

BASEMENT FINISHING AND REMODELING CODE GUIDELINES

February, 2007

One of the objectives of the Johnson County Building Officials Association is to enhance construction uniformity and the adoption of common construction codes and procedures. This document is intended to assist contractors and home owners in understanding the minimum code requirements for basement finish projects. It is also intended to provide guidance for obtaining permits and inspections.

The information provided should not be considered a complete list of code requirements. Structural modifications, such as relocation of support columns, relocation of bearing walls, or reframing floor joists are not within the scope of this document. A registered design professional should be hired to provide review and design services for structural projects. Permit requirements may vary from city to city. Complete information is available in the codes and ordinances adopted by each City. Check with your city for complete requirements prior to obtaining a permit and before starting any work.

BUILDING PERMITS AND PERMIT REQUIREMENTS

Permits – A permit is required to finish or remodel a basement that involves construction of walls or installation or extension of electrical circuits, plumbing drains or vents, or ductwork.

Exempt Work – Repair and maintenance work, such as, carpeting, painting, wall paper, receptacle replacement, fixture replacement (sinks, stools, lighting fixtures), vanities and cabinetry do not require a permit.

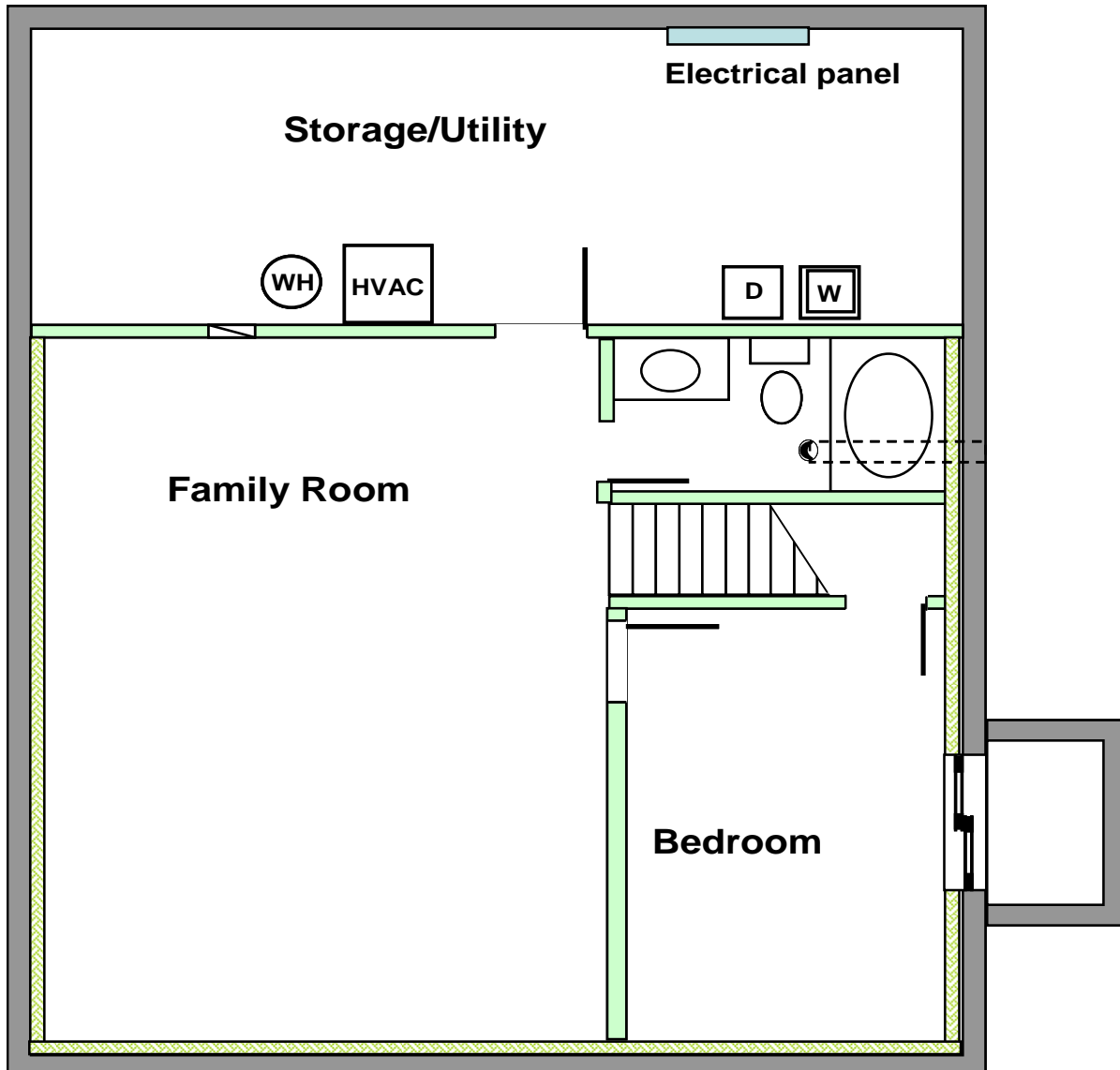
Contractors – Most municipalities allow a homeowner to obtain a permit to do work in the house they own and occupy. If the homeowner is hiring a contractor to do the work, this document suggests that the contractor be required to obtain the permit. To obtain a permit, most cities require the contractor to be licensed with Johnson County. Licensing assures that contractors have met the minimum requirements for code knowledge, and maintain workman's compensation and general liability insurance. Code deficiencies or failure to complete the work in compliance with the code requirements is the responsibility of the person who obtained the permit. For additional contractor licensing information contact www.contractorlicensing.jocoks.com

