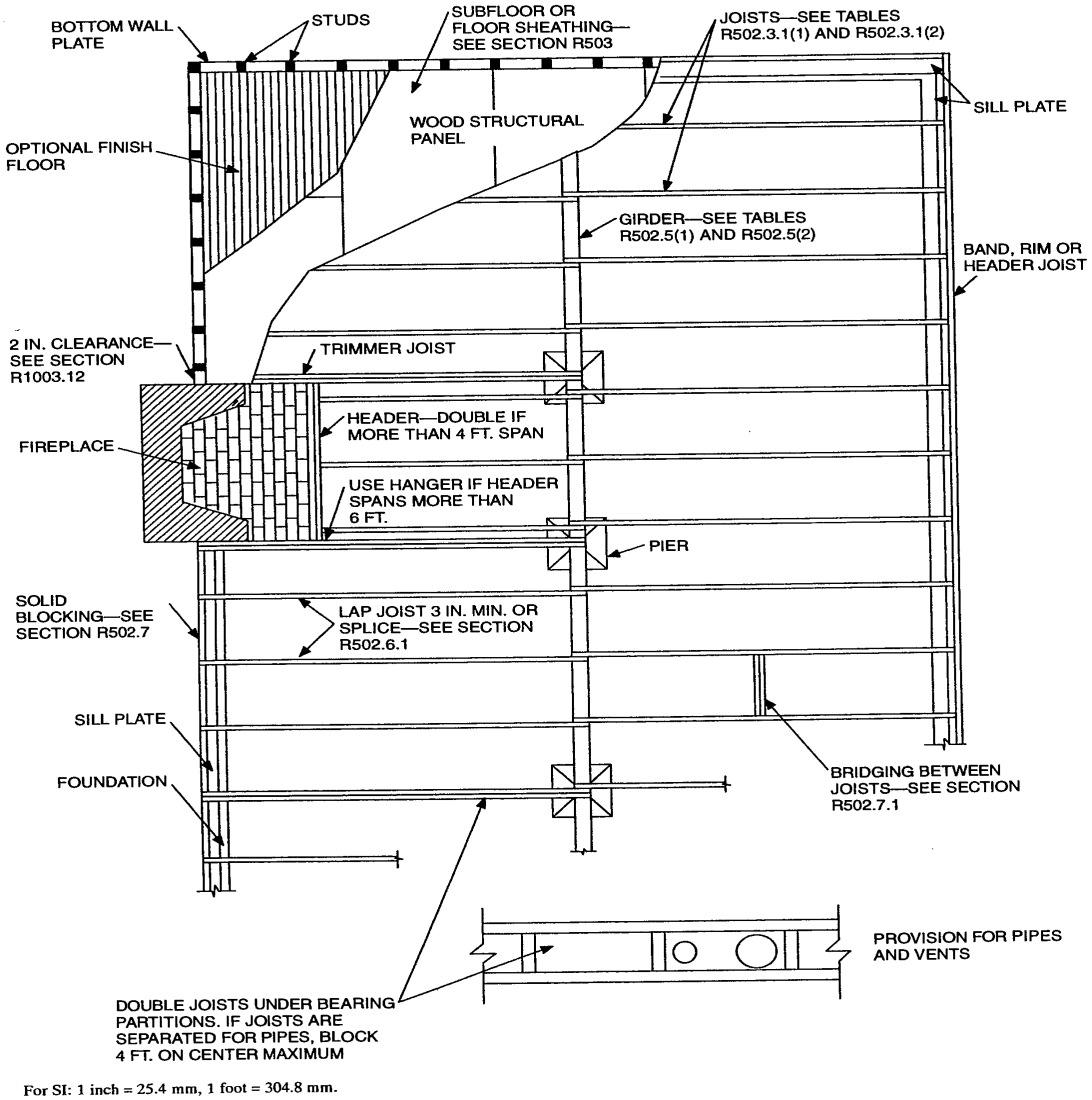
Waterproofing a typical foundation wall above. This is sheet-applied material with a drainage/protection board combination material installed (such as “Miradrain” brand). The foundation drain at the bottom of the wall has yet to be installed.

Waterproofing, closer view. Note attempt to use foam insulation as transition between concrete and wood, and wood close to soil, both never a good idea.

ROUGH FRAMING AND PLUMBING/ELECTRICAL/MECHANICAL INSPECTION

Once the concrete has cured sufficiently the rough framing may begin. If you are retained to review the plans, framing details should be contained therein. If you are not retained to review plans then inspection is based upon general construction practice and the conventional construction provisions of the applicable Code.

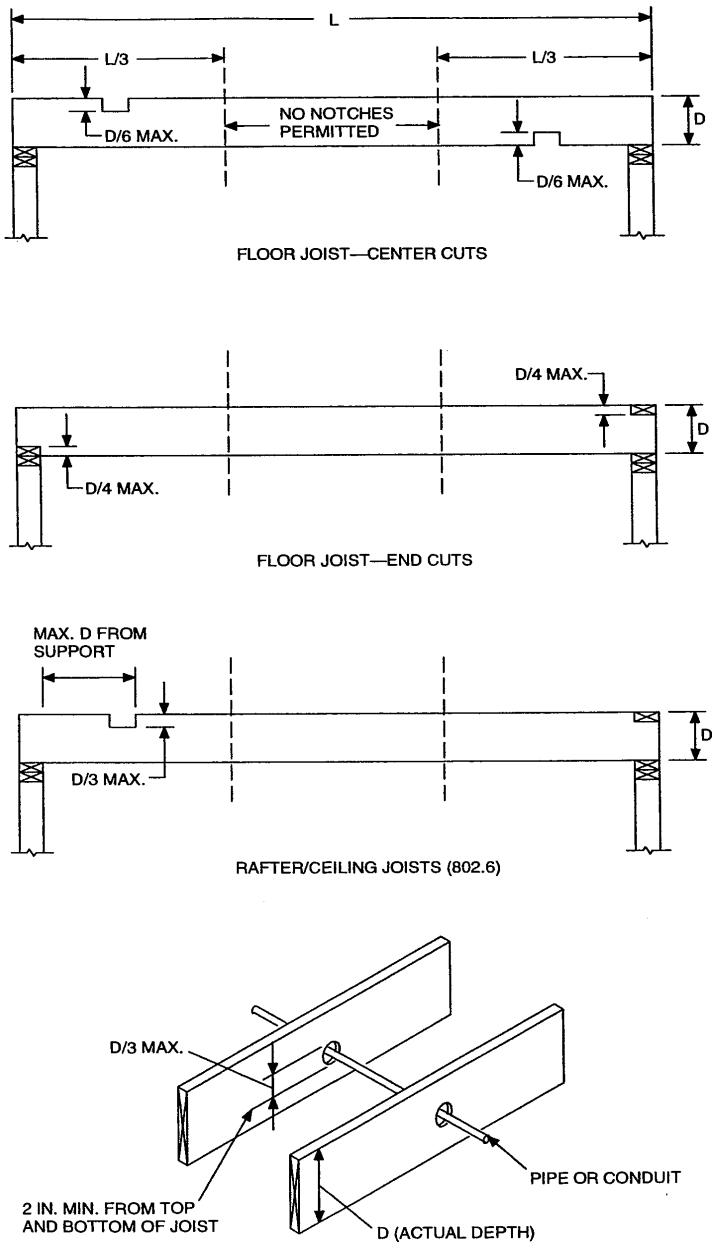
The sizing and spacing of the framing members should be specified in the drawings. In areas where shearwalls (braced walls) are required, the location and nailing schedule should also be in the drawings. There are some basic minimum requirements present in the Codes that will be reviewed in this book. Basic floor framing is depicted below.



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

FIGURE R502.2
FLOOR CONSTRUCTION

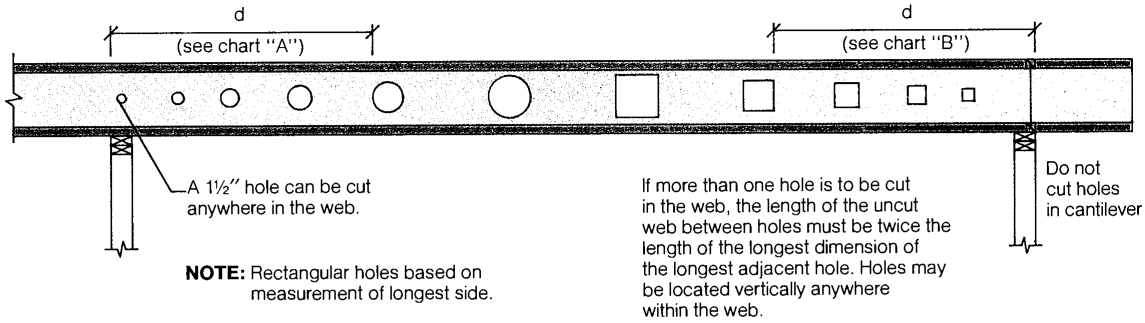
Floor joists should always be restrained from rotation at the ends by attachment to a header, band joist, rim joist or adjoining stud, or by solid blocking. Joists exceeding 2x12 should have bridging or blocking at 8-feet intervals. Any joists that rest on a beam and are not continuous should lap at least 3-inches and be nailed to the bypassing joist with three nails (IRC 502.6.1).
Notching and boring of joists is a location of common mistakes. The diagram below indicates acceptable notching and boring for horizontal wood members. Engineered truss webs and chords should never be altered. I-joists may be bored per the manufacturer's instructions.



For SI: 1 inch = 25.4 mm.

FIGURE R502.8
CUTTING, NOTCHING AND DRILLING

TJI® JOIST HOLE CHARTS



TJI® Joists are manufactured with 1½" perforated "knockouts" in the web at approx. 12" o.c.

CHART A – ROUND HOLES

MINIMUM DISTANCE (d) FROM ANY SUPPORT TO HOLE

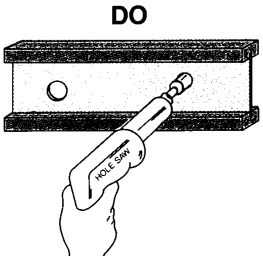
JOIST TYPE	ROUND HOLE SIZE													
	2"	3"	4"	5"	6"	6½"	7"	8"	8⅞"	9"	10"	11"	12"	13"
9½" TJI®/25	1'-0"	2'-0"	3'-0"	4'-0"	5'-0"	5'-0"	—	—	—	—	—	—	—	—
11⅞" TJI®/25	2'-0"	2'-6"	3'-0"	4'-0"	5'-0"	5'-0"	5'-0"	5'-6"	6'-0"	—	—	—	—	—
14" TJI®/35	2'-6"	3'-6"	4'-0"	4'-6"	5'-0"	5'-0"	5'-0"	5'-6"	6'-0"	6'-0"	6'-6"	7'-0"	—	—
16" TJI®/35	2'-6"	3'-6"	4'-0"	4'-6"	5'-0"	5'-0"	5'-0"	5'-6"	6'-0"	6'-0"	6'-6"	7'-0"	7'-6"	8'-0"

CHART B – RECTANGULAR HOLES

MINIMUM DISTANCE (d) FROM ANY SUPPORT TO HOLE

JOIST TYPE	RECTANGULAR HOLE SIZE – LONGEST DIMENSION										
	4"	5"	6"	6½"	7"	8"	8½"	9"	10"	11"	12"
9½" TJI®/25	4'-0"	5'-0"	5'-6"	6'-0"	—	—	—	—	—	—	—
11⅞" TJI®/25	4'-0"	5'-0"	5'-6"	6'-0"	6'-0"	6'-6"	6'-6"	—	—	—	—
14" TJI®/35	4'-6"	5'-0"	5'-6"	6'-0"	6'-0"	6'-6"	6'-6"	7'-0"	8'-0"	—	—
16" TJI®/35	4'-6"	5'-0"	5'-6"	6'-0"	6'-0"	6'-6"	6'-6"	7'-0"	8'-0"	8'-6"	9'-0"

NOTE: The distances in the above charts are based on uniformly loaded joists supporting the maximum loads shown for any of the tables listed in this reference guide. For other load conditions, contact your Trus Joist representative.

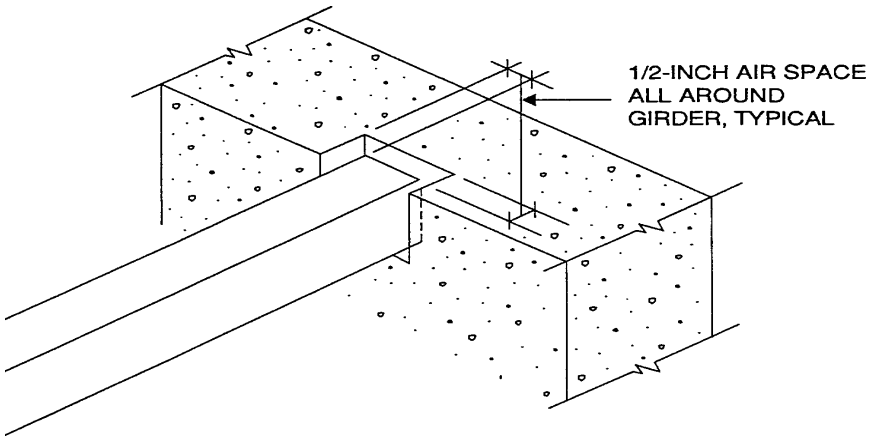


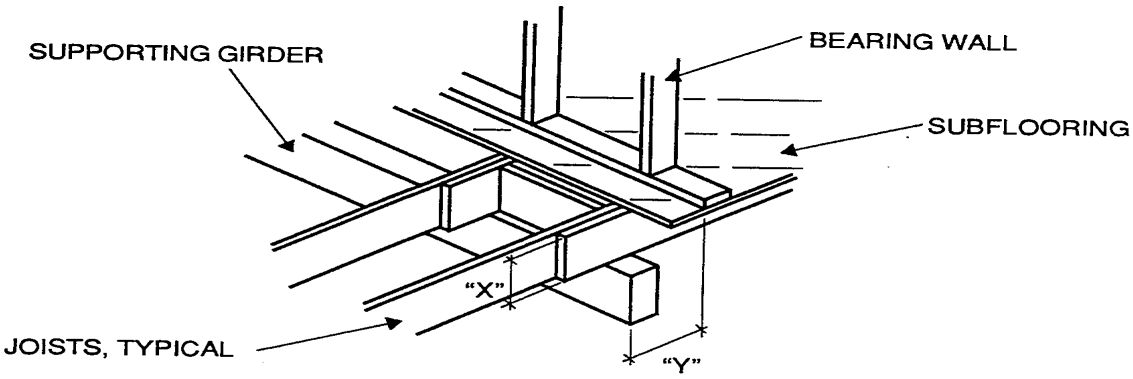
When in doubt regarding installation of engineered lumber it is best to contact the manufacturer for instructions. The illustration is a typical I-joist manufacturer specification, but they do differ.

Notches need to be evaluated carefully to determine if the member cut is even bearing. In this case the cut member was non-bearing soffit material only. However, the B-Vent is too close to wood.

In this photo the I-joist was cut completely through to accommodate a fireplace chimney and not headered or otherwise supported. Chimney 2-inch clear to wood is questionable.

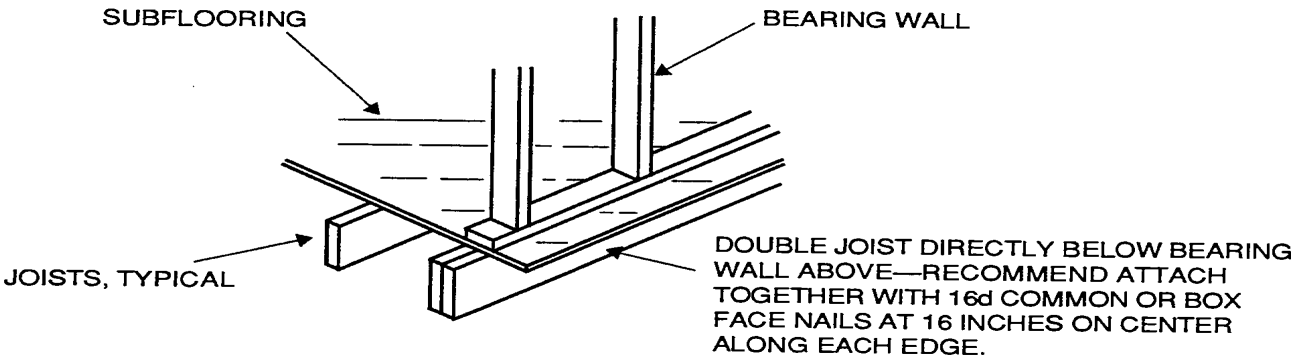
The maximum offset of a bearing wall from supporting joists or beam below is one joist depth. Any untreated beams or any wood supported by masonry/concrete should have at least ½-inch airspace at the sides and top of the bearing point to prevent deterioration. Wood bearing on masonry requires 3-inches of contact bearing, on wood 1.5-inches of bearing (IRC 502.6).



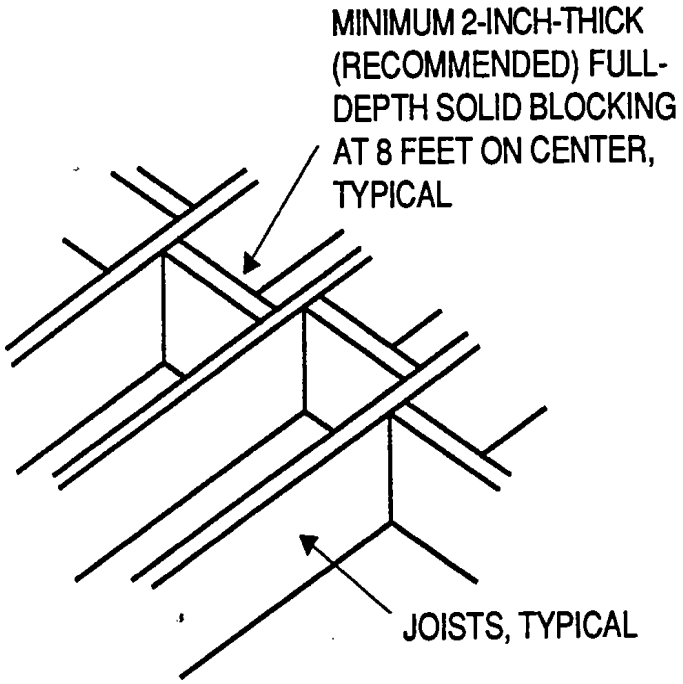


DISTANCE "Y" MUST NOT EXCEED DIMENSION "X"

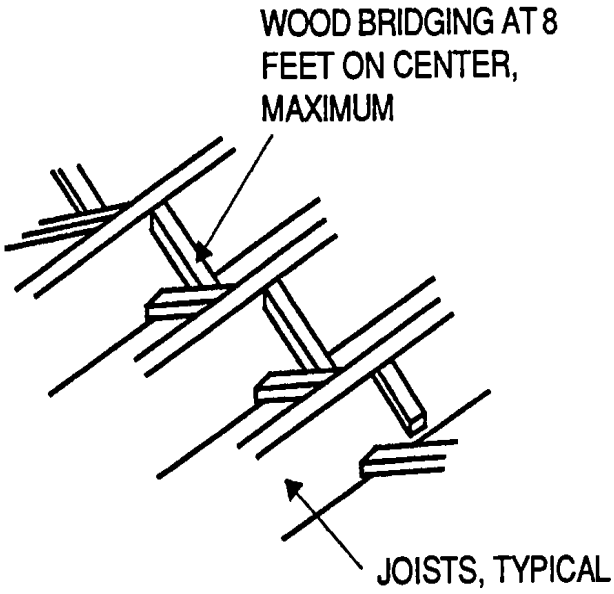
SUPPORT OF BEARING PARTITION—PERPENDICULAR TO JOISTS



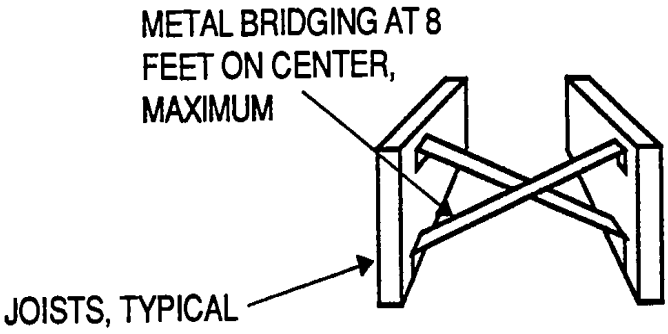
SUPPORT OF BEARING PARTITION—PARALLEL TO JOISTS



SOLID BLOCKING



WOOD BRIDGING



Typical methods of joist blocking and bridging are shown above. Generally, the deeper the joist, the more blocking is required. Blocking is also usually required where joists pass over a bearing wall.

Sill plates (wall bottom plates in contact with concrete/masonry foundation) should be pressure treated or wood of natural resistance to decay (IRC 323.1). Any untreated wood in the subfloor should have 12-inches clear to the soil if beams, 18-inches clear if joists (IRC 323.1). Generally, interior wall bottom plates can be untreated wood placed on concrete slabs if there is a vapor retarder under the slab (IRC 323.1(3)).

Floor joist spans can vary greatly. Typical allowed spans for residential construction, Douglas Fir #2 lumber at 16-inches on center, is: 2x6 – 9feet, 9inches, 2x8 – 12feet, 7inches, 2x10 – 15feet, 5 inches, 2x12 – 17feet, 10inches. See IRC tables 502.3.1(2) and 502.8.1 for more information.

Floor and roof sheathing (plywood or oriented strand board) is usually imprinted with a span rating. The most common is 24/16. The table below indicates maximum spans for this sheathing.

TABLE R503.2.1.1(1)

ALLOWABLE SPANS AND LOADS FOR WOOD STRUCTURAL PANELS FOR ROOF AND SUBFLOOR SHEATHING AND COMBINATION SUBFLOOR UNDERLAYMENT[a,b,c]

SPAN RATING	MINIMUM NOMINAL PANEL THICKNESS (inch)	MAXIMUM SPAN (inches)[d]		LOAD (pounds per square foot, at maximum span)		MAXIMUM SPAN (inches)
		With edge support	Without edge support	Total load	Live load	
Sheathing[e]		Roof[f]				Subfloor[l]
12/0	$^5/_{16}$	12	12	40	30	0
16/0	$^5/_{16}$	16	16	40	30	0
20/0	$^5/_{16}$	20	20	40	30	0
24/0	$^3/_8$	24	20[g]	40	30	0
24/16	$^7/_{16}$	24	24	50	40	16
32/16	$^{15}/_{32}$, $^1/_2$	32	28	40	30	16[h]
40/20	$^{19}/_{32}$, $^5/_8$	40	32	40	30	20[h,i]
48/24	$^{23}/_{32}$, $^3/_{48}$	48	36	45	35	24
60/32	$^7/_8$	60	48	45	35	32
Underlayment, C-C plugged, single floor[e]		Roof[f]				Combination subfloor underlayment[k]
16 o.c.	$^{19}/_{32}$, $^5/_8$	24	24	50	40	16[i]
20 o.c.	$^{19}/_{32}$, $^5/_8$	32	32	40	30	20[i,j]
24 o.c.	$^{23}/_{32}$, $^3/_4$	48	36	35	25	24
32 o.c.	$^7/_8$	48	40	50	40	32
48 o.c.	$1^3/_{32}$, $1^1/_8$	60	48	50	40	48

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kN/m^2.

a. The allowable total loads were determined using a dead load of 10 psf. If the dead load exceeds 10 psf, then the live load shall be reduced accordingly.

b. Panels continuous over two or more spans with long dimension perpendicular to supports. Spans shall be limited to values shown because of possible effect of concentrated loads.

c. Applies to panels 24 inches or wider.

d. Lumber blocking, panel edge clips (one midway between each support, except two equally spaced between supports when span is 48 inches), tongue-and-groove panel edges, or other approved type of edge support.

e. Includes Structural 1 panels in these grades.

f. Uniform load deflection limitation: $^1/_{180}$ of span under live load plus dead load, $^1/_{240}$ of span under live load only.

g. Maximum span 24 inches for $^{15}/_{32}$- and $^1/_2$-inch panels.

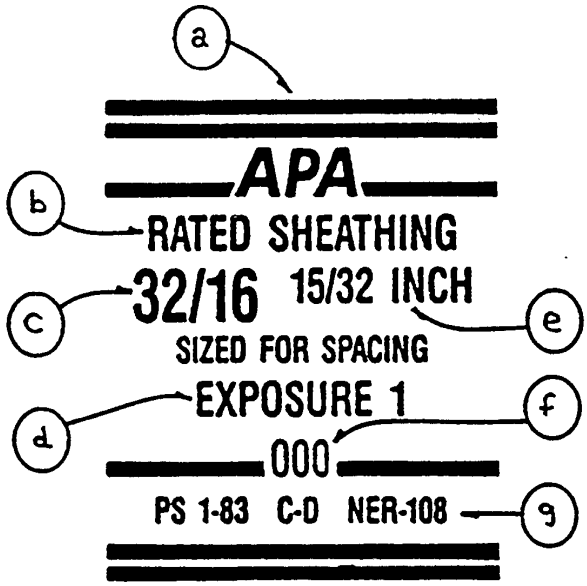
h. Maximum span 24 inches where $^3/_4$-inch wood finish flooring is installed at right angles to joists.

i. Maximum span 24 inches where 1.5 inches of lightweight concrete or approved cellular concrete is placed over the subfloor.

j. Unsupported edges shall have tongue-and-groove joints or shall be supported with blocking unless minimum nominal $^1/_4$-inch thick underlayment with end and edge joints offset at least 2 inches or 1.5 inches of lightweight concrete or approved cellular concrete is placed over the subfloor, or $^3/_4$-inch wood finish floor is installed at right angles to the supports. Allowable uniform live load at maximum span, based on deflection of $^1/_{360}$ of span, is 100 psf.

k. Unsupported edges shall have tongue-and-groove joints or shall be supported by blocking unless nominal $^1/_4$-inch-thick underlayment with end and edge joints offset at least 2 inches or $^3/_4$-inch wood finish flooring is installed at right angles to the supports. Allowable uniform live load at maximum span, based on deflection of $^1/_{360}$ of span, is 100 psf, except panels with a span rating of 48 on center are limited to 65 psf total uniform load at maximum span.

A typical wood panel grade mark is diagramed below. The first number in the span rating (32) is for when the panel is installed as roof sheathing, the second number (16) is for floors.



(a) Mark of qualified inspection and testing agency

(b) Performance-rated notation

(c) Span rating

(d) Exposure durability classification

(e) Panel thickness

(f) Mill number of the producing mill

(g) Applicable product standard acceptance

Fastening of wood framing is important to assure load paths and to prevent failures. The table on the next page indicates the typical minimum fasteners for framing members. For wood panels the minimum fastening is typically 8d nails at 6-inches on center at the edges and 12-inches on center in the field. High wind areas or shear walls may require tighter nailing. Check the drawings for special requirements.

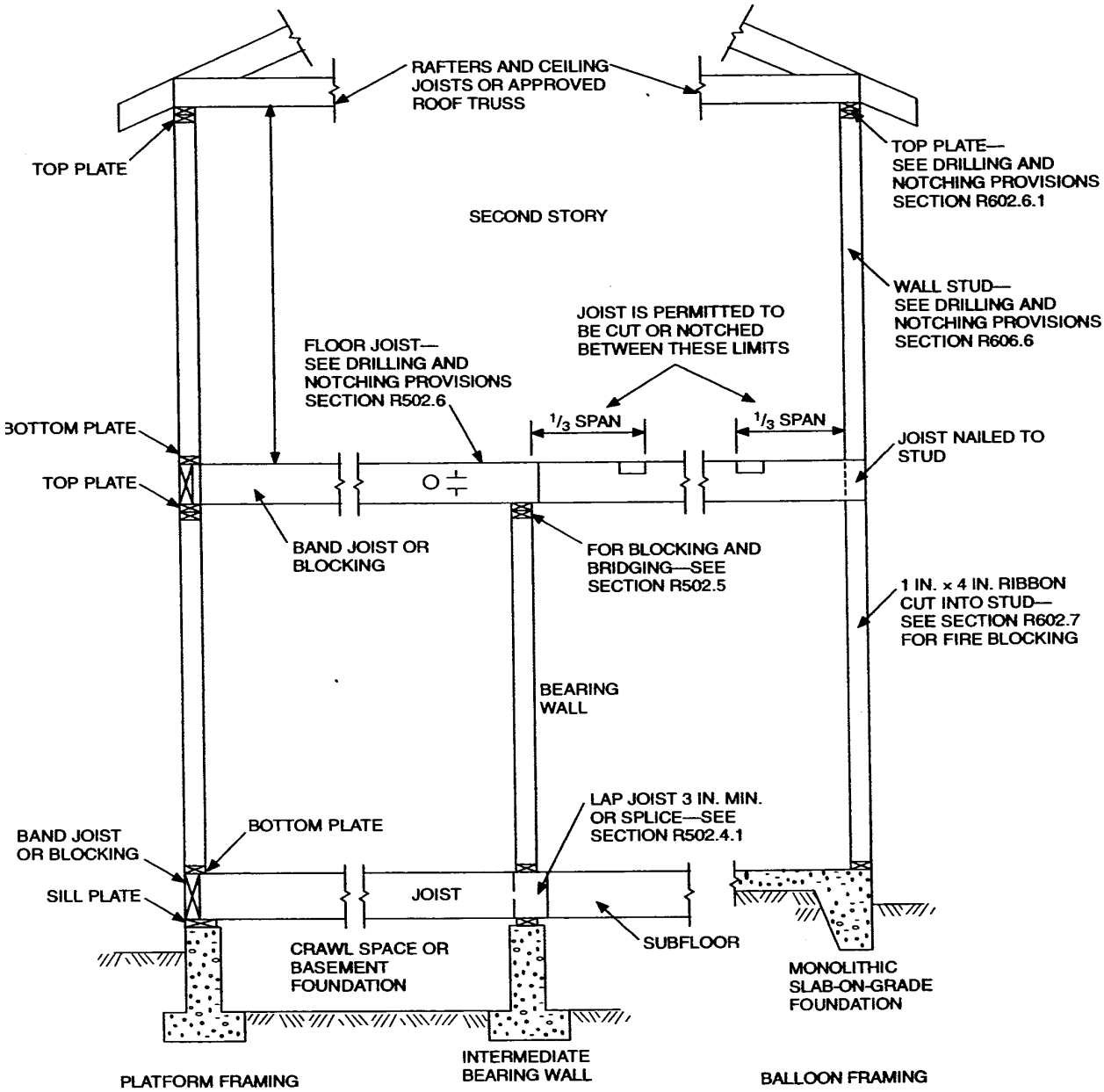
TABLE R602.3(1)
FASTENER SCHEDULE FOR STRUCTURAL MEMBERS

DESCRIPTION OF BUILDING ELEMENTS		NUMBER AND TYPE OF FASTENER[a,b,c,d]	SPACING OF FASTENERS
Joist to sill or girder, toe nail		3-8d	—
1″ x 6″ subfloor or less to each joist, face nail		2-8d 2 staples, $1^3/_4$	— —
2″ subfloor to joist or girder, blind and face nail		2-16d	—
Sole plate to joist or blocking, face nail		16d	16″ o.c.
Top or sole plate to stud, end nail		2-16d	—
Stud to sole plate, toe nail		3-8d or 2-16d	—
Double studs, face nail		10d	24″ o.c.
Double top plates, face nail		10d	24″ o.c.
Sole plate to joist or blocking at braced wall panels		3-16d	16″ o.c.
Double top plates, minimum 48-inch offset of end joints, face nail in lapped area		8-16d	—
Blocking between joists or rafters to top plate, toe nail		3-8d	—
Rim joist to top plate, toe nail		8d	6″ o.c.
Top plates, laps at corners and intersections, face nail		2-10d	—
Built-up header, two pieces with $^1/_2$″ spacer		16d	16″ o.c. along each edge
Continued header, two pieces		16d	16″ o.c. along each edge
Ceiling joists to plate, toe nail		3-8d	—
Continuous header to stud, toe nail		4-8d	—
Ceiling joist, laps over partitions, face nail		3-10d	—
Ceiling joist to parallel rafters, face nail		3-10d	—
Rafter to plate, toe nail		2-16d	—
1″ brace to each stud and plate, face nail		2-8d 2 staples, $1^3/_4$	— —
1″ x 6″ sheathing to each bearing, face nail		2-8d 2 staples, $1^3/_4$	— —
1″ x 8″ sheathing to each bearing, face nail		2-8d 3 staples, $1^3/_4$	— —
Wider than 1″ x 8″ sheathing to each bearing, face nail		3-8d 4 staples, $1^3/_4$	— —
Built-up corner studs		10d	24″ o.c.
Built-up girders and beams, 2-inch lumber layers		10d	Nail each layer as follows: 32″ o.c. at top and bottom and staggered. Two nails at ends and at each splice.
2″ planks		2-16d	At each bearing
Roof rafters to ridge, valley or hip rafters: toe nail face nail		 4-16d 3-16d	 — —
Rafter ties to rafters, face		3-8d	—
Wood structural panels, subfloor, roof and wall sheathing to framing, and particleboard wall sheathing to framing			
$^5/_{16}$-$^1/_2$	6d common nail (subfloor, wall) 8d common nail (roof)[f]	6	12[g]
$^{19}/_{32}$ -1	8d common nail	6	12[g]
$1^1/_8$-$1^1/_4$	10d common nail or 8d deformed nail	6	12

(continued)

The nailing requirements above for wood panels (sheathing) assumes that the panel long dimension is installed perpendicular to supports.

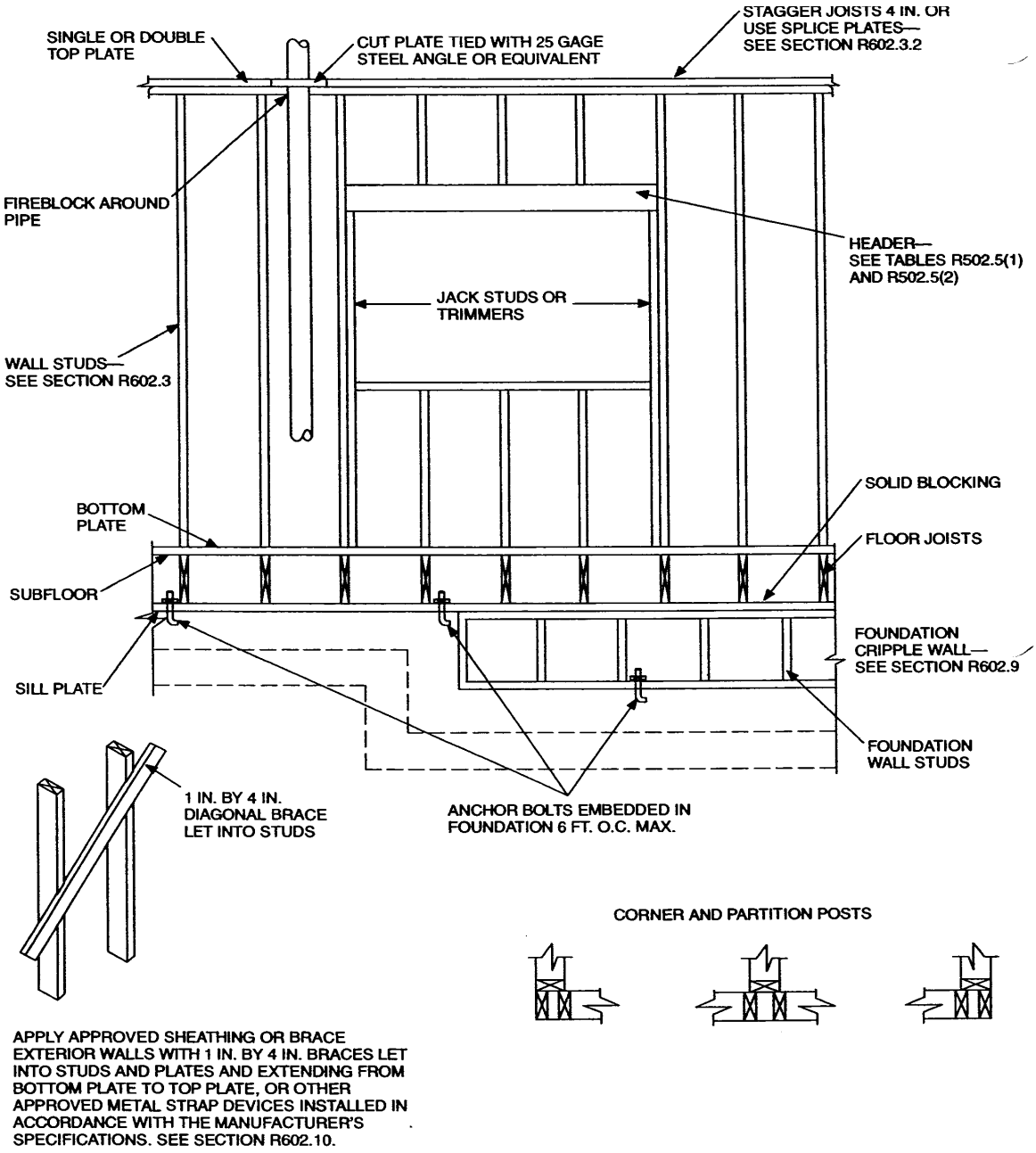
Wall construction is typically wood framing, as depicted below. In some areas the walls may be masonry. Any wood framing (roof, floor) supported by masonry must always be well anchored to the masonry, generally with metal bolts and/or connectors.



For SI: 1 inch = 25.4 mm.

FIGURE R602.3(1)
TYPICAL WALL, FLOOR AND ROOF FRAMING

The IRC diagram below depicts typical wall framing, with an opening for a window. Note the header installed above the opening to distribute the loads to each side of the opening.



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

Note: A third stud and/or partition intersection backing studs shall be permitted to be omitted through the use of wood backup cleats, metal drywall cl other approved devices that will serve as adequate backing for the facing materials.

FIGURE R602.3(2)
FRAMING DETAILS

Walls typically are required to be braced to help prevent lateral movement. The amount of bracing depends upon the local area conditions and height/design of the structure. The bracing requirements are generally noted in the construction documents. The most common methods used are sheathing panels and diagonal let-in bracing. Sometimes stucco and/or drywall are also used, but rarely.

The above photo depicts a fully braced wall with metal strap. This was a large multi-story house with a heavy roof. Also note the stucco weep screed installed at the bottom of the wall. Nails in the bracing sheathing should not be over-driven. This condition weakens the structural panel and should be checked by the design architect or engineer when encountered. Be sure that straps are connected; see the photo below (strap at concrete not fastened).

When inspecting stud walls, be aware that there are limitations in stud height depending upon the size of the stud and what is supported. Generally, 2x4 studs at 16-inches on center are accepted for one story homes. Usually, above one-story requires 2x6 studs at 16-inches on center. The tables below and on the following page give us some guidance regarding stud sizing and spacing.

TABLE R602.3.1
MAXIMUM ALLOWABLE LENGTH OF WOOD WALL STUDS EXPOSED TO WIND SPEEDS OF 100 MPH OR LESS IN SEISMIC DESIGN CATEGORIES A, B, C and D[a,b,c]

HEIGHT (feet)	ON-CENTER SPACING (inches)			
	24	16	12	8
Supporting a roof only				
>10	2x4	2x4	2x4	2x4
12	2x6	2x4	2x4	2x4
14	2x6	2x6	2x6	2x4
16	2x6	2x6	2x6	2x4
18	NA[a]	2x6	2x6	2x6
20	NA[a]	NA[a]	2x6	2x6
24	NA[a]	NA[a]	NA[a]	2x6
Supporting one floor and a roof				
>10	2x6	2x6	2x6	2x6
12	2x6	2x6	2x6	2x4
14	2x6	2x6	2x6	2x6
16	NA[a]	2x6	2x6	2x6
18	NA[a]	2x6	2x6	2x6
20	NA[a]	NA[a]	2x6	2x6
24	NA[a]	NA[a]	NA[a]	2x6
Supporting two floors and a roof				
>10	2x6	2x6	2x6	2x6
12	2x6	2x6	2x6	2x6
14	2x6	2x6	2x6	2x6
16	NA[a]	NA[a]	2x6	2x6
18	NA[a]	NA[a]	2x6	2x6
20	NA[a]	NA[a]	NA[a]	2x6
22	NA[a]	NA[a]	NA[a]	NA[a]
24	NA[a]	NA[a]	NA[a]	NA[a]

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kN/m^2, 1 pound per square inch = 6.895 kPa, 1 mile per hour = 1.609 km/h.

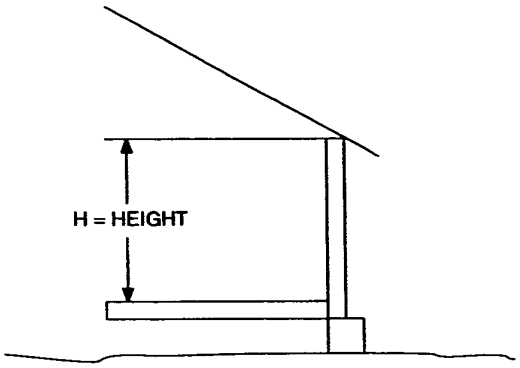
a. Design required.

b. Applicability of this table assumes the following: Snow load not exceeding 25 psf, but not less than 1310 psi determined by multiplying the AF&PA NDS tabular base design value by the repetitive use factor, and by the size factor for all species except southern pine, E not less than 1.6 by 10^6 psi, tributary dimensions for floors and roofs not exceeding 6 feet, maximum span for floors and roof not exceeding 12 feet, eaves not greater than 2 feet in dimension and exterior sheathing. Where the conditions are not within these parameters, design is required.

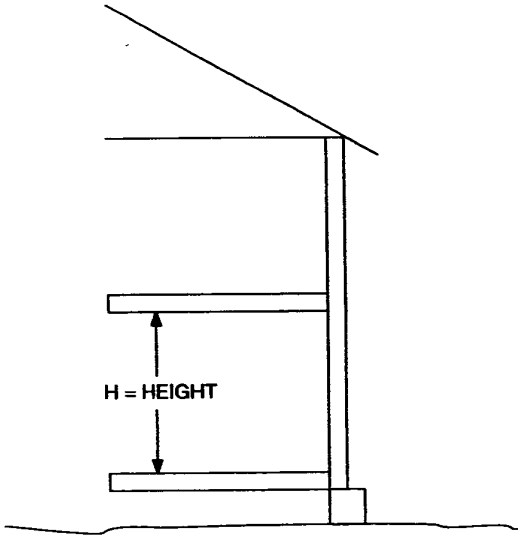
c. Utility, standard, stud and No. 3 grade lumber of any species are not permitted.

(continued)

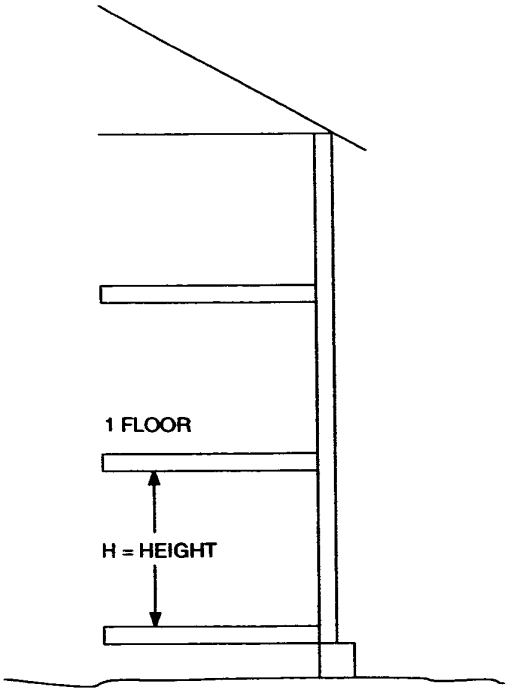
TABLE R602.3.1—continued
MAXIMUM ALLOWABLE LENGTH OF WOOD WALL STUDS EXPOSED TO WIND SPEEDS OF 100 MPH OR LESS IN SEISMIC DESIGN CATEGORIES A, B, C and D_1



1 ROOF LOAD

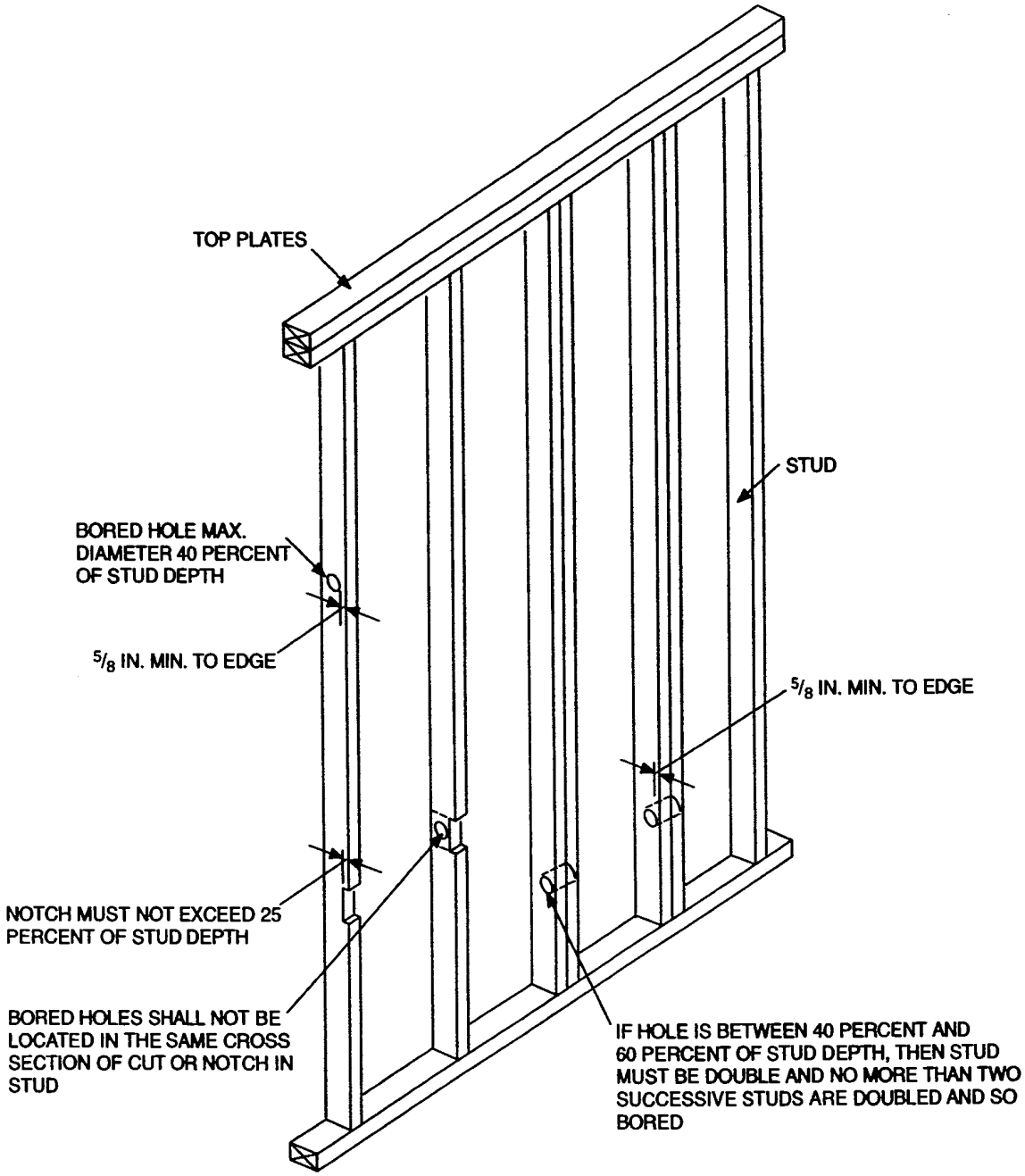


1 ROOF LOAD
1 FLOOR LOAD



1 ROOF LOAD
2 FLOOR LOADS

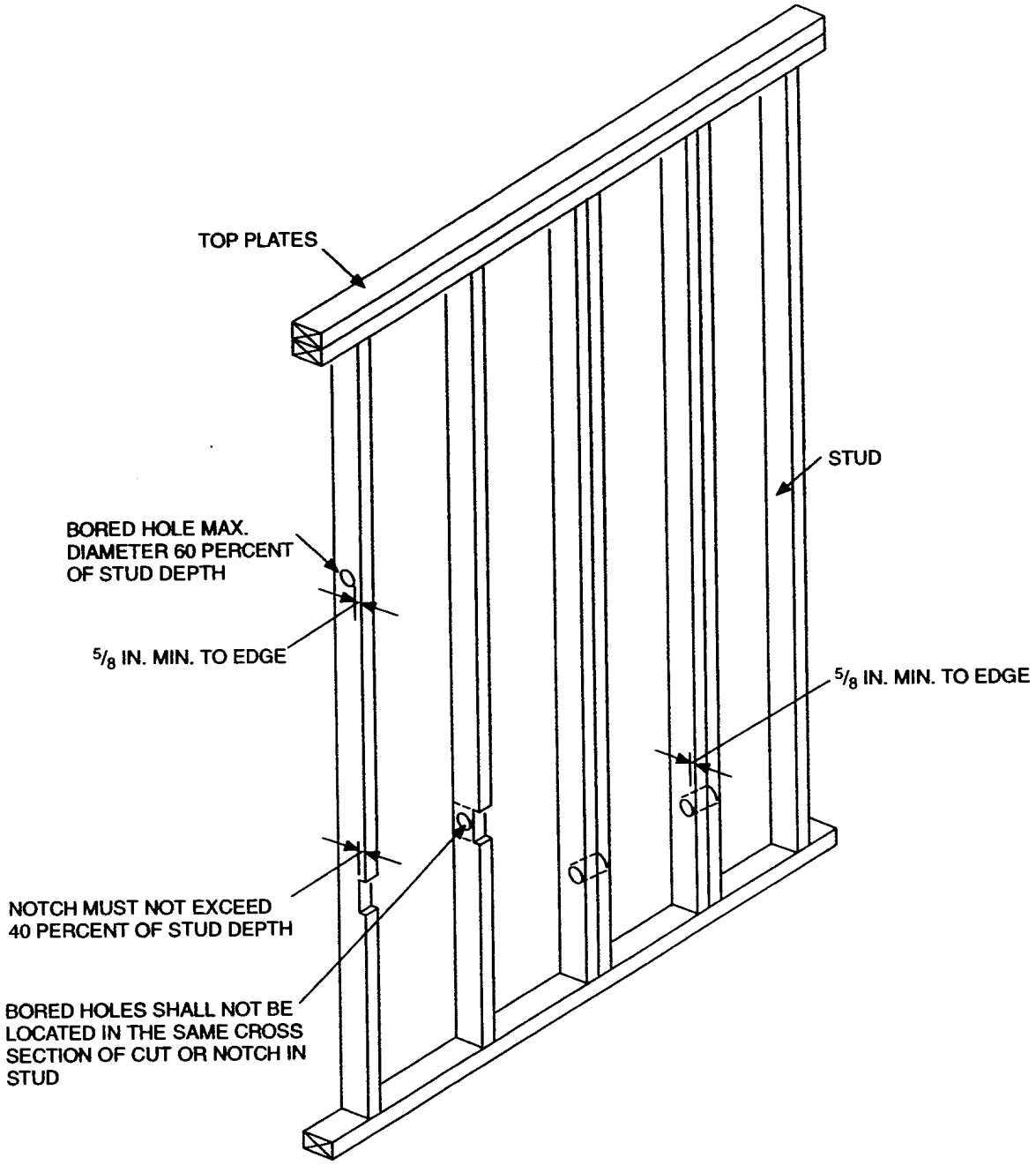
Notching and boring of stud walls is categorized into two types of walls, bearing and non-bearing. The following illustrations give us guidance on wall notching and boring.



For SI: 1 inch = 25.4 mm.

Note: Condition for exterior and bearing walls.

FIGURE R602.6(1)
NOTCHING AND BORED HOLE LIMITATIONS FOR EXTERIOR WALLS AND BEARING WALLS

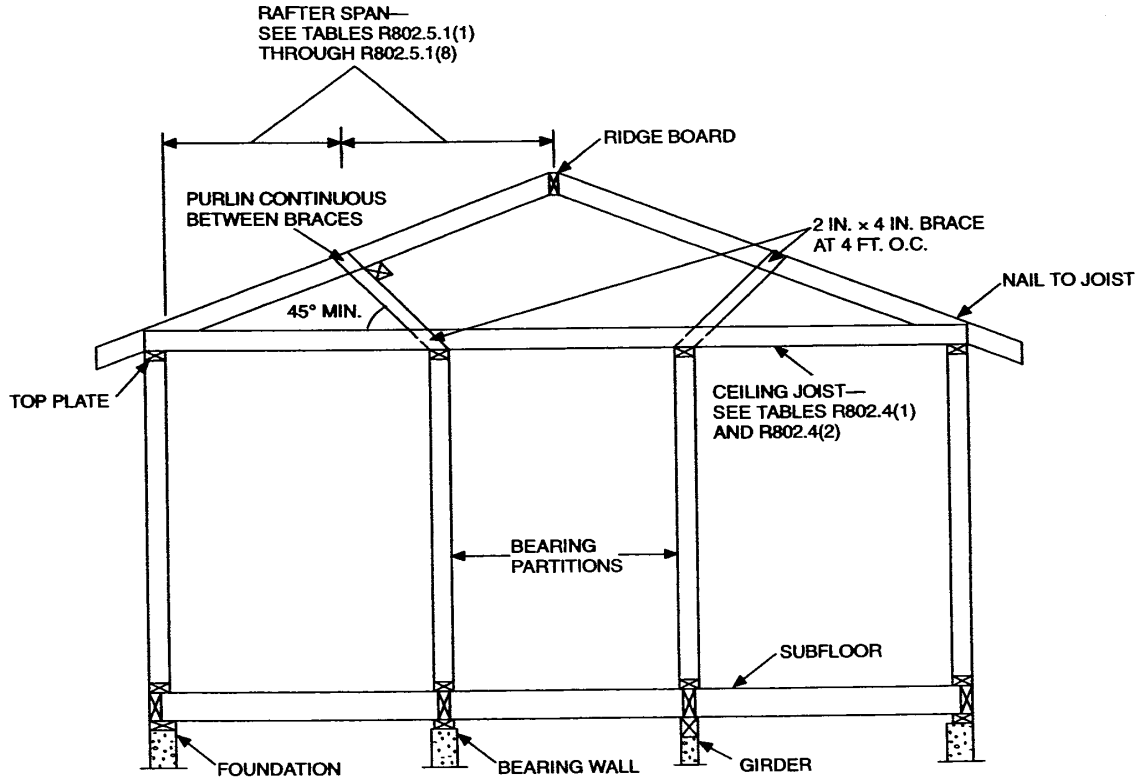


For SI: 1 inch = 25.4 mm.

FIGURE R602.6(2)
NOTCHING AND BORED HOLE LIMITATIONS FOR INTERIOR NONBEARING WALLS

NOTE THIS PAGE IS NON-BEARING WALL

Roof framing is typically either “stick-framed” (site built from dimensional lumber) or engineered trusses. Trusses should never be altered at the site unless the alteration is designed by a truss engineer. Stick built framing can be checked for proper span (usually noted on the plans) and excessive notching, etc. Spans can vary greatly, so tables are not provided in this book. Many times, conventional rafters can be much smaller when braced, i.e., use a mid-span support such as a purlin. This is also typically shown on the construction documents. The diagram below depicts typical rafter framing.



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 degree = 0.018 rad.

Note: Where ceiling joints run perpendicular to the rafters, rafter ties shall be nailed to the rafter near the plate line and spaced not more than 4 feet on center.

FIGURE R802.5.1
BRACED RAFTER CONSTRUCTION

When inspecting roof framing be sure that the ridge board is at least 1x material and the depth of the cut end of the rafters. When slope is less than 3:12 the ridge board must be 2x minimum material as it acts as a beam. All hip and valley rafters should be at least 2x material and at least the depth of the cut ends of the rafters. Openings for chimneys or other large penetrations must be properly headerd the same as with walls and floor framing. Be sure to check for proper ventilation of the attic. Note most builders are now moving to sealed/conditions attics. The attic access should be in an accessible area and be at least 22” x 30”. Roof sheathing minimum thickness is 5/8-inch (or 15/32”), with minimum fastening per the table in page 26 in this book, typically 6-inches on center edges and 12-inches on center field.

The photograph below depicts typical modern roof framing using prefabricated trusses and some fill-in conventional framing.

The photograph below is a nearly finished roof deck. Inspect for rough edges that might damage the roof underlayment, and for proper panel nailing.

Inspecting rough plumbing and electrical and HVAC during the framing inspection allows for picking up any excessive notching or other damage to framing. It also allows the inspector to determine if these systems are installed with reasonable compliance with local Codes and industry standards.

Plumbing DWV should be inspected for proper slope of the piping and support. All horizontal plastic drainpipe requires support at minimum 4-foot intervals, plastic water supply about every 32 inches and supports should not be material that can damage the plastic piping. Be sure to check that toilet drains are roughed in with proper minimum clearances (15-inches side to side, center to center). Water supply piping must be separated from wood framing to prevent thermal expansion noise, but solidly fastened to prevent water hammer. It is prudent to have the water system pressurized during inspection, if possible.

Electrical rough inspection includes inspecting cabling for damage and proper support. It is a good idea to spot check for receptacles in locations that can be missed, like refrigerator alcoves, near sinks, and icemakers. Note that all bathroom sinks require receptacles near them (within 3-feet of edge) so one receptacle is not adequate in many bathrooms. Inspect for convenience receptacles on every wall, and that there are switched lights at exterior doors and at attics or crawlspaces with mechanical equipment. Pay particular attention to the kitchen countertop area where receptacles are required to be spaced every four feet. Rough inspection is also a good time to check for service grounding methods. Most new homes use a “ufer” (concrete encased) grounding electrode, the metal reinforcing steel in the foundation. Be sure there is proper access to the grounding electrode connection (unless the conductor connection is embedded in the foundation) and there is a grounding electrode conductor between the grounding electrode and the main service panel neutral terminal bar. Check location of panelboards, they should not be located inside clothes closets or bathrooms. Also check that rough wiring is installed for smoke and carbon monoxide alarms.

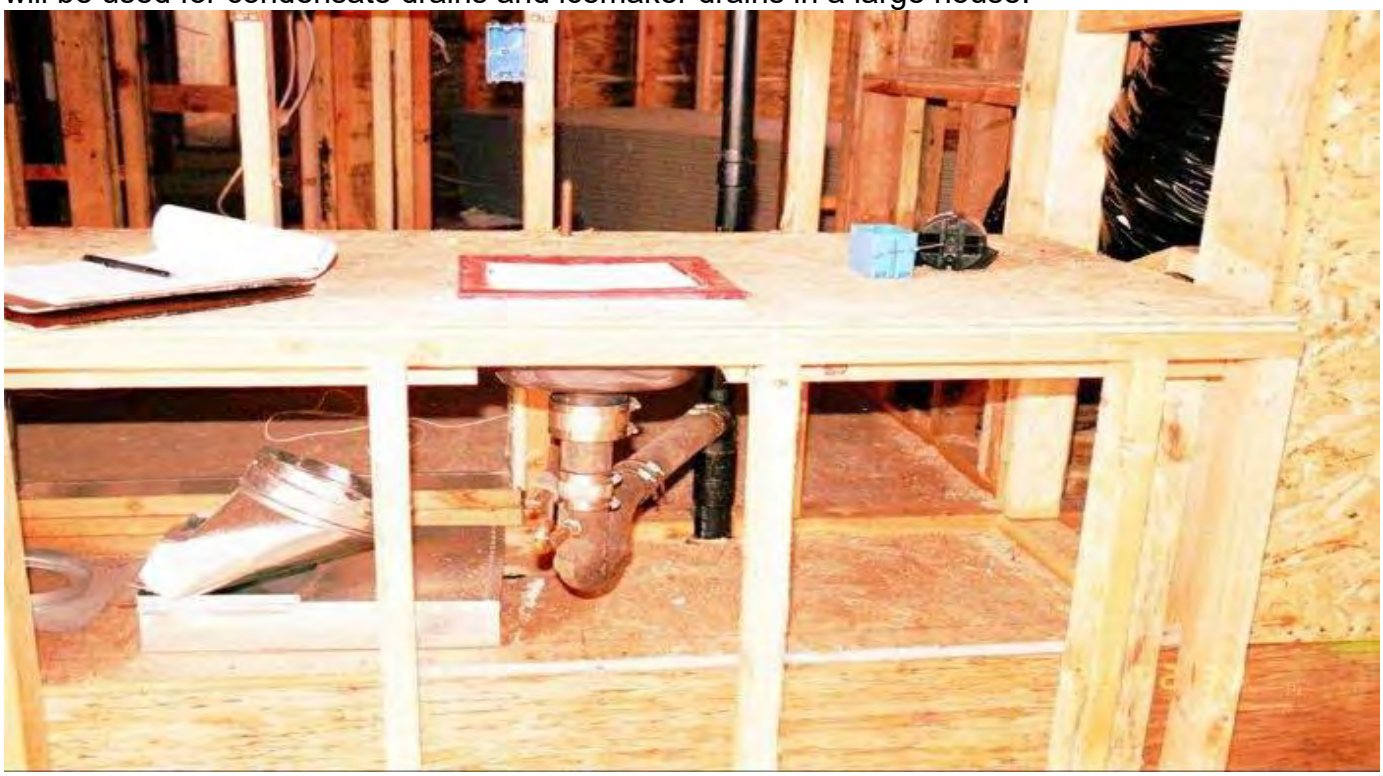
At rough in it may be possible that there is no furnace or equipment installed for HVAC, only the rough ductwork and register boots. The most common defect is kinked or damaged flexible ductwork. Next most common is forgotten items like bathroom fan exhaust vents and clothes dryer vents. Be sure the clothes dryer vent does not pass through a plenum or other system. If fuel- burning appliances are to be installed check for proper combustion air in appliance rooms and that there are acceptable provisions for venting the appliances. Also check factory-built fireplaces for proper fire stopping at the ceiling to attic line and for clearances to combustibles, usually 2-inches for most metal chimneys. Access to attic mounted equipment should be minimum 22 inches by 30-inches by 30-inches height.

Gas piping is mostly steel pipe and usually difficult to damage. However, many times installers damage wood framing during installation. Any fuel gas piping to be installed under or in a concrete slab should be sleeved. Additionally, no gas piping should be installed in a circulating (read return air) or ventilating air duct. CSST gas supply tubing has its own rules, best is to study the factory installation manual for details.

Most of the time the plumbing, mechanical and electrical (except for electrical main service capacity) are not depicted or specified on the construction documents. It is left up to the contractor to determine the appropriate size of equipment. Usually, the homeowner decides quality of fixtures and any special placement of devices with the contractor. Be sure to advise the client that before drywall is the best time to think of any locations for additional receptacles, lights, and low voltage/signal/control items.

In the photo below clinched nails are being used to fasten pipe and tubing to the building. Proper materials and methods should be used for fastening.

The photo below is the rough in of a trap primer (copper tubing entering side of trap) at a floor sink that will be used for condensate drains and icemaker drains in a large house.



The photo below depicts a reasonably well-executed rough in for a sub panel. The cables are properly fastened within 12-inches of the box and the neutrals and equipment grounds are separated in the box.

In the photograph below the “ufer” grounding electrode is rather short and will be difficult for electrician, phone and cable to use as a common grounding electrode.

The photograph below depicts a vinyl shower pan undergoing a water test. This test is normally required by the municipal inspector, but sometimes you will visit the site while this test is being performed.

The photograph below is the gauge attached to the water supply system. The system is pressurized with air for a certain amount of time required by the municipal inspector to check for leaks.

In the photograph below the non-metallic sheathed cable is damaged. This often happens around borings for pipes. In most cases, the plumber and HVAC contractors install those systems first as it is easier to run wires around solid pipes and ductwork.

The photograph below depicts a wood burning metal fireplace chimney lacking the proper 2-inches separation to combustibles.

The photograph below depicts a kitchen island range rough in. The large hole is the fan exhaust pipe, the PVC is for wiring and the gas pipe is sleeved in a 2-inch plastic pipe as it runs under the slab.

Below is a typical factory-built fireplace rough-in. Check for proper clearance to wood and the presence of the metal safety strip (sheet metal extension) at the floor if the floor is combustible (protects gap at hearth extension when embers might enter)

The photograph below was an unusual condition. The HVAC installer decided to take combustion air for a lower-level mechanical room from the garage. This condition compromised the fire resistive wall between the house and garage, and the recommendation was to move the opening up to the roof.

Below are restricted flexible ducts, a quite common condition in new construction.

Many times, during rough inspection the insulation is installed, and inspection of this component is possible. Most inspectors prefer to perform the rough framing/plumbing/HVAC/electrical inspection first with no insulation, and then return visit for the insulation prior to drywall. Often this is not possible or within budget and insulation is either not inspected or inspected along with all rough.

If insulation is part of the inspection check for proper coverage first. Many times, insulation is missing in hard-to-reach areas, or inside walls that are sheathed inside and out. Be sure the insulation is not compressed in small stud bays, rather cut to fit. Compressing insulation reduces the “R” value. Check for filling of gaps around windows with non-expandable foam or other material. Proper installation of insulation around electrical boxes and pipes is to cut the insulation to fit, but this is rarely done. Insulation should be tight around recessed lights if rated “IC” as most now are also airtight.

The photograph below depicts insulation in a ceiling with exterior balcony above.

The insulation in the photograph above is short at the ends in several locations. There also is no vapor retarder. Faced insulation should be used in confined areas with the retarder facing the conditioned space in heating climates. In some hot humid climates, it can be beneficial to face the vapor retarder to the exterior. Consult the building official regarding placement of vapor retarder. In some areas the preferred vapor retarder is 4-mil plastic sheeting.

During rough inspection is the appropriate time to check for safety glass in areas subject to human impact. This is generally interpreted to include any tub/shower area, doors, windows near doors, and areas close to foot traffic. IRC section 308 provides an outline for the areas that safety glass is required. Generally, you should find safety glass in tub/shower enclosures, including any windows within 60-inches of the tub/shower floor, in doors and within 24-inches of any vertical edge of a door. If a window required to be safety glass is not equipped with safety glass look for the same size window at other locations of the house, sometimes they are switched out by mistake.

Rough inspection is the time to check shower pans for watertightness. Most installers of shower pans will water test them for at least 24-hours. The pan liner should extend 3-inches above the threshold and there should be no holes (fasteners) less than 1-inch above the threshold. See IRC 2709.

Emergency exit is required in all bedrooms and habitable basements (IRC 310.1). The escape windowsill height must not exceed 44 vertical inches from the floor. The minimum window openable size is 5.7 square feet, with absolute minimum widths of 20-inches and minimum height of 24-inches. Note that 20x24 inches is not the minimum size of an escape window. The 5.7 square feet size must be met, so a 20-inch-wide window would need to be 41-inches high, a 24-inch high window would need to be at least 34-inches wide, and so on. Basement exit windows must be equipped with proper window wells with a minimum 36-inch dimension (IRC 310.2). Any escape windows that are to be equipped with security bars must have quick release mechanisms (IRC 310.4).

Rough inspection is also a good time to verify that all habitable rooms are equipped with windows for light and ventilation. Check the project drawings for size and location, if available. Most jurisdictions allow exhaust fans in bathrooms and laundry rooms. Check to be sure these fans are ducted to the exterior. Also check the kitchen exhaust fan (if installed) has a duct to the exterior installed.

Inspect the stairways for proper headroom of 6-feet, 8-inches, measured from the nose of the tread vertical to the ceiling. The maximum stair step rise is 7-3/4 inches vertical, and the minimum stair step run is 10 horizontal inches. All treads/risers in a single stairway should be equal in rise and run with a factor of error of 3/8-inch total throughout the stairway (IRC section 311 describes stairs). Any landings should be at least 36-inches wide (the minimum width of a stairway or hallway) and the depth of the door, minimum 36-inches. Proper grippable handrails will be required, so check for blocking in the wall for fastener attachment. Watch for doors that may open over stairways, this is prohibited per section 311.7.6 of the IRC.

You should also be checking the rough framing for proper fire stopping. Any concealed space open for airflow that exceeds 10-feet in any horizontal or vertical dimension requires fire stopping (also called draft stopping) per section 302 of the IRC. Fire stopping is commonly omitted at soffits and drop ceiling intersections to walls, at the bottom of confined stair stringers and around duct and pipe penetrations in top plates of walls. A firestop is also required where a factory-built fireplace chimney, if enclosed in a chase, penetrates the attic space. In other words, if you can enter the attic and look down and see the top of the factory-built fireplace, its wrong.

Inspect masonry fireplaces for proper steel placement per the construction drawings. Most areas require that tie straps be installed from the masonry chimney to the wood framing in the attic. Also be sure the fireplace chimney will extend to a point at least 2-feet above any part of the building within 10 horizontal feet (IRC 1003.9). There should not be any wood framing within 2-inches of any masonry fireplace structure (including chimney) per IRC 1001.11.

ROOFING AND WATERPROOFING

Keeping water/moisture out of the house is one of the most important construction processes that occur, but many times the most careless in application. This will be where you should be very aware of the potential for building damage in the event of a defect.

Inspecting the roofing can be difficult considering the wide swing of installation methods in various areas of the country, and budget constraints. There are some general requirements in the building code, such as the roof shall be watertight (IRC 903). Most of the codes refer to the manufacturer installation instructions. It is best to ascertain the manufacturer of roofing to be installed and obtain these instructions. The construction documents are also a source for information such as roof slope, material, and method of installation. With so many differing requirements for roofing available, we will cover only very general items in this book.

Roofs are required to be fastened to the roof and be waterproof (IRC 903.1). Flashings shall be installed at all penetrations and intersections and be waterproof (IRC 903.2). The roof shall drain (IRC 903.4) and where integral roof drains are used, overflow drains or scuppers shall be installed (IRC 903.4.1). Note that the overflow drain requirement is generally interpreted to include balconies and decks. Parapets shall be covered with a waterproof material (IRC 903.3) called coping. Roof materials shall be installed per the manufacturer's instructions (IRC 903.1) and be compatible with the structure to which applied (IRC 904.2).

The photograph below is a typical roof deck with tile felt installed. The underlayment should typically lap at least 6-inches at the ends and 2-inches at the horizontal laps (IRC 905). The underlayment always should start at the bottom of the roof and in cold climates ice-dam protection should be installed at the eaves (IRC 905).

The photograph below is a typical roof with felt installed and the concrete tiles loaded on the roof. When a heavy roof is to be used, smart builders will have the roof loaded and drywall placed inside on the floors to make the building settle and the wood bend to its load. This way drywall cracking is reduced to a minimum. Note the metal flashings installed.

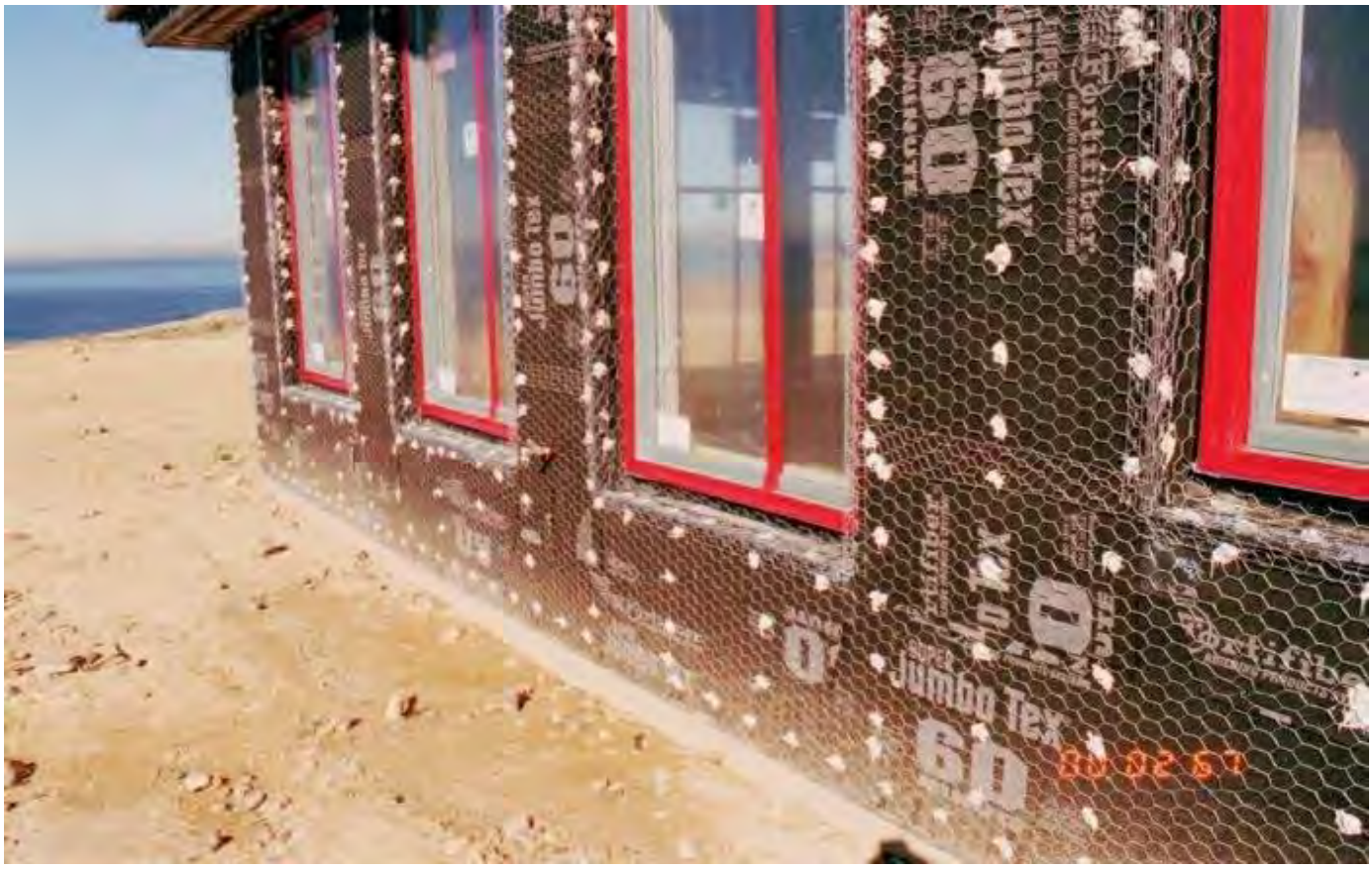
This roof has a hot-mopped (built-up) roof installed in a low-slope area where concrete tiles are to be installed. The slope is less than required for tile type of roof, so an additional membrane roof is required under the tiles. The wood battens will be used to fasten the tiles.

When inspecting complicated buildings, be on the lookout for details that just won't work. The detail in the photo below does not allow enough room for the roof flashing and deck edge flashing to be installed. This is an example of conditions you need to think of at the site.

The photograph below is the same detail as above, but at a more finished house. It would be prudent to recommend modification of this detail to allow proper flashing. Note the proper "kick-out" flashing at the end of the confined rake flashing that directs water away from the building as per IRC 903.2.1.

The codes require that the building be provided with a weather resistant barrier at the exterior with flashings at all penetrations, and no water shall accumulate within the wall assembly (IRC 703.1). Sheathing paper (sometimes called building paper or wrap) is required to be installed horizontally (start at the bottom) lapped 6-inches minimum at the edges and 2-inches at the laps, with upper lapping over lower pieces (IRC 703.7). In addition, heating climates require a moisture vapor retarder be installed at the warm side of the insulation (IRC 322.1) unless there is no possibility of moisture or freezing damaging construction.

We recommend completely inspecting the weather envelope for breaks, improper laps or tears that may allow water penetration into the building. The photograph below depicts a location susceptible to windblown water where the builder opted to caulk every nail hole and penetration caused in the building paper from installation of stucco lath.



We certainly agree that redundancy with waterproofing is not a bad idea. Also note above that the builder chose to use 60-minute grade D building paper. Standard grade is 15 to 20-minute water penetration paper. The better grade paper is an improved installation at economical cost. Notice also that the stucco lath is lapped wire-to-wire and paper-to-paper to avoid water intrusion and stucco cracks. See IRC section 703 for stucco paper and lath requirements. The stucco weep screed is visible at the bottom of the photo. This screed allows water to drain and not accumulate in the wall. This screed must terminate above grade and paving to operate properly.

Pay particular attention to exterior changes in plane such as stairs and balconies. All doors should be equipped with metal or plastic sill pans to direct water to the exterior. The photo below is an example of a not well thought out stair flashing. The upper metal should lap over the metal below. This fundamental rule of exterior flashing is often ignored.

The photo below is a door sill flashing and deck to stucco wall flashing. The deck to wall flashing metal includes a stucco weep screed, this metal is sometimes called “diado” flashing in the trades.

Windows and doors will be the most common penetrations, and the most common to be improperly flashed. The following diagrams depict the proper method of window flashing installation per the Association of Window Manufacturers for windows with nailing fins. Wood windows many times have no fin and will require flashing with metal “head” or “water table” flashing, and stapling of flashing paper to the jambs and sill. Remember that pieces of flashing paper or wrap above should always lap over lower pieces to obtain the shingle effect that always directs water to the exterior.

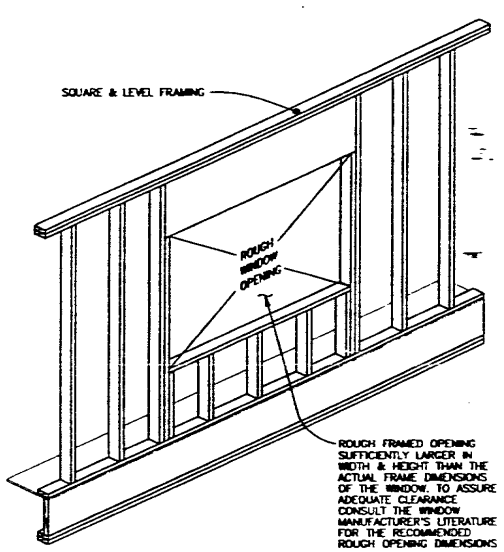


Fig. 1. Rough Window Opening

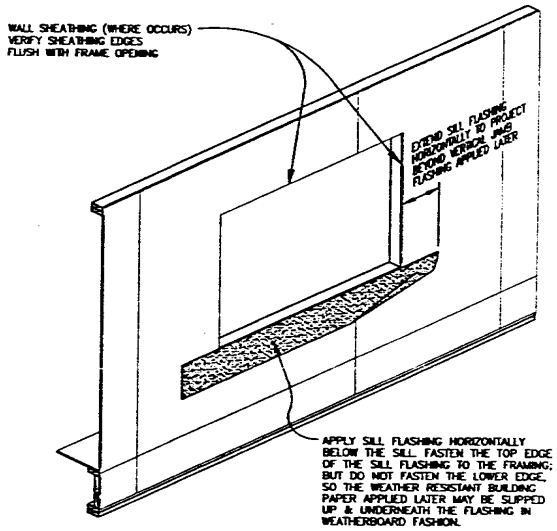


Fig. 2. Sill Flashing

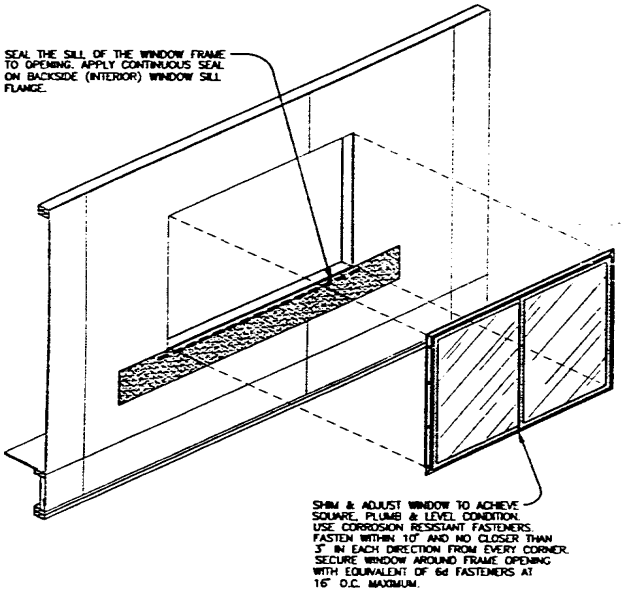


Fig. 3a. Window Installation (Method 'A')

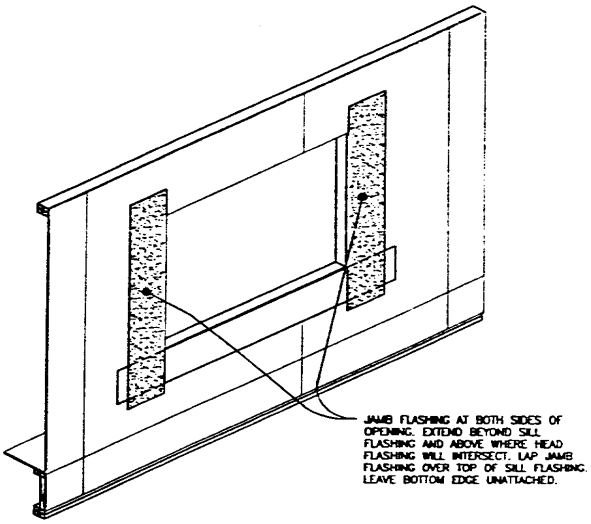


Fig. 3b. Jamb Flashing (Method 'B')

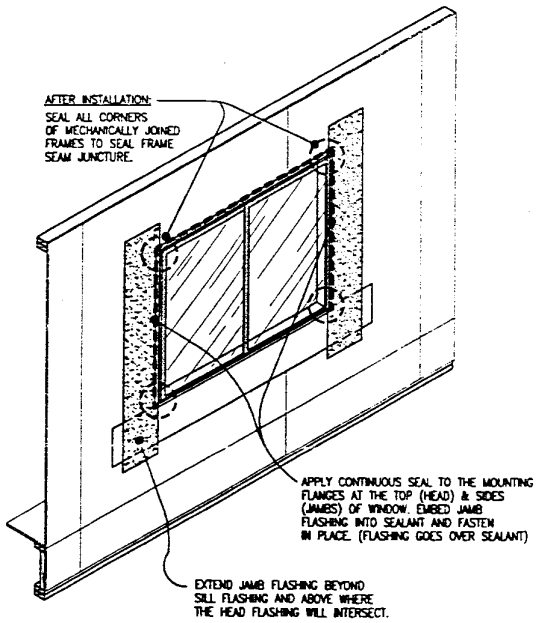


Fig. 4a. Jamb Flashing (Method 'A')

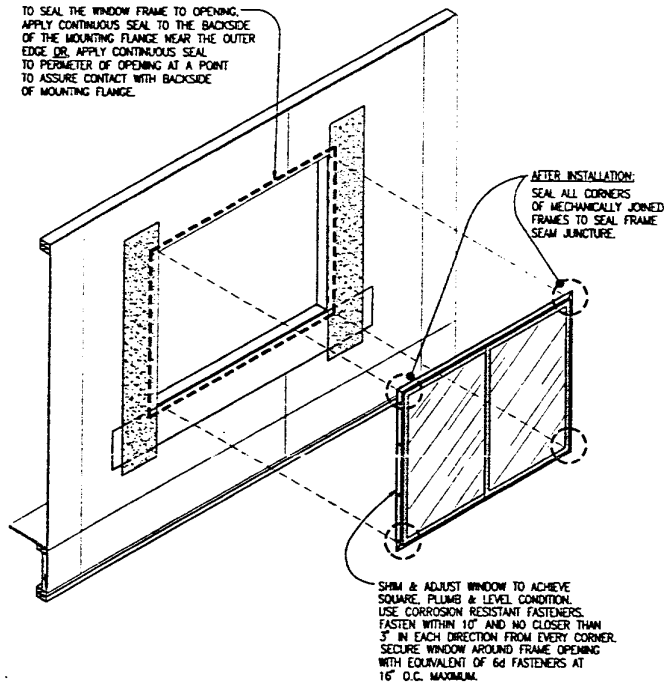


Fig. 4b. Window Installation (Method 'B')

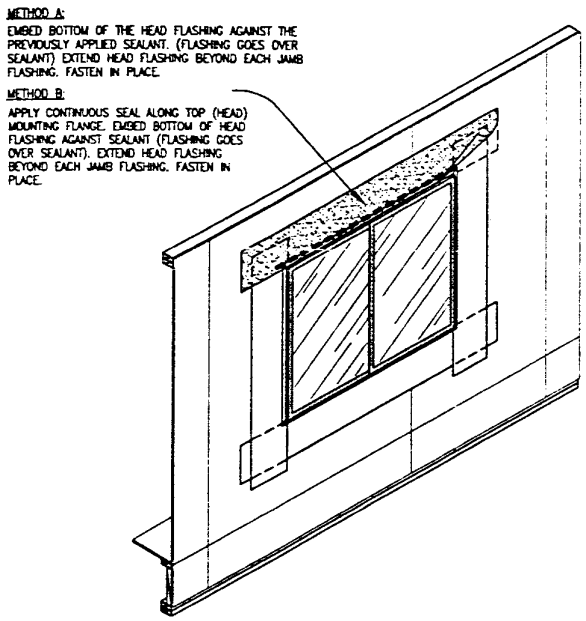


Fig. 5. Head Flashing

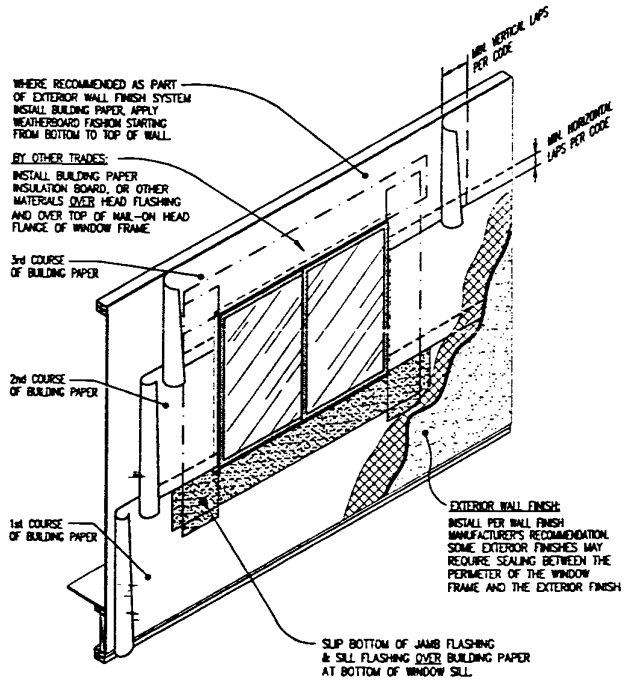


Fig. 6. Primary Weather Barrier Application by Others

Doors will be flashed in similar fashion to windows, except the sill should be protected by a sill flashing, sometimes called a pan flashing. An example is shown in the photograph below.

The photo below is an example of a window in process of installation. Note the shingling of the wrap and that the flashing paper is already installed.

The photograph above shows a window installed in a fully sheathed wall with foam sheathing board used as flashing. This is not considered an industry-wide accepted practice and it would be prudent to water test this window prior to installation of exterior cladding to check watertightness, particularly since it is difficult to flash circular top windows. Note also in this photograph the installation of masonry ties and the step in the concrete foundation, indicating that this wall will be covered with anchored masonry veneer.

The photograph below depicts a skilled window installer creating the caulking seal around the window nail fin head and jambs as directed in the installation instructions. This bead of caulking helps seal the window fin into the flashing paper and/or exterior frame.

The photograph below shows a window installation with metal head flashing installed. The author would recommend that the metal be installed under the top wood “plant-on.”

In this photograph you can see the flashing method is modified asphalt strips (sometimes called “Vycor,” “Ice & Water Shield,” and “Jiffy-Seal,” all brand names). This material is very sticky on one side, allowing sealing in the windows. This material is rather pricey but is a much-improved installation over standard flashing paper. Note the positive slope of the windowsill.

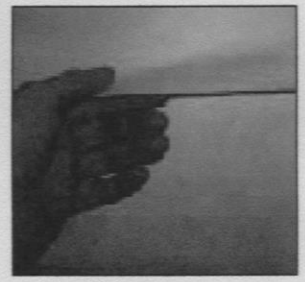
The photograph below depicts a weathered-in wall pocket. Note how the sill flashing (in this case modified asphalt material) laps over the building paper below.

The photograph below depicts typical “housewrap” being used as the weather-resistant barrier. This type of material is becoming more popular due to the ease of installation.

It is still important to install per the manufacturer’s installation instructions and remember to shingle above components over lower components. In the photograph below the house wrap is not installed properly. The horizontal laps are not the minimum 2-inches, and the window head (top) nailing fin is over the wrap material and there is no visible flashing material. These conditions may allow moisture to contact the wood framing. Most housewraps require that the windows be taped into the wrap, and that proper flashing papers be installed at all penetrations. At times, it may be prudent to recommend water testing the penetrations prior to installation of siding to determine the effectiveness of the weather proofing. A great reference for installing windows and deck ledgers in house wrap is “Moisture Protection of Wood Sheathing” published by NAHB and available free at www.nahbrc.org.

The following two pages depict installation of penetrations in housewrap buildings per the National Association of Home Builders Research Center.

Installation of House Wrap



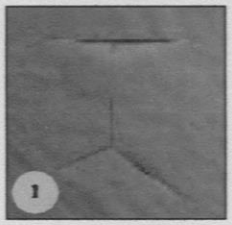
Right Way:
Upper layer lapping over lower layer.

Wrong Way:
Incorrect horizontal joint will divert draining water behind the housewrap onto the sheathing.

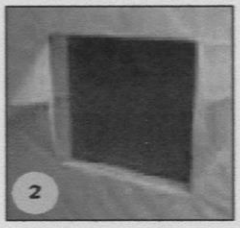
House Wrap Checklist:

- ❑ Have you installed house wrap before windows and doors?
- ❑ Have you weatherboard lapped horizontal joints by at least 6"?
- ❑ Have you lapped vertical joints 6 to 12"?
- ❑ Have you used 1" min. staples or roofing nails, spaced at 12"-18" on center?
- ❑ Have you taped all joints with house wrap tape?
- ❑ Is the house wrap allowed to drain at the bottom of the siding?
- ❑ Does the house wrap extend over the sill plate and foundation joint?
- ❑ If you use a bottom flashing, does the house wrap lap over the flashing?

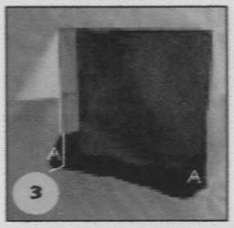
Flashing Window Openings over House Wrap



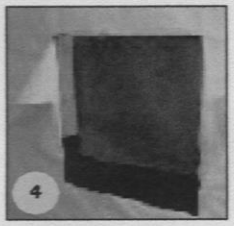
Install house wrap over completed sheathing with minimum joints, covering windows and doors. Cut house wrap at windows as shown..



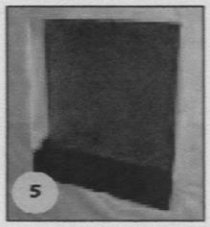
Fold house wrap flap over the sill and staple in place.



Sill flashing should be 6-inches longer than sill. Bend at corners to form upturned legs and fasten to framing. Remove tabs A by cutting the flashing along the crease and vertically as shown.

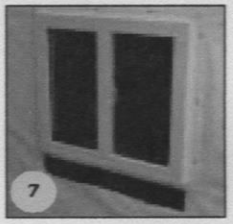


Fold the flashing down and fasten to wall.

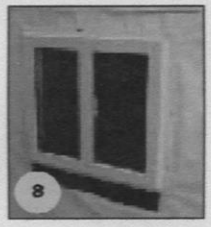


Fold the vertical flaps of house wrap over the rough framing.

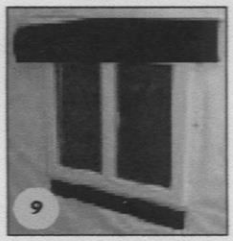
Apply a bedding of sealant to the top and sides of the window mounting flange.



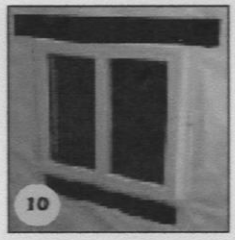
Insert the window and fasten.



Cut the house wrap to install counter flashing over the mounting flange. The slit should extend beyond the window frame and be above the mounting flange by 6 inches.

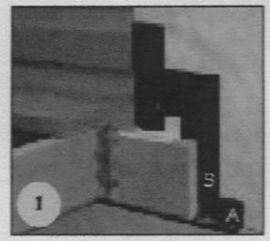


Slip the flashing material behind the house wrap and position the bottom edge with the window frame.

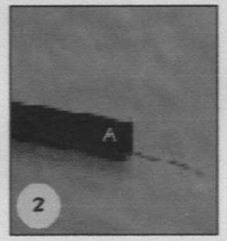


Fasten the counter flashing.

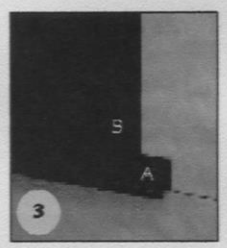
Flashing Deck Ledger over House Wrap



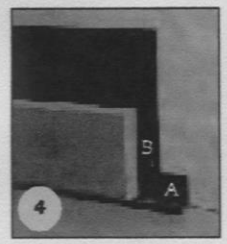
Completed deck assembly. Flashing A and B may be omitted when no siding is below the deck.



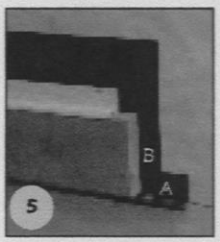
Fasten metal z-flashing (A) over the house wrap. Position the z-flashing at the bottom edge of the deck ledger.



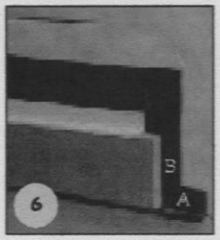
Position counter flashing material (B) by lapping over the metal z-flashing and fasten to wall.



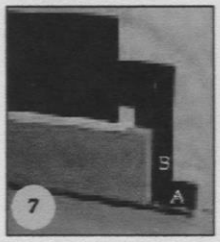
Fasten the deck ledger to the house and leave $^1/_4$-inch gap between the ledger and metal z-flashing.



Position and fasten metal z-flashing over top edge of deck ledger.



Cut horizontal slit in house wrap.



Insert counter flashing material into the slit and position the bottom edge $^1/_4$-inch above the bend in the metal z-flashing. The counter flashing material should extend 6-inches above the slit and behind the house wrap.

Flashing at Exterior Decks

Exterior decks can cause a break in the weather protection system. As every deck varies in location and structure, the following suggestion is only one of many ways to flash at a deck. Always be sure that water will flow away from the structure.

Flashing at Exterior Doors

Flashing at exterior doors is similar to that at windows for the head and side jambs. At the sill, housewrap or building felt should be folded in on the rough sill framing. If using a pan flashing at the door sill, be sure that the pan is on top of the housewrap. If using a threshold without the pan flashing, the housewrap or felt should be installed first and under the threshold.

Caulking and Sealants

Caulking and sealants can be used with flashing and where flashing won't work. Most sealants need to be maintained, and should be relied upon only when no flashing is possible.

Sealant Installation Best Practices

Checklist:

- ❑ Is there sufficient backing behind the sealant?
- ❑ Do you need to install backer rod?
- ❑ Is wood primed prior to installation of sealant?
- ❑ Is the type of sealant you're using compatible with the weather conditions?
- ❑ Is the type of sealant compatible with the adjacent materials?
- ❑ Have dirt and loose material been removed prior to installing sealant?
- ❑ Have you discussed the maintenance of the sealant with the homebuyer?

In some areas, masonry veneer is popular. This material (brick, stone, etc.) is usually installed over a wood framed wall that is covered with a building wrap material. It is important to provide weep holes for the escape of moisture. The IRC section 703.1 specifically requires that exterior coverings be installed to prevent accumulation of water within the wall. The photograph below depicts anchored full width brick veneer. Weep holes for release of moisture are visible.

The photo below depicts a typical brick veneer ledge in the foundation. Full-thickness anchored veneer requires structural support due to its weight, usually by a key in the foundation.

The codes did allow house wrap or building paper to be omitted in few conditions a few decades ago, however, weather wrap is now always required (IRC 703.2). This applied to certain vinyl and aluminum sidings, and some wood panel sidings. One you may encounter is when panel siding (such as plywood “texture 111) is installed with shiplap or batten joints. However, joints must occur at framing members and special care must be used when installing caulking around penetrations. Most manufacturers require that joints at the top of panels must use a metal “kick-out” or “Z” flashing to direct water out of the joint. The author prefers to see some form of weather wrap with any type of siding. The following are informative diagrams from the American Plywood Association.
Note that flashing is still required at windows and doors even when building paper can be omitted.

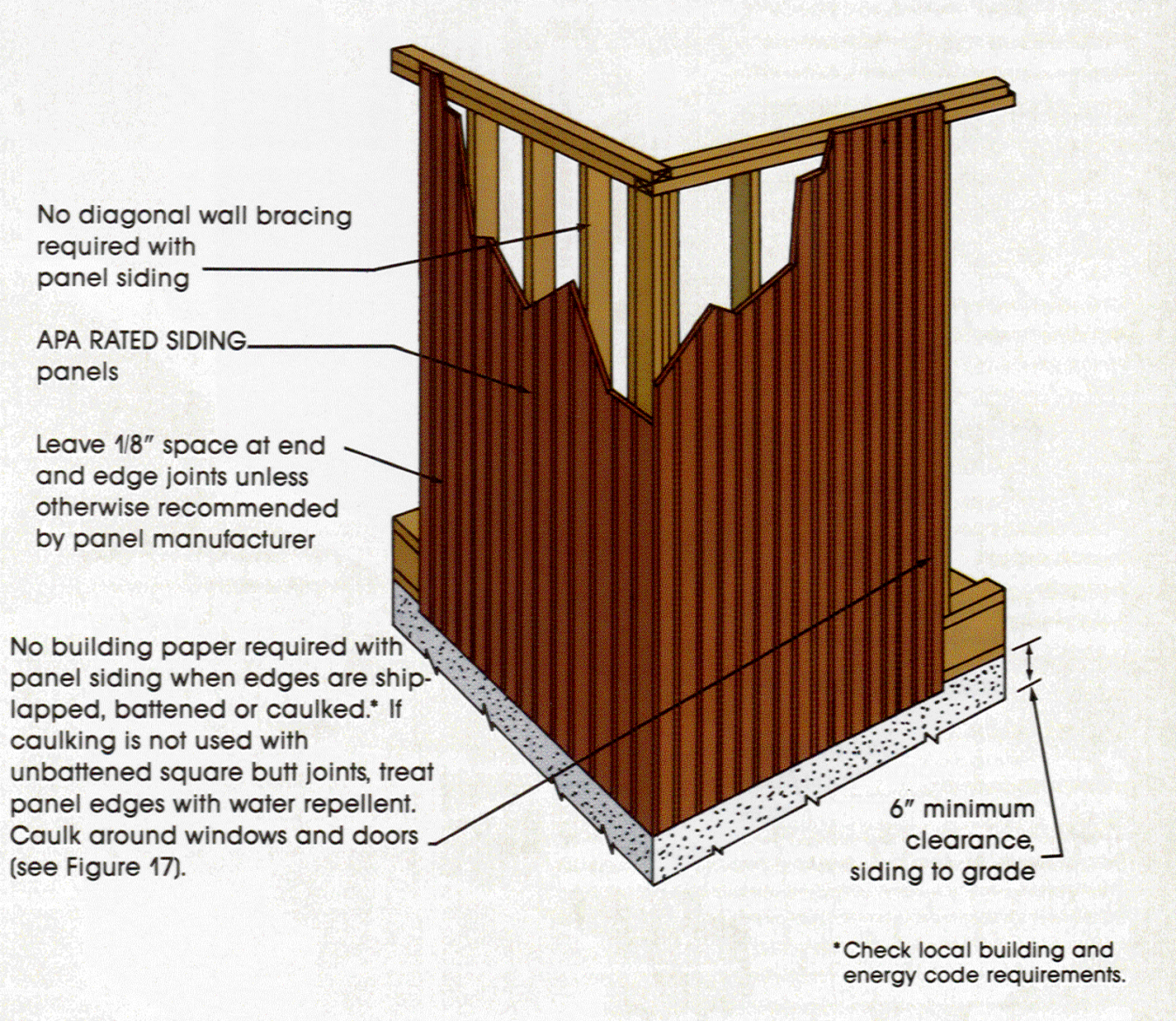


Figure 15 Brick Veneer Over APA Panel Sheathing

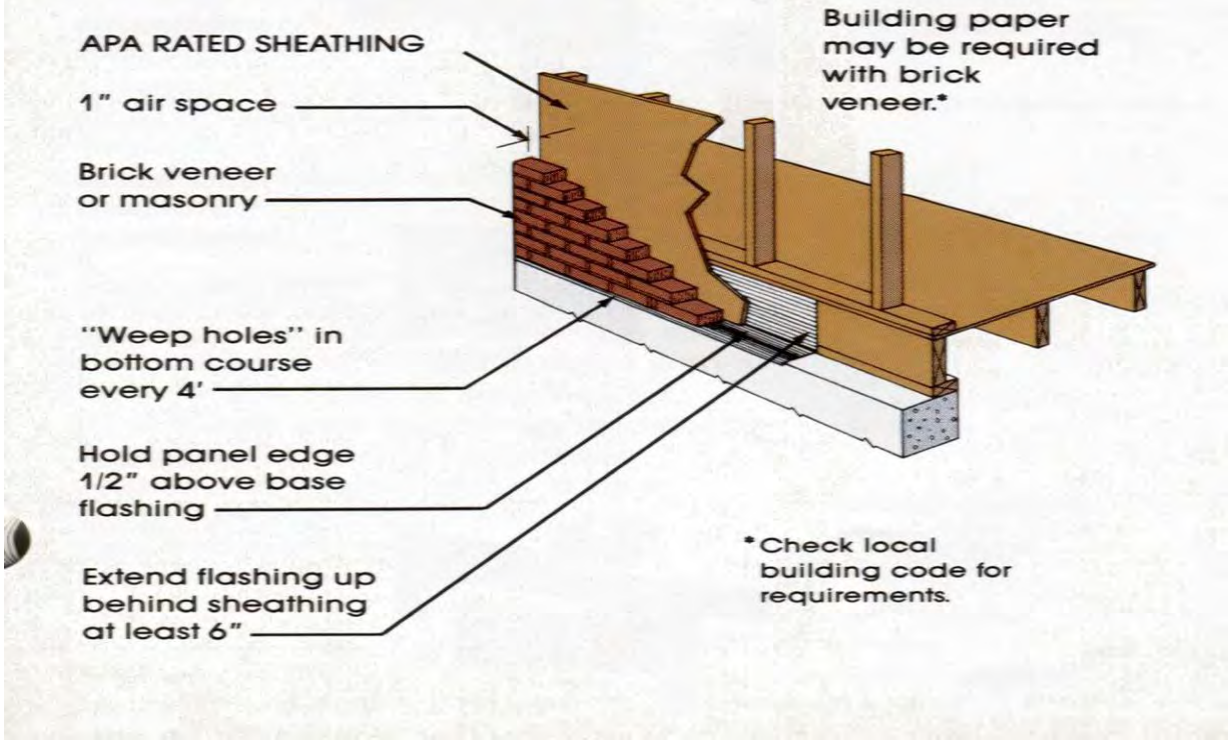
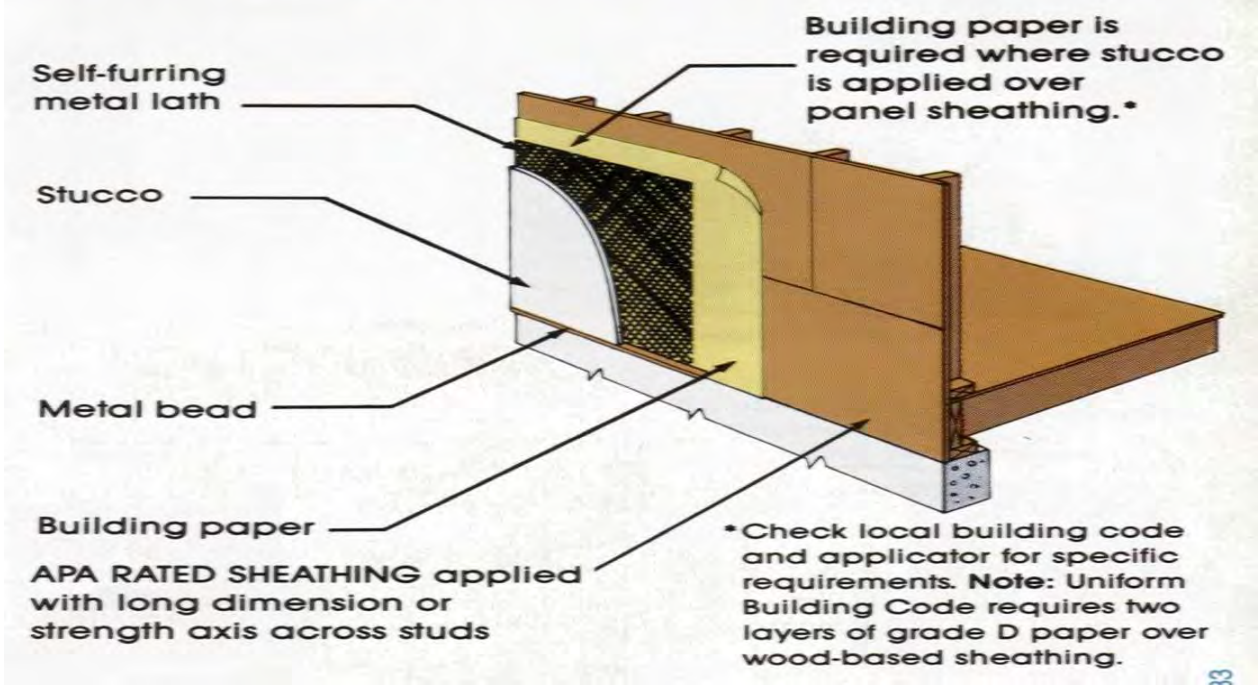


Figure 16 Stucco Over APA Panel Sheathing

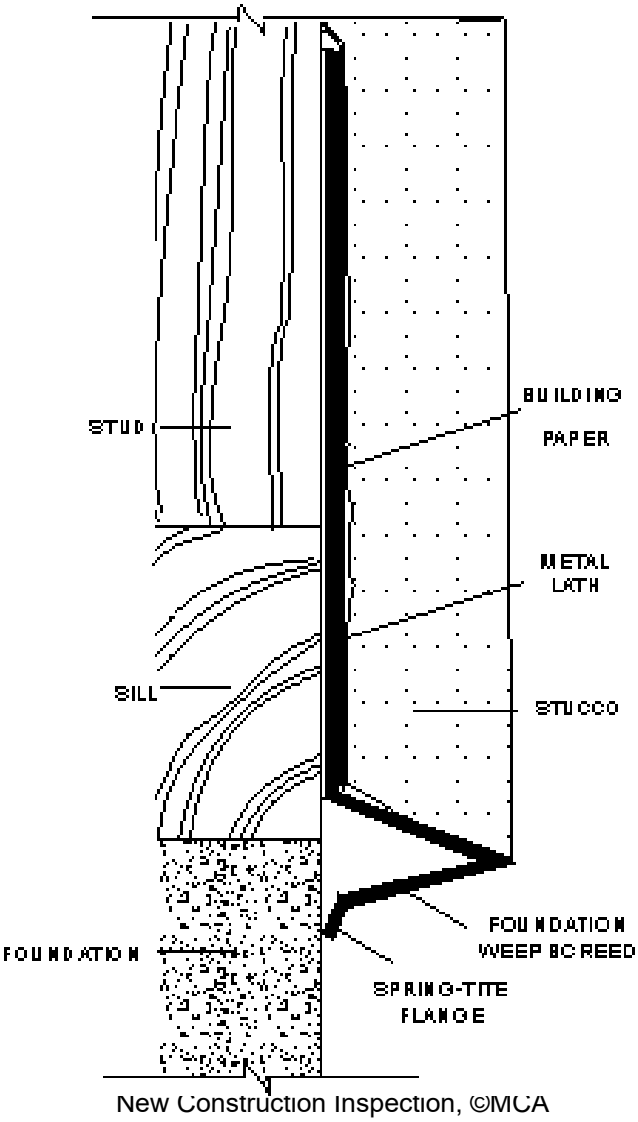


FINAL INSPECTION

Final inspection includes observing all aspects of the construction. This includes exterior cladding, roofing, interior finishes and completed electrical, plumbing, and mechanical systems. Oftentimes minor details are forgotten and/or systems have yet to be activated and tested. Final is generally going to be about the same as a typical Alabama home inspection.

We recommend first inspecting the roof to determine if installed per manufacturer installation instructions. Since composition shingles are still the most popular roofing material in North America, we have included a popular manufacturer's installation instructions on the next page. This information is useful for guidance only; obtain the specific roofing material manufacture instructions for your project. If no instructions are available simply inspect as you would any home.

Inspect the exterior grade for proper slope away from the building. The exterior surfaces should slope away from the building about 6-inches in 10-feet (IRC 401.3). If drains are utilized to manage water, verify that they daylight (the terminus is exposed) or are eliminating into an approved storm drain or sump with pump. Verify that the sump pump discharge is at least 20-feet from the building to prevent re-cycling the water through the sump and pump.



Inspect the exterior cladding for proper installation and weatherproofing. Exterior claddings should not be in contact with grade (soil or paving) and all exterior flatwork. Most manufacturers of wood siding recommend minimum clearance of 6-inches to grade (IRC 317.1). Nearly all the wood and composite sidings require caulking at penetrations. However, caulking should never be installed at "Z" style (AKA water table or kick-out) flashings as the caulk will prevent water from weeping out of the wall. Consider the purpose of the flashing or joint before making judgement regarding caulking.

Plaster exterior cladding is usually installed in three coats when conventional "stucco." EIFS (Exterior Insulating Finish System) and one-coat stucco are typically proprietary systems and must be installed per manufacturer specifications. Determine the system to be used and obtain the instructions if your project is EIFS or One-Coat style plaster. Consider recommending to the client to retain an expert or manufacturer representative installation monitoring if the finish system is to be EIFS or One-Coat plaster.

All stucco systems should be equipped with a weep screed at the bottom of the wall to allow moisture to weep from the system.

DIRECTIONS FOR APPLICATION

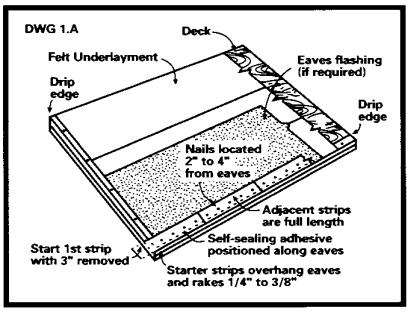
IF THESE DIRECTIONS ARE IGNORED, WE CANNOT BE RESPONSIBLE FOR ANY TROUBLE THAT MAY RESULT AND THE LIMITED WARRANTY COVERING THESE SHINGLES MAY BE VOIDED. SHINGLES SHOULD NOT BE JAMMED TIGHTLY TOGETHER. ALL ATTICS SHOULD BE PROPERLY VENTILATED.

DECK PREPARATION

Roof decks should be dry, well seasoned 1x6 boards, exterior grade plywood at least 3/8" thick and conform to the specifications of the American Plywood Association, 7/16" oriented strandboard, or chipboard.

Fire Retardant Plywood decking is NOT an approved substrate for ELK shingles.

UNDERLAYMENT



Use non-perforated 15 or 30 pound asphalt saturated felt.

Underlayment is required on new construction and recommended for reroofing.

STANDARD SLOPE: 4/12 to 21/12.

Use one layer of underlayment, as shown in Drawing 1.A.

LOW SLOPE: 2/12 to 4/12.

Completely cover the deck with two plies of underlayment overlapping a minimum of 19". Begin by fastening a 19 inch wide strip of underlayment placed along the eaves. Place a full 36" wide sheet over the starter horizontally placed along the eaves and completely overlapping the starter strip.

EAVE FLASHING (ICE DAMS)

In localities where leaks may be caused by water backing up roof above ice dams that may form along eaves, eave flashing MUST be installed.

STANDARD SLOPE: 4/12 to 21/12.

Use coated roll roofing of not less than 50 pounds over the felt underlayment extending from the eave edge to a point at least 12 inches beyond the inside wall.

LOW SLOPE: 2/12 to 4/12.

Use a continuous layer of asphalt plastic cement between the two plies of underlayment from the eave edge up roof to a point at least 24" beyond the inside wall line.

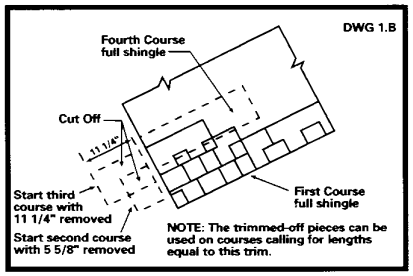
METAL DRIP EDGES

Metal drip edges are recommended along rake and eave edges of all decks.

Consult the Elk Sales Office for application specifications over other decks and other slopes.

SHINGLE APPLICATION

STARTER COURSE: USE A STRIP SHINGLE INVERTED WITH THE HEADLAP APPLIED AT THE EAVE EDGE. With at least 3" trimmed from the end of the first shingle, start at the rake edge overhanging the eave 1/4" to 3/8". Fasten 2" from the lower edge and 1" from each side. See Drawing 1.A.



FIRST COURSE: Start at the rake and continue course with full shingles laid flush with the starter course. Refer to Drawing 1.B.

SECOND COURSE: Start at the rake with shingle having 5-5/8" trimmed off and continue across roof with full shingles.

THIRD COURSE: Start at the rake with shingle having 11-1/4" trimmed off and continue across roof with full shingles.

FOURTH COURSE: Start at the rake and continue with full shingles across the roof.

FIFTH AND SUCCEEDING COURSES: Repeat application as shown for second, third, and fourth courses.

ALL PURPOSE: For use on new or reroof work over any properly built and supported roof deck having adequate fastener holding capacity.

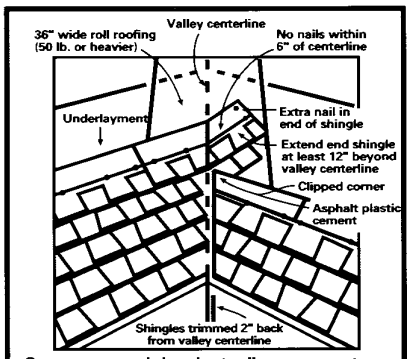
REROOFING: Cut back old shingles at eaves and rakes and install new wood edging strips. MAKE DECK SMOOTH.

EXPOSURE — Five and five-eighths inches (5-5/8").

IMPORTANT: Do not remove tape on back of shingle.

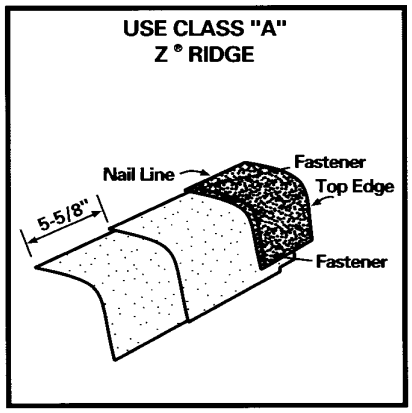
CAUTION: By careless and improper storage or handling, fiberglass shingles can be harmed. Keep these shingles completely covered, dry, reasonably cool, and protected from the weather. Do not store near steam pipes, radiators, furnaces, or other sources of heat. Do not store in direct sunlight until applied. **DO NOT DOUBLE STACK.** Systematically rotate all stock so that the material that has been stored the longest will be the first to be moved out.

VALLEY CONSTRUCTION



Open, woven and closed cut valleys are acceptable when applied by ARMA recommended procedures. For metal valleys, use 36" wide vertical underlayment prior to applying 24" metal flashing.

HIP AND RIDGE SHINGLE



FASTENERS

HELP STOP...BLOW-OFFS and CALL-BACKS

Four fasteners must be driven into the DOUBLE THICKNESS (laminated) area of the shingle. Nails or staples must be placed along the "fastener line". 1-1/4" fasteners required on new construction, 1-1/2" fasteners required on reroofing, (minimum 3/4" deck penetration). Fastener must be parallel with fastener line.

If you nail on the "fastener line", you will penetrate both layers of the laminated shingle and the top portion of the shingle under it. This gives you double protection...You will lower the chances of blow-offs, and you will not jeopardize your warranty. If you fasten above the "fastener line" you will miss the shingle below and obtain no secondary fasteners.

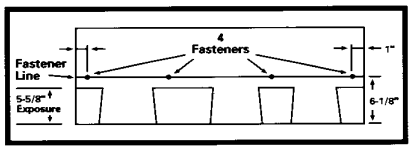
CAUTION:

Do not use fastener line for shingle alignment.

All ELK PRESTIQUE shingles have a U.L. Wind Resistance Rating when using nails or staples on reroofs as well as new construction.

PROPER FASTENER LOCATION

Standard Slope

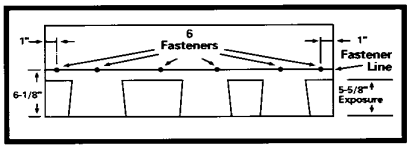


NAILS: Non-corrosive, 3/8" head, 10 to 12 gauge barbed shank roofing nails. Minimum 3/4" penetration in deck. 1-1/4" nail required for new construction and 1-1/2" nail required for reroofing. Nails should be long enough to sink into and hold in a sound nailing base.

STAPLES: Non-corrosive, 16 gauge minimum, crown width minimum of 15/16". Minimum 3/4" penetration in deck.

Special care must be taken in the use of staple guns. Staples must be driven with the gun accurately adjusted to insure that the entire crown bears tightly against the shingle but does not cut the shingle surface. An improperly adjusted staple gun can result in raised staples which can cause a fish-mouthed appearance and can prevent sealing.

Mansard and High Wind Areas



MANSARD AND HIGH WIND AREA FASTENER LOCATION

Correct fastening is critical to the performance of the roof.

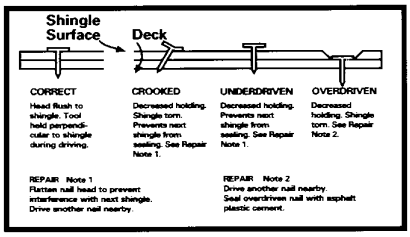
For slopes exceeding 60° (or 21/12) use 6 fasteners. Locate fasteners in the fastener area 1" from each side edge with the remaining 4 fasteners equally spaced along the length of the double thickness (laminated) area.

High wind areas are areas where sustained winds greater than 50 miles per hour are normally experienced.

ELK will accept only fastening methods according to the above instructions.

PROPERLY AND IMPROPERLY DRIVEN NAILS

PROPER *IMPROPER*



ELK Premium Roofing
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Suite 100
Tempe, AZ 85282
800-879-4355

PLANT LOCATION:
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Shafter, CA 93263
800-355-4968

CORPORATE HEADQUARTERS:
14643 Dallas Parkway
Dallas, TX 75240
972-851-0400

SSOOS 12-96 Printed in the USA

Typical Composition Roofing Installation Instructions (obtain specifications for your particular project)

If your project cladding is vinyl or metal inspect for damage, that all components are installed, and for proper fastening. With both products the material should be nailed loosely, i.e., you should be able to move the siding horizontally by hand. Check soffits and window trim for excess looseness. Any type of siding or exterior wall covering should be fastened with corrosion resistant fasteners (IRC 703.4)

If the cladding on your project is to be hardboard, cement fiber or other composite type siding, obtain the manufacturer installation instructions. These sidings are easily damaged if not installed properly, particularly hardboard. The joints must allow for expansion but be sealed to the weather. The manufacturers are also specific in their directions regarding prohibiting contact of the siding material with roofing materials, soils, or concrete paving. During final inspection be sure to check the lower edge of lap siding at the first four or five courses for proper sealant (paint). This area is difficult to cover with a paint sprayer and is often missed.

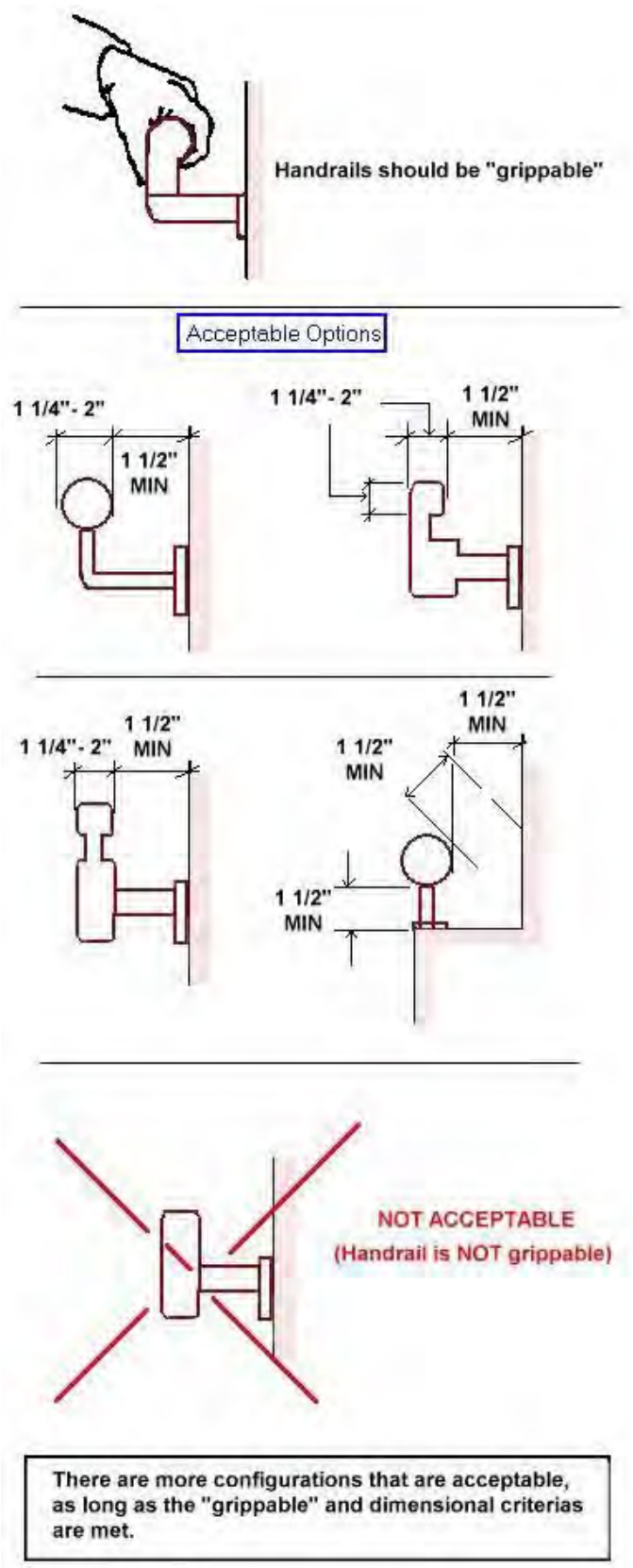
Adhered Masonry Veneer should be inspected for details included in the Masonry Veneer Manufacturers Association "Installation Guide and Detailing Options for Compliance with ASTM C1780 booklet which is the consensus installation guide. Often masonry veneer is not properly terminated at roofs, walls, etc. and missing kick-out flashings where required. Further education regarding AMV is suggested for any home inspector and various organizations offer courses.

Stairways, both interior and exterior, are important components to inspect as they are often constructed without regard for floor finish heights. If planned well, the stair risers should all be within 3/8-inch in vertical dimension. There is some leeway for the lowest step when terminating at a sidewalk or public way, as many times the sidewalk is sloping. Be sure no doors open over interior stairs (they can open at stairs, just not over) as this condition is a fall hazard. See IRC section 311. Exterior doors may open over a step of not more than 7-3/4-inches as long as there is a landing (width and depth of the door, min. 36-inches) after the first step. Many inspectors consider the front entry steps to be part of the ingress/egress to the building and recommend handrails at any exterior stairways. The following page depicts typical handrail dimensions.

If your project has an attached garage, then a dwelling/garage fire separation is normally required (IRC section 302). This is typically drywall installed covering any part of the garage that is immediately adjacent to the house or house framing including attic. This wall should have no holes (no framing exposed) and the door to the house is required to be solid wood or a minimum 20-minute rated door. Be sure to check that there are no exposures to the house attic framing through this wall. Often, we find standard (not fire rated) pull-down ladders in garages which allow flames access to the house attic once the pull-down door fails which is rather quick.

Jurisdictions differ regarding the allowance of pipe and electrical box penetrations in garage to house firewalls. Most permit plastic pipe and electrical boxes to penetrate one side of the wall covering (if the hole is tight to the penetration) but check with your local jurisdiction for their interpretation. Jurisdictions also have a myriad of interpretations regarding attic access through garage fire-ceilings. If there is direct access to the house attic framing from an attic access in the garage technically this attic access should be at least 20-minute fire rated. Check again with your local building and safety department regarding this issue.

Note: multifamily fire separation wall requirements are much more rigorous and vary depending upon fire sprinklers, occupancy, square footage, etc., see IRC chapter 3 for more information regarding multi-family separation requirements.



Handrails are required to be grippable and be installed on any stairway with more than three risers (IRC 311). Handrails also shall return to the wall at the ends to prevent the tripping hazard of personal items catching the end of the handrail. The rail height should be 34 to 38-inches vertical from the nose of the treads.

All decks, balconies and exterior or interior trafficable surfaces where the drop to grade is 30-inches vertical or greater require a guardrail. It is a good safety enhancement to recommend a guardrail at any location a person could walk off an edge and be injured.

Guardrails are required to be substantially secured, and not less than 36-inches in height. Openings in guardrails should not exceed 4-inches. This four-inch requirement is to prevent children from falling through the opening. It is prudent to recommend that guardrails not be climbable but not required.

When checking decks and other appurtenances be sure the ledger is properly fastened to the building, and the ledger is properly flashed. Some inspectors carry a wrench to attempt to spin lag screws at deck ledgers. If the screws keep spinning this means they are only into the wood sheathing and not framing members as required. IRC chapter 5 provides us some deck construction guidelines that should be reviewed. We recommend obtaining the document DCA-6 Residential Wood Deck Construction Guide from American Wood Council for specifics. Often your local building department will have standard construction detail sheets available for decks, patio covers, retaining walls, etc.

Plumbing final inspection includes operation of all fixtures to observe for slow drains, possibly caused by improper venting and/or construction debris in the pipes. There should be adequate clearance in front of toilets, showers, and sinks (usually 21 to 24 inches minimum). Water supply to the building should be provided by a minimum ¾-inch inside diameter pipe. It would be prudent to check water supply pressure for the minimum 40-psi required (IRC 2903). Check for hot water flow from the left side faucets at fixtures, and be sure hot water is connected to the dishwasher. Water heaters should be inspected for proper installation.

Electrical final inspection requires removal of panelboard covers to inspect for proper size of wire to over current protection device. Branch circuits should be sized to at minimum meet the rating of the breaker, i.e., 12AWG minimum to 20-ampere breakers. See NEC table 310-15 for wire sizing. Remember that air-conditioning circuits are different. The conductor is sized per the rating plate on the condenser unit, as is the maximum fuse/breaker size.

In subpanels, check that the neutrals and grounds are terminated on separate terminal bars (buses), and that the neutral is not bonded to the panel. Grounds and neutrals should always be separate paths all the way back to the main service panel, where they are both connected to the neutral terminal bar. See NEC section 250-24(a)5 and 408-40.

All breakers should be labeled and there must be disconnects within sight of most fixed appliances, such as electric water heaters, central air-conditioning condensers and furnaces.

Check a representative number of receptacles with a tester for proper polarity and grounding. Also check light fixtures for operation. There should be switched exterior lights at all exterior doors and light switches a both levels for stairways greater than six risers. Many homes have switched receptacles for lights in rooms such as living, family, and bed, instead of installed light fixtures.

The main service panel must be provided with a grounding electrode, such as a driven rod(s) or concrete encased electrode, usually a section of reinforcing steel. Typically, a #4AWG (NEC 250-66) copper wire is used for this connection between the main panel neutral terminal bar and the grounding electrode. Most jurisdictions also require that any interior metal water piping (and sometimes gas piping and/or metal ductwork) be bonded to the house electrical grounding system.

Mechanical final inspection should include operation of heating and cooling, as well as all ventilation fans. Check for airflow at all registers. In accessible spaces (attic and basement/crawl) inspect for duct installation, support and for excessive leakage. Flexible ductwork is almost always improperly installed. Be especially cognizant of return air duct leakage in garages or other areas where noxious or otherwise offensive gasses could be sucked into the home. We also recommend sealing of all chases and penetrations (such as under-slab for refrigerant lines, condensate drains, etc.) that terminate in the return air plenum, if any, to prevent suction of soil gasses (such as radon) into the conditioned air stream.

If fuel burning furnaces are installed combustion air and combustion air sources/combustion chambers must be separated from return air openings by minimum 10-feet or a positive separation such as a tight-fitting door.

Mechanical also includes final inspection of fireplaces. Check for proper non-combustible hearth extensions and that no combustible material is installed within 6-inches lineal from the fireplace firebox opening. Most often now we see sealed gas appliances which are operated by a switch and are not solid fuel rated. I have found it prudent to count the appliances in the house (gas and or solid fuel) and correlate to the roof penetrations. I have found a few houses with 5 solid fuel fireplaces and 4 roof terminations – after further investigation it was found the metal chimney was never finished through the roof for one of the factory-built fireplaces.

Often new home inspection findings include appliances not completely installed, as in the photo below, the vent connector is not installed, also the fuel gas sediment trap is not properly configured, another common deficiency. The installer here used duct insulation as padding on the service platform for the unit, making the wood a bit easier on the knees.

Some mechanical system items may be considered upgrades. We recommend checking for heat source in every room with an outside wall (like master bedroom closets, bathrooms). If heat is not installed in closets, bathrooms, these rooms may be uncomfortable during winter. We also recommend that a small return be installed in basements to aid dehumidification. Tin on floor joists and wood-framed building cavities used as ductwork result in excessive leakage. We always recommend factory ductwork where possible.

CONCLUSION

As in any inspection, your conclusions are based upon experience, training, and professional judgment. With progress inspections, the building codes, and other regulations, such as manufacturer instructions and the project drawings/specifications also are relevant.

The purpose of the supplemental inspection is not to upset everyone at the site or be king of the hill. When making a judgment call, consider these factors: will it affect performance, longevity, or safety of structure? Does the condition substantially comply with the applicable regulations? Remember that homes are built by persons, not stamped out of a machine. Construction is never perfect, but should be expected to last, and be safe.

The client is expecting you to provide input regarding the above, as well as be somewhat of an authority figure. Typically, just the knowledge that a quality control inspector will be on the job will promote the tradespersons to install well-executed systems and components.

This book was created as a guide for inspectors desiring more knowledge regarding new construction inspection and is based upon the experiences of the author. It is recommended that you research the custom and practices in your region for more information. We also recommend further study and building code knowledge to become proficient at new construction inspection. This book provides some general code requirements but is not in-depth regarding codes as code information is readily available in other books available from other sources and from your local Authority Having Jurisdiction.

Good luck in your inspection endeavors.