



## Appendix B Framing Handout

### Tools commonly used when framing

**Claw Hammer**



**Rip Hammer**



**Framing Hammer**



**Utility Knife**



**Wrecking Bar / Crow Bar**



**Cats Paw**



**Level**



**Wonder Bar / Pry**



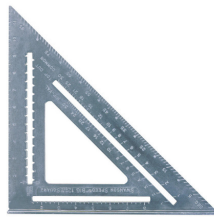
**Tape Measure**



**Chalk Line**



**Speed Square**



**Carpenters Square**



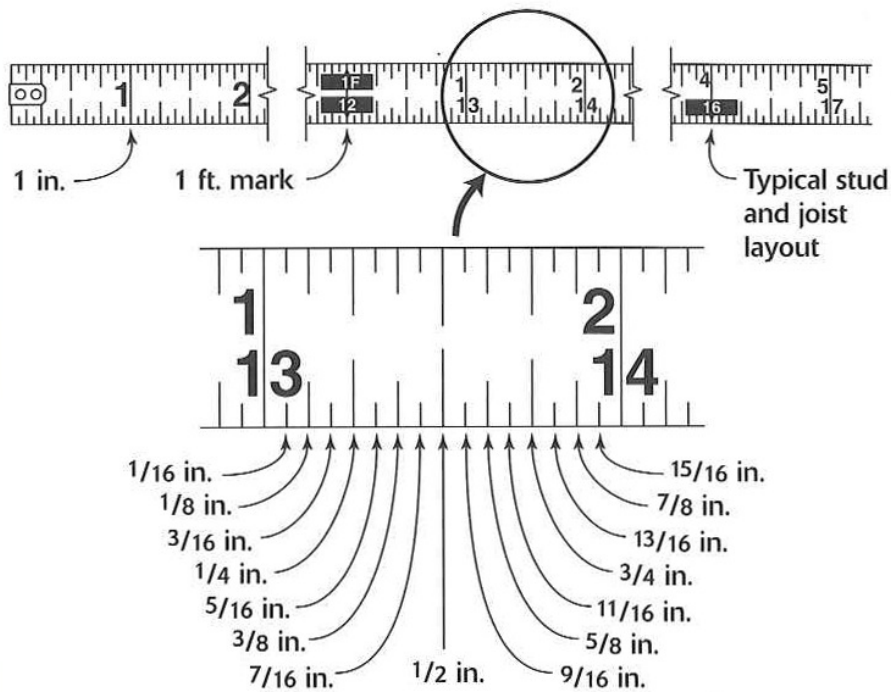
**Circular Saw**



**Reciprocating Saw / Sawzall**



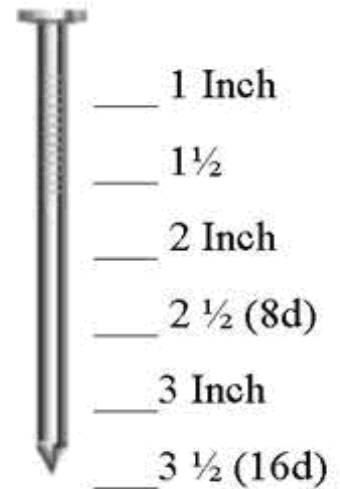
**READING A TAPE MEASURE**



It's important to know at a glance what the different marks on a tape measure mean. Practice using a tape so your measurements will be accurate.

## Fasteners Used:

- On 2 x 4 and 2 x 6 walls use (2) 16 penny nails on the top and bottom of each stud.
- On 2 x 4 and 2 x 6 double top plates use (1) 16 penny nail (try to center it so you don't hit the nails used for the studs). Double top plate seams are to receive (2) 16 penny nails.
- Bottom plates are to be nailed with (2) 16 penny nails per stud opening. When nailing down exterior walls bottom plates make sure to nail as close to the outer edge as possible to hit the rim joist. When nailing down the interior wall bottom plates try to hit floor joists as often as possible. (Make sure you don't nail doorways as these bottom plates will be removed).
- On sheathing use 8 penny nails. The perimeter is to be nailed every 4" to 6" and the field is to be nailed every 6" to 8".
- With joist hangers use Joist Hangers (10d thick x 1 1/2").



## Lumber Sizes / Types:

*(Note: there are many sizes and types of lumber however these are a few of the most commonly used types on Milwaukee Habitat sites)*

- 2 x 4 - varies in length typically anywhere from 6' to 24'. A 2 x 4 is actually 1 1/2" x 3 1/2" due to the process of drying and planing (process used to make the wood smooth).
- 2 x 6 - varies in length typically anywhere from 6' to 24'. A 2 x 6 is actually 1 1/2" x 5 1/2" due to the process of drying and planing (process used to make the wood smooth).
- 2 x 10 - varies in length typically anywhere from 6' to 24'. A 2 x 10 is actually 1 1/2" x 9 1/4" due to the process of drying and planing (process used to make the wood smooth).
- LVL (Laminated Veneer Lumber) – Engineered lumber consisting of many pieces of veneered lumber glued together to give added structural strength. Commonly available in lengths of 24' to 48', thicknesses of 1 3/4" to 3 1/2" and depths ranging from 9 1/4" to 18".
- I-Joist – Consist of oriented strand board (OSB) webs fitted into high grade solid sawn lumber or laminated veneer lumber (LVL) flanges. I-Joists are commonly available in lengths ranging from 28' to 48' and depths ranging from 9 1/2" to 16".
- OSB (Oriented strand board ) – Comes in various thicknesses and sizes, on MHH sites we use 1/2" thick 4' x 8' sheets for the walls and 3/4" thick tongue and groove 4' x 8' sheets for the sub floor and roof decking.

# Types of Lumber Commonly Uses by Milwaukee Habitat

## FRAMING LUMBER



2x4



2x6



2x8



2x10



2x12



4x4

## I-Beam



## LVL



## OSB



## Joist Hanger



## **Habitat's Plate Marking / Framing Procedure:**

- **X's** - indicate stud placement.
- **Red Lines** – indicate placement of interior wall nailers which are placed perpendicular to the studs flush with the interior side of the wall.
- **O's** - indicate placement of the king studs for windows or doors. Doors are indicated by a D (following the number of the door) for example D1 or D2. The same system applies to the windows which are indicated by W1, W2, etc. Window and Door openings are pre-built and delivered to the jobsite; you would then find the corresponding window and or door and install it in the correct opening.
- Each plate is identified with a number. This number also corresponds to the erecting sequence. You will be erecting panels starting with the lowest numbered plate.
- Each plate is marked with an orientation arrow to alert you to the direction it will have in the wall assembly. All plates should be positioned so that these arrows run from rear-to-front on the side walls of the house and as-marked on the wall plan for the front and rear walls.
- Each plate will be marked with the location of any intersecting walls, as well as with the locations of the door and window frames. You will always erect walls numerically (starting with the lowest numbered wall), and position them as directed by the orientation arrow.

# **Work Site Safety**

## **Introduction:**

Safety is everybody's concern and is always an important consideration at any construction site. Building construction can be one of the most dangerous occupations. Since Habitat work crews normally have a high proportion of inexperienced people, everyone must pay particular attention to safety. Try to be conscious of the safety of others as well as yourself. An observer can often see danger better than the worker involved in the project. Be cautious at all times and ask questions. Do not go ahead with a task if you are uncertain how it is done, or if you are unable to do it. Safety is based on knowledge, skill and an attitude of care and concern. Supervisors should instruct each worker about the correct and proper procedures for performing each task. This should familiarize the worker with the potential hazards of doing the tasks and advise him or her as to how such hazards can be minimize

## **General Safety:**

- Don't lift beyond your strength. Get a partner. Remember to bend your knees. Lift with your back straight.
- Keep an eye on your load as you move and turn so as not to whack someone with a board.
- Do not run when carrying tools or materials.
- It's good practice to obtain updated vaccinations such as tetanus shots.
- Know where the water, first aid kit, and fire extinguisher are located.
- Tell the house leader immediately in the event of an injury.
- Refer to the instruction sheet included in the body fluids clean up kit located in the site trailer prior to sanitizing the work site after any injury that requires clean up.
- Think and concentrate on your task.
- If you are uncertain about how to do a task or how to operate a power tool - ASK A SUPERVISOR
- Advise your supervisor IMMEDIATELY of any unsafe or hazardous tool or condition.

## **Security & Housekeeping:**

- Many accidents can be avoided by proper on-site housekeeping. Following are some recommendations:
- Have access to a telephone – Every MHFH house has a land line from insulation until closing. Locate and test it at the beginning of every work shift.
- Milwaukee Habitat for Humanity will have potable water at the site unless noted otherwise.
- Locate the safety bucket in each house. The safety bucket contains:
  - -1 first aid kit
  - -1 Fire extinguisher
  - -Safety paper packet including: sign-up sheets, waivers, staff contact sheets, directions to the nearest hospitals, incident report sheets, safety huddles, etc.
- Do not store flammable or combustible materials inside the building.
- Arrange deliveries to minimize value of materials on job site.
- Keep the area around the building clear of debris.
- Keep the interior of the building, including stairs, halls, and open floor areas, free of debris.
- Remove nails from scrap lumber as soon as practical.
- Keep all electrical cords free of entanglement with loose materials and in good repair.
- Wipe up spilled liquids on areas that may cause workers to slip.
- Build protective barriers around openings on the site or in the building that may cause falls.
- When dropping materials to the ground, barricade the drop area.
- Excess tools, small pieces of material, sawdust, mud and power cords each represent a potential for injury on the job site.
- Stack unused lumber and building materials neatly so as to reduce the chance of tripping and to assist in accounting for materials.
- Discard banding material as soon as it is removed from bundled lumber.

## **Work Site Clothing & Worker Safety Equipment:**

The affiliate will make basic safety equipment available to every volunteer such as hard hats, safety glasses, dust masks, ear plugs, etc., as needed. Proper clothing is as essential to safety as the proper selection and use of tools / safety equipment.

- Wear clothes and gloves that are appropriate for the work and weather conditions. Loose clothing is dangerous around power tools.
- Workers shall wear work boots and thick-soled shoes at all times when on a construction site. Any worker wearing sandals or other types of inappropriate footwear shall not be permitted to remain at a construction site.
- Hard hats are to be worn during the framing phase of construction, or when required by a supervisor.
- Earplugs must be worn when using a power tool for a prolonged period of time or when instructed by a supervisor.
- A worker must wear protective glasses any time he or she is operating a power tool or when instructed by a supervisor.
- Each worker must wear a dust mask when installing insulation, sanding or when instructed by a supervisor.

- Hammering or the use of power tools has the potential to produce projectiles which could cause eye injuries.
- When persons are exposed to harmful respiratory substances, respiratory protective devices must be used.
- Clothing should be loose enough to permit easy bending but not loose enough to get caught in moving tools.

### **Hand and Power Tools:**

- Wear safety glasses when operating power tools and nailing.
- Wear hearing protection when operating saws.
- Never hold the work in your hands. Place the work on a firm surface.
- Guards on saws must be in place & operating. Tools must be in safe condition. Keep blades sharp. Make sure wooden handles do not have splinters and cracks.
- Don't bind the blade of any saw. If a saw binds, it will kick back toward the operator. Do not overreach.
- Select the correct tool for your work. Carry only those tools you need.
- Regularly inspect tools for broken or missing pieces. Inspect cords for frayed wires or damaged insulation.
- Use grounded plugs on tools appropriately.
- Plug electrical equipment into a ground fault circuit interrupter.
- Use tools for their intended purpose.
- If unfamiliar with a tool's use, ask for assistance and take time to practice using the tool.
- Do not operate tools without approval or supervision. Do not operate a tool if you have not been trained to use it.
- Do not over exert yourself or the tool; this can lead to slips and strains.
- Place yourself in a good body position - most hand tool accidents result from being struck by the tool or flying chips.
- Disconnect power source before moving the tool, making adjustments, or changing bits or blades.
- Do not use the cord to lift or lower the tool.
- Do not fasten extension cords with staples, nails or suspend by wire.

### **Ladders:**

- Use ladders for the purposes for which they were designed. Do not use ladders for skids, braces or work benches.
- Make sure ladder size meets job demands.
- Do not use step ladders as straight ladders, always open all four feet and lock spreaders in place on a step ladder and place in a level condition.
- Do not place tools or materials on steps.
- Use proper angles when using straight and extension ladders. When using a non-self-supporting ladder use the "four-to-one" rule: for every four feet of height, move the bottom of the ladder one foot from the wall. One way to ensure proper angle is to stand with your feet at the base of the ladder and extend your arms straight out. If your hands just touch, the ladder will be very close to the 4 to 1 ratio.
- Secure straight and extension ladders by tying off the top or securing the base.
- Top extension ladders must extend at least three feet beyond the supporting object when used as an access to an elevated work area.
- Before climbing extension ladders make sure latches are properly engaged.
- Extension ladders must be overlapped a minimum of three rungs.

- Keep body near the middle of the ladder. Avoid leaning off the edge of a ladder. Move the ladder frequently so as not to be tempted to lean too far.
- Do not step on the top rung or platform on a step ladder.
- Do not carry anything that will prevent holding on with both hands while ascending or descending the ladder. Use a tool belt or a tool bag to lift tools.
- Only one person on a ladder at a time.
- If it becomes necessary to place a ladder in or over a doorway, barricade the door.
- Do not use metal ladders near an electrical exposure.
- Always inspect the ladder before you use it. Never use the ladder if it is damaged, broken, or bent. Make sure that all parts are in good working order, and all rivets, joints, nuts and bolts are tight.
- Face the ladder while climbing and stay in the center of the rails. Grip both rails securely while climbing.
- Do not lean over the side of the ladder. Your belt buckle should not be further than the side rail.
- On single or extension ladders, never stand above the third rung from the top and never climb above the point where the ladder touches the wall or vertical support.
- On stepladders, never stand on the paint shelf, spreaders or back section.

### **Framing Safety:**

- Observe all rules and precautions specified under general, power tools and ladders.
- Remove nails from discarded lumber as soon as practical.
- Use a respirator when sanding pressure treated wood.
- Always wear a hard hat when work is being done overhead during the framing stage. Watch for materials falling from above.
- Use caution when walking on floor joists. Watch your footing.
- Cover stair openings as soon as sub-floor is installed with suitable materials.
- Install a slide guard about 6” from the bottom of the first course of roof sheathing as soon as it is installed to prevent tools or personnel from sliding off the roof.
- Install GFCI circuits in the temporary power system.
- Stairways with 4 or more risers or which rise more than 24” must include handrails at 30” –38” high from the plane of the treads.
- Take precautions when climbing onto or off of the roof. This is when many roof related falls occur.
- Do not step backwards on a roof. Every year, experienced roofers fall off the roof by stepping backwards off of the edge.
- When roofing, wear shoes with soft soles with some tread left.
- Loose materials and sawdust should be removed frequently from the roof surfaces.
- When standing up walls, make sure there are enough people to hold up the wall, and have bracing ready so it can be fastened as soon as possible. Workers should not be positioned on the outside of the wall.
- Make sure the wall is fully supported until the bracing is up.
- Do not allow personnel to work beneath areas being roofed.
- Never work on a roof alone.

# ADDITIONAL REFERENCE MATERIAL

## Words to Know:

- **Bottom Plate/Sole Plate** - The bottom framing member of a wall that the studs attach to and keep the studs nailed to the subfloor.
- **Ceiling Joist** - Framing system for stick built roofs for sheetrock ceiling in rooms below; Milwaukee Habitat for Humanity only uses these on the front porch ceilings.
- **Center Line** - On plans, a broken line, usually indicated by a dot and dash, showing the center of an object and providing a covenant from which to lay off measurements.
- **Chalk Line** – A light cord that has been rubbed with chalk for marking; the line left by a chalked string.
- **Cripple** – A structural member that is cut less than full length, such as a studding piece above or below a window or a door; framing member used to support rafters.
- **Decking** - OSB that is nailed to the rafters or trusses to create the roof deck. Decking is also used to describe the dimensional lumber used to create the floor for an exterior deck or porch.
- **Double Top Plate / Cap Plate** - The cap plate is used to tie partition walls into adjoining walls.
- **I Joist** - Prefabricated framing lumber used for floors, ceilings, and rafters. I joists are identified by a top and bottom chord of wood usually 2” thick (either solid or pressed wood) with an OSB web between them. They are light and easy to work with and allow for long unsupported spans where an open floor plan is desired.
- **Joist Hanger** - Prefabricated and engineered metal connector nailed to support beams (if flush with frame system) or ledger and band of deck framing.
- **King Stud** - A full length stud in the wall framing system that butts up to each end of a header. The header is both toe nailed and end nailed into the king studs.
- **OSB** - Shortened and common name for Oriented Strand Board. OSB is identified by the glued pieces of wood chips that it is comprised of- a good and environmentally sound building material using less virgin cut wood than normal plywood. ½” thick OSB is used for wall sheathing and roof decking, while the ¾” tongue and groove sheets are used for subfloor.
- **Penny** - Nails are measured in a system that refers to their size. The unit is called a "penny." The larger the number, the larger the nail. A 3-penny (3 d) nail is much smaller than a 16-penny nail. The origin of the term "penny" in relation to nail size is based on the old custom in England of selling nails by the hundred. A hundred nails that sold for sixpence were "six penny" nails. The larger the nail, the more a hundred nails would cost. Therefore the larger nails have a larger number for its penny size.
- **Sheathing (sheeting)** – The first layer of exterior wall covering nailed to the studding; roof boards are also referred to as sheathing.
- **Snapping Out - Layout** technique after slab is poured/subfloor framed to assure correct placement of house walls. With the use of blueprints, chalk lines are “snapped out” on the subfloor to assure rooms are square and align properly. If lines are snapped out on a different day than the walls will be put in place, they must be covered with clear lacquer.
- **Stud** – A series of slender wood members used to support elements in walls and partitions; vertical members of appropriate size and spacing to support the structure. All Milwaukee Habitat for Humanity studs are 92 5/8” long.

- **Temporary bracing** - 2x4 lumber (10' lengths) used to straighten and hold walls from moving while either second floor or roof is framed above. One end of the brace is nailed with at least 2 16d nails at the top plate and the bottom is nailed either to the subfloor with the use of scrap lumber or to the bottom plate of the same wall. Top edge of bracing should not extend above the cap plate of the wall to which it attaches. Temp. bracing should never be removed until wall sheathing is in place and either roof is framed in decked (if single story) or second floor is framed and subfloor down.
- **Top plate** - Horizontal framing member of the wall frame unit into which studs are end or toe nailed.
- **Trimmer Stud / Jack Stud** - Wall framing member cut to length to support the ends of a header, either for a door or window. Length of jacks depends on height of rough opening. Jack studs fit under the header and directly beside and touching the king studs.

## PARTS OF A HOUSE