Codes – This document is based on the 2006 International Residential Code (IRC) and accepted engineering and construction practices. Please check with the local jurisdiction regarding the specific code that has been adopted, and any code amendments that may affect the use of this document as a construction guide.

Application and Fees – Application to the local jurisdiction is required to obtain a permit. In addition to completing an application for a permit, plans showing the work to be performed and payment of permit and plan review fees are also generally required. Plan review and permit fees may vary for each jurisdiction.

Construction Plans – A sample plan has been provided showing the minimum information necessary on the plans. Plans shall be drawn to a scale (1/4-inch or 1/8-inch equals 1-foot is preferred).

SAMPLE PLAN



INSPECTIONS – Inspections at various stages of the work are required as the work progresses. The jurisdiction issuing the permit will provide information to specify when inspections are required and how they will be scheduled. The project is not considered complete until a satisfactory final inspection has been obtained. When the final inspection is approved the permit is closed and the space can be occupied. Failure to call for a required inspection is a violation of most municipalities' building code. Inspections are generally required as follows:

- **Under slab -plumbing** – Where under-floor plumbing is required for backwater valves, floor drains, bathrooms and kitchens a plumbing under-slab inspection is required after the under-floor piping is installed and prior to filling the trench and replacing the floor.
- **Rough-in** – This inspection is done before any wiring, plumbing piping, or mechanical ducts in walls and ceilings is covered with insulation, sheet rock, paneling, etc. All piping, ductwork, sub-panels, wiring, junction boxes, and outlet boxes shall be installed. Do not install switches or receptacles.
- **Insulation** – This is inspected after insulation is installed and prior to installing drywall. This inspection is not required by all jurisdictions although compliance is still required.
- **Drywall** – This inspection is performed after all drywall is installed and prior to painting. A partial inspection for water resistant drywall around tubs and showers may be requested prior to inspection of other areas. Make sure access to valves, junction boxes, etc. remain accessible. Not all jurisdictions required a drywall inspection.
- **Final** – This inspection is scheduled when insulation, drywall, doors, and all fixtures, receptacles and devices have been installed so the space is ready to occupy and use. Cosmetic items that are not regulated by the building code, such as trim, painting, and other finish work, do not have to be completed to obtain the final inspection.

EXISTING CONSTRUCTION THAT MAY NOT MEET THE CURRENT CODE

Sometimes homeowners question what might happen if the building inspector comes for an inspection, and notices something that does not comply with the building code. “Will I be required to change everything that the inspector finds wrong, even if it is not part of the basement remodeling project?” The building code addresses remodeling existing buildings with the following language:

“R102.7.1 Additions, alterations or repairs.

Additions, alterations or repairs to any structure shall conform to that required for a new structure without requiring the existing structure to comply with all of the requirements of this code, unless otherwise stated. Additions alterations or repairs shall not cause an existing structure to become unsafe or adversely affect the performance of the building.”

Generally, the inspectors look at the new work, and check to see that it meets the building codes. Existing noncompliant parts of the home (except for smoke detectors) are allowed to stay the same, unless the problem is severe enough to be dangerous.

The building code specifically requires that the smoke detection system throughout the house be upgraded to meet the current code requirements when you remodel your basement. This special requirement is in the building codes because of the importance of smoke detectors and the lives that they save every year. The details of this requirement are listed in the **RESIDENTIAL ELECTRICAL** section of this document.

PLANNING YOUR BASEMENT REMODELING PROJECT

It is important to consider code requirements when planning your basement remodeling project. Some of the more common issues to consider are listed below. Please be aware that this is not a comprehensive list.

The furnace and water heater must be provided with access that would allow the equipment to be replaced, or to be serviced. The manufacturer's instructions will include required clearances on all sides of the equipment, and other important details that may impact how much space must be maintained around the equipment. Do not plan to build walls that will reduce this required space.

Many components of a house require access for servicing and replacement. Your plans should take into account that this access will be provided. The main water shutoff, the drain valve, and the electrical grounding connection to the water line must remain accessible. All electrical junction boxes, floor drains, cleanout fittings, backwater valves, gas line unions, and valves for water and gas lines are required to remain accessible.

Electric panels are not allowed within closets or bathrooms. A required working clearance of at least 30" wide and 36" deep in front of the panels must be provided. The panels should remain accessible so that the cover can be removed and accessed for future wiring needs or repair and maintenance.

Plumbing fixture drain lines are required to be sloped not less than 1/4 inch per foot for 2 1/2 inch or less drain lines, and not less than 1/8 inch per foot for 3 inch and larger drain lines. Be sure to consider the distance your drain lines must travel, and the elevation of the drain line you want to tie into, when planning the location of your plumbing fixtures.

New bedrooms are required to have direct access to the exterior by way of a properly sized window or door. Take advantage of existing doors or compliant windows when planning your room layouts.

FRAMING – Walls, Boring and notching of studs and joists, Wall finishes

Wall Framing – Wood or metal studs may be used. Non-bearing walls may be constructed of 2X4 or 2X3 studs spaced a maximum of 24 inches on center, or with 2X4 flat studs (long dimension of the stud parallel to the wall) spaced a maximum of 16 inches on center. Utility grade studs are permitted for non-bearing walls up to a height of 10 feet. Non-bearing walls may be constructed with a single top plate. Exterior walls shall be of sufficient depth to accommodate a minimum R-9 insulation (minimum 2x4 studs walls and minimum R-13 insulation is recommended)



Wall Sole (Bottom) Plates – Wood sole plates which are not separated from the slab by an approved moisture barrier (such as a polyethylene plastic 6 mils or more in thickness) are required to be pressure treated or naturally decay resistant wood. Studs or other framing members in direct contact with a concrete foundation wall also are required to be pressure treated or naturally decay resistant wood.

Nails – Fasteners used in preservative treated wood (ACQ) should be hot dipped galvanized nails or other approved fasteners. Nailing schedule:

- Sole plates shall be attached to the floor with equivalent of 16d nail at 16" o.c. Some options include powder actuated fasteners, expansion anchors, and concrete nails.
- Top or sole plate to studs – 2-16d; toenails 3-8d or 2-16d
- Double studs face nail – 10d @ 24" o.c.

Fireblocking – Fireblocking is a code mandated technique that would slow the spread of fire in a concealed location. Without it, a fire may spread rapidly, using the chimney effect to move up in concealed chases. Fireblocking is typically done with 2 inch thick nominal lumber, ¾ inch plywood, or fiberglass insulation. Fireblocking is required in concealed locations, such as walls, wall/ceiling interconnections with soffits, concealed stairs, and around pipes and other penetrations at the floor/ceiling level. This is a frequently misunderstood requirement. A very good explanation of this issue can be found at the following internet web site:

<http://www.awc.org/HelpOutreach/eCourses/MAT110/Section10-Firestopping.pdf#search='fireblocking'>

Protection of Wiring and Piping from Physical Damage – Wiring and piping within walls must be protected from physical damage from nails and other objects driven into the studs and joists. Holes bored in joists and studs must be kept located to provide a minimum 1/4 inches of clearance for wires, such as type NM cable, and 1/2 inches for plumbing and water piping. Where the clearance is less the area shall be protected by a 1/16 inch plate to cover the area. For plumbing and water piping the plate shall extend a minimum 2 inches above sole plates and below top plates.



Cutting, Boring, and Notching

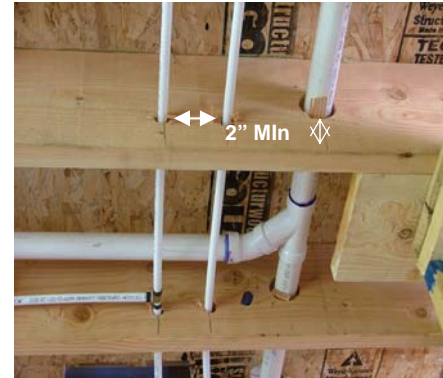
Location	Holes ^{1,2}		Notches ^{1,2}
	Edge distance	Diameter	
Wall stud nonbearing	Min 5/8"	40% of width – (1/3/8" for 2x4 stud)	40% of width
Wall stud nonbearing	Min 5/8"	60% with double studs and max 2 successive studs – (2-1/16" for 2x4 stud)	40% of width
Wall stud bearing	Min 5/8"	25% of width – (7/8" for 2x4 stud)	25% of width
Wall stud bearing	Min 5/8"	60% with double studs and max 2 successive studs	25% of width
Top plate – load bearing wall		Maximum 50% of stud width	Maximum 50% of stud width
Floor Joist ³	Minimum 2 inch clearance from the top and bottom edge of the joist.	Maximum 1/3 joist depth and not closer than 2 inches to the top or bottom; separate successive holes by 4 times the holes diameter.	Maximum depth of the notch is 1/6 joist depth and the maximum width of the notch is 1/3 joist depth. Notches are not permitted in middle 1/3 of the joist span; Maximum notch at support is 1/4 joist depth. Notching not permitted for I-joists
<ol style="list-style-type: none"> Where the hole or notching limitations are exceeded studs shall be: replaced; protected with approved stud shoes installed per the manufacturers installation instructions; or repaired per an engineered design. Provide protective plates where required edge clearances (1/1/4 inches for wires and 1-1/2 inches for plumbing) for wiring and plumbing is not maintained. Holes in engineered wood joists shall be per the manufacturer’s instructions. 			

Floor Joists – (note: floor joists are structural members and should not be cut unless approved by the jurisdiction).

- Bored holes conventional wood framing
 - Holes shall not be located closer than 2 inches from the top or bottom of joist.
 - Successive holes shall be separated by not less 2 inches.
 - The diameter of holes shall not exceed 1/3 the depth of the joist.



- Bored holes in engineered wood trusses and I-joists
 - Hole placement shall follow the manufacturer’s installation instructions. Instructions should be available from the manufacturer’s web site or consult with the local jurisdiction. Never cut, notch or alter the top or bottom chord of the truss or I-joist.



Top of Wall Support / Isolation – The tops of walls should be attached to the supporting framing above to provide lateral support. Some cities require that nonbearing walls provide an isolation joint at the top of the wall (hold the wall below the bottom of the floor joists and beams) to minimize floor movement, caused by expansive soils, from being transferred to the first floor framing. Many houses are built on clay soils that are highly expansive. Soil expansion and contraction can cause the floor to move up and down even though the floor may not crack. If wall framing is tight to the floor above this up and down movement can result in similar up and down movement of the floor and walls above.

Check with your local jurisdiction regarding requirements for isolation joints.

Ceiling Heights – The minimum clearance requirement in all habitable rooms is 7 feet. Bathrooms, toilet rooms, closets, halls, storage or utility spaces and similar areas are not considered habitable rooms. Habitable rooms should have a minimum floor area of 70 square feet. If a room has a sloped ceiling, the required ceiling height (7 feet) shall be maintained in at least 35 square feet. Beams, HVAC ducts, and plumbing piping shall maintain a minimum height of 6 feet, 6 inches. Talk to your local building inspector if there is a problem maintaining ceiling heights. There are some exceptions that you may be eligible for.

Wall Finishes – Gypsum Wallboard (data shown is for 1/2” wallboard with studs at 24” o.c.) – Gypsum wallboard may be installed with the long side either horizontal or perpendicular to the framing. Adhesive is not required.

Cement, fiber-cement, or glass mat gypsum backer board shall be used as backers for wall tile in tub and shower areas and wall panels in shower areas.

APPLICATION OF 1/2” GYPSUM WALLBOARD(w/o adhesive)			
Location	Max. Nail Spacing	Max. Screw Spacing	Comments
Walls	8” o.c.	12” o.c.	Screws shall be type W or type S and penetrate not less than 5/8” into the wood stud. Nails shall be 1 5/8” gypsum board nails, 0.086” dia., or 1 1/4” ring shank .086” dia.
Ceilings	7” o.c.	12” o.c.	

STAIRWAYS

Stairway accidents are the leading cause of home injuries. To minimize falls on stairways complying with the basic code requirements for stair construction is essential.

Stairways – The rise and run requirements for stairways has changed over the years. Many stairs of older homes were constructed with a treads and risers that do not meet current codes. Newer homes are constructed to a 7-3/4 riser and 10 inch run standard. The basic rise and run do not have to be upgraded to meet current code requirements as part of the basement finish for older homes. Floor covering materials should be carefully considered because the maximum variation from between the highest and lowest riser is 3/8 inch. Adding a finish material more than 3/8 inch in thickness to the floor in front of the stairs might reduce the height of the first riser too much, and create a code violation.

Open risers are not permitted. As part of the basement finish any existing open risers shall be modified so that a 4 inch sphere could not be passed through. Where possible the stairs should be constructed so that there is a 3/4 inch nosing for each tread.

All stairways shall have a minimum clear width of 36 inches at all points above the handrail height, and below the required headroom height (6' – 8" measured vertically from the sloped plane adjoining the tread nosings, and floor surfaces of landings and platforms). The minimum clear width of the stairway at or below the handrails is 31.5 inches.

Handrail – A handrail shall be provided on at least one side of each stairway that consists of 4 or more risers between landings. Handrails shall be continuous along each flight of stairs (from landing to landing) from the top riser to the bottom riser. Handrails shall be placed between 34 and 38 inches above the nosing of steps and provide a graspable surface. The handrail shall have a circular cross-section with an outside diameter between 1-1/4 and 2 inches with a circumference of between 4 and 6 inches. The space between the handrail and wall shall be not less than 1-1/2 inches.

Guardrail – Where the height of any riser on the open side of a stair or landing is more than 30 inches above the floor guardrails are required to prevent falling off of the stairs. Guard rails shall be not less than 34 inches in height measured at the nosing of treads. The guardrail shall have intermediate railings below the guardrail spaced so a sphere greater than 4 inches in diameter cannot pass through at any point, except that a 6 inch limitation is permitted at the triangular opening formed by the intersection of the tread and riser at the bottom of the guardrail.

Additional Information – The Stairway Manufacturers' Association publishes an excellent aid to understanding the code requirements and terminology relating to stair construction. This document may be found on the internet at

<http://www.stairways.org/pdf/2006%20Stair%20IRC%20SCREEN.pdf>

Enclosed Usable Space Under Stairways – Enclosed accessible space under stairs shall have walls, under-stair surfaces and any soffits protected on the enclosed side with ½ -inch gypsum board.



EMERGENCY ESCAPE AND EGRESS OPENINGS – (2006 IRC R310) Basements, and all sleeping rooms are required by code to have at least one emergency escape opening with a net clear area of 5.7 sq. ft. A separate egress opening for the adjoining area of the basement is not required if there is an egress opening in a basement bedroom. The minimum net clear opening may be reduced to 5 square feet if your emergency egress opening is a window with the sill not more than 44 inches below the finished grade level adjacent to the window. Emergency escape windows are allowed to be installed under decks, provided the location of the deck allows the window to be fully opened, and provides a path not less than 36 inches in height to a yard area. **Note:** Check with your local jurisdiction on the application and interpretation of this section. Some cities have adopted changes to this section of the building code.

The emergency escape and egress opening may be a door or window. The opening must open directly to the exterior. Your local window supplier will be able to verify if the window you selected meet the egress requirements

Emergency escape window wells shall provide a minimum area in front of the window of 9 square feet, with a minimum dimension of 3 feet. Window wells must allow emergency escape windows to fully open. Wells more than 44 inches deep shall be provided with a permanently affixed ladder, usable with the window in the fully open position. The ladder may encroach a maximum of 6 inches into the required dimensions of the window well. Ladders shall have an inside width of at least 12 inches, shall project at least 3 inches from the wall, and ladder rungs shall be spaced not more than 18 inches on center vertically for the full height of the window well. If a cover is provided over the well it shall be openable from the egress side and provide the same clear areas as require for the window.

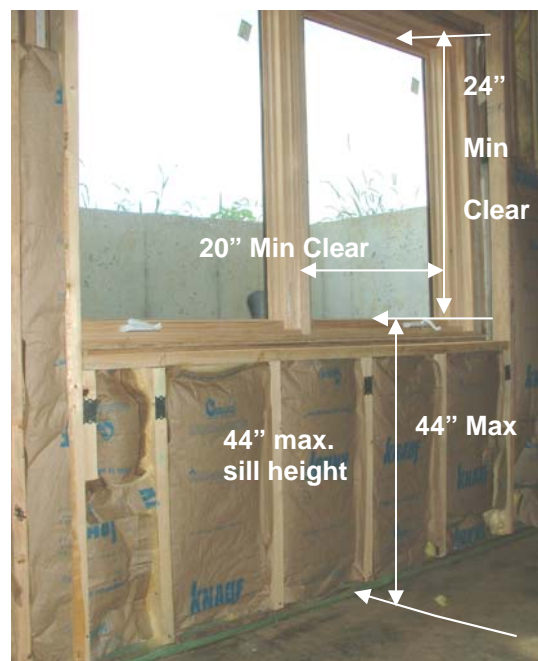


Emergency escape windows shall be operational from the inside of the room without the use of keys, tools, or special knowledge. The opening shall have a minimum height of 24 inches and minimum width of 20 inches with the bottom of the openable portion being not more than 44 inches above the floor

Where **casement windows** are used, the clear opening width shall be measured with the window in the open position.

Where **double hung windows** are used, the required clear openable area shall be provided without using a removable or tilt out sash.

Note: Where windows are adjacent to engineered swales that require minimum low opening



elevations, a continuous concrete window well, extending from the footing level to required minimum elevation, is required. Check with your local jurisdiction for details

ENERGY EFFICIENCY

Insulation – Approximately 20% of the dwelling heat loss occurs through un-insulated basement walls. Leaving these walls un-insulated can result in condensation occurring on these cool basement wall surfaces. Basement wall insulation is an essential consideration to save energy, keep basement walls warm and reduce the potential for moisture problems. Additional information on this topic can be found in books, magazines or on internet web sites such as



http://www.buildingscience.com/resources/foundations/Understanding_Foundations.pdf

Exterior walls adjacent to finished space shall be insulated. Insulating basement walls is inexpensive and provides a significant reduction in energy usage. When insulating the walls, do not forget to insulate the exposed rim joist at the top of the walls.



Wood framed walls (including the joist cavity at the rim joist) shall be insulated to provide a minimum R-13 insulation.

Concrete walls shall be furred out to accommodate minimum R-9 insulation.

Moisture vapor retarders – Vapor retarders are required on **wood framed exterior walls**. The vapor retarder helps control air infiltration, and keeps moisture on the warm side (interior side) of the wall where it can be effectively controlled. **Note:** Some vapor retarders such as kraft faced paper, are highly flammable. The building code does not allow these flammable vapor retarders to be left exposed. A wall covering material must be applied to separate these products from the usable space. The recommended covering material is ½” gypsum board. Sheet plastics, such as polyethylene are **vapor barriers**. **Vapor barriers** do not allow moisture or air to pass through a wall. These types of **vapor barriers** should be avoided, since they may act to trap moisture in a wall.

A vapor retarder or barrier is not recommended on the warm side of concrete walls between the insulation and the basement space because moisture that migrates through the concrete wall may be trapped within the wall. This may lead to mold and other moisture related problems in the wall cavity. Moisture that may accumulate with cavities adjacent to foundations should be allowed to dry to the interior through the gypsum board. Foam board is thought by some to be a preferred insulating material for basement concrete walls. Foam board should be applied directly

to the concrete wall, and should be covered by ½ inch gypsum board. A more detailed discussion of this issue can be found at the website listed above.

Windows – Window contribute significantly to energy efficiency. New windows shall have an energy efficiency (U-value) of $U = 0.4$ or less (minimum double glazed window). Single pane windows with storms are not permitted.

If new doors or windows are installed it is extremely important to install them so they are effectively flashed and sealed to keep water from penetrating the structure. Read and follow the window installation instructions. Caulk liberally under the nailing fin so the caulk oozes out around the edges of the fin. Exterior flashing is required above exterior trim piece above the window. The flashing must extend under the siding and over trim piece (Note: Panel siding may require notching so the flashing can be applied). Additional information can be found in publications, or internet web sites, such as

<http://www.buildingscience.com/resources/windows/default.htm>

Air infiltration – Controlling air infiltration significantly increases overall comfort, reduces energy usage, and minimizes moisture migration that contributes to mold growth, and other detrimental effects. Holes for water spigots, air conditioner lines, electrical conductors, cable TV, and exhaust ducts should be sealed with foams or caulks that are made for protection of penetration that are exposed to weather. Doors and windows should be sealed between the frame and the rough opening with approved insulation or foam. Weather stripping should be applied around door openings.

RESIDENTIAL ELECTRICAL –

This document contains limited information regarding circuit installation and wiring. Additional information is needed to properly install wiring. Circuit installation and wiring require knowledge and expertise to maintain electrical safety. When in doubt installations should be performed by professionals. All electrical work shall comply with the adopted Electrical Code.

Clearances and Access to Electrical Panels –

Equipment shall not be installed in front of electrical panels. Electrical panels shall not be installed in storage closets or bathrooms, and closets or bathrooms should not be built around existing electrical panels.

Circuits required –

- Bathroom receptacles – One separate 20 amp circuit, receptacles shall be GFCI protected.
- Laundry area – One separate 20 amp circuit.
- Kitchens – Two separate 20 amp circuits for the counter top. Counter top receptacles shall be GFCI protected.

Note: Separate circuits may be required for other appliances based on the manufacturer's installation instructions. A separate circuit for large appliances, such as dishwashers, space heaters, etc... may also be required.



Protection of wires – Non-metallic sheathed cable (Romex, NM cable)

- NM cables must be secured with approved electrical staples to studs within 12 inches of all junction boxes and at intervals of not more than 4-1/2 feet.
- Holes for cables through studs should not be closer than 1-1/4 inches to the face of the studs (to prevent nails from damaging the cables). Cables closer than 1-1/4 inches must be protected with approved metal plates.
- Holes in floor joists must be at least 2 inches away from the top or bottom of the joist.
- Cables must be kept away from sharp edges or protected with approved grommets.



Switch controlled lighting –

- At least one wall switch-controlled light fixture must be installed in every habitable room and bathroom. In other than kitchens and bathrooms one or more receptacles controlled by a wall switch shall be substituted for the lighting outlet.
- A wall switch-controlled lighting fixture must be installed in hallways.
- Lighting for stairways shall have wall switch-controls at each floor level.

Junction boxes – All splices for wiring must be made within approved outlet boxes or junction boxes that are readily accessible for inspection and repair.

- Do not install junction boxes in the attic or conceal them within walls.
- Make sure all boxes are correctly sized for the number of wires entering and exiting the boxes.

To simplify installations purchase outlet boxes with the largest volume compatible with the type of fixture being used



As a general rule, plan your wiring to receptacles in a continuous series, and avoid using the boxes for dual purposes such as having the box serve receptacles and as a junction box to branch in more than one direction. For homeowners doing their own work selecting a box with that volume of space for the type of receptacle being installed is advisable. Boxes are sized by assigning a minimum volume to each conductor entering and exiting the boxes and for each device in the box. Additional information can be found in publications, or internet web sites, such as http://ecmweb.com/mag/electric_box_box_box/index.html

Smoke detectors – Finishing your basement triggers a requirement to upgrade the smoke detectors throughout your home to new dwelling standards. Smoke detectors are required in each sleeping area, outside of each sleeping area and on each story of the dwelling. Detectors shall receive their primary power from the house wiring and shall be provided with battery backup. The detectors shall be interconnected so that the activation of one detector will activate all of the connected devices. An exception to this requirement allows battery operated smoke detectors to be added where finish materials have not been removed in areas requiring the upgrade, and there is no attic space or other access that would allow the detectors to be hard wired and tied together. Check with your local jurisdiction for specific issues on your project.

(GFCI) Ground fault circuit interrupter protected of outlets –

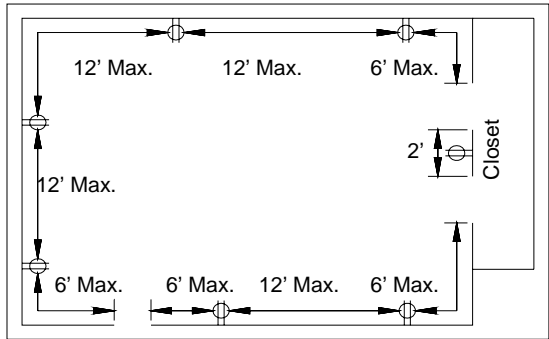
GFCI protection for receptacles is required in the following locations:

- Bathrooms -
- Unfinished basement areas (areas used as work rooms, storage and mechanical equipment) – Note: Dedicated circuits for a washer, dryer, furnace, sump pump, refrigerator or freezer do not require GFCI protection.
- Receptacles serving bar sinks, sinks, kitchen counter top and kitchen islands.

(AFCI) Arc fault circuit interrupter protected outlets –

The Electrical Code has added arc-fault circuit interrupter protection requirements for all electrical outlets in bedrooms. AFCI protects against arcing that may occur in broken or frayed cords of electrical appliances. AFCI protection is either installed at the circuit breaker or an AFCI outlet is installed on the first receptacle in the series. Note: Some cities have not adopted the AFCI requirements therefore consult with your local jurisdiction if you are considering not installing these devices.

Receptacle outlet spacing – Note: All receptacles shall be of the grounding type.

- General use outlets (bedrooms, kitchens, family rooms, dens, sunrooms, recreation rooms and similar spaces) – Receptacles shall be provided for all unbroken wall spaces over 2 feet wide; Receptacles shall be located so that no point on the floor line is more than 6 feet, measured horizontally from an outlet.
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- Kitchens and counter tops – one receptacle for each wall space wider than 12 inches; no space along the wall shall be more than 24 inches from a receptacle; at islands or peninsula counters provide one receptacle when the counter has a long dimension more the 24 inches or a short dimension more than 12 inches.
 - Bathrooms – Provide one receptacle for each bathroom within 3 feet of the outside edge of each lavatory/sink.
 - Hallways – Hallways of 10 feet or more in length shall have at least one receptacle.

Lighting fixtures – Where ceiling heights are less than 7 feet above the floor recessed fixtures should be used to minimize damage to fixtures and potential fire and safety hazards.

In closets and storage spaces care should be taken to assure lighting fixtures do not come in contact with combustible materials. Surface mounted incandescent lighting fixtures (including pendant fixtures) shall provide a minimum 12 inches of clearance from the front of shelves and any point where storage can occur. The clearance can be reduced to 6 inches for recessed and/or fluorescent fixtures.

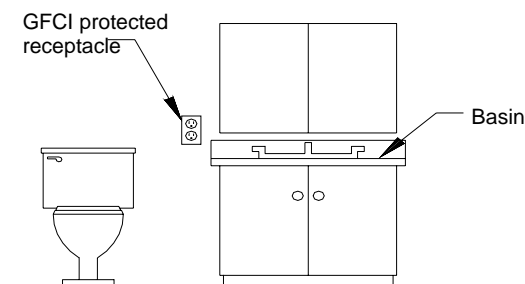
Bar areas, kitchenettes and kitchens –

For these types of spaces each jurisdiction should be consulted to assure you are complying with local codes regarding the number of required circuits.

Many basement finishes have spaces that duplicate many of the appliances found in kitchens even if they do not meet the strict definition of a kitchen (sink, refrigerator and range). Where a full kitchen is installed it shall be wired to meet the requirements of a kitchen. Where a secondary space is provided to serve as a space for small cooking appliances such as pop corn poppers, coffee makers, ice makers, microwave, blenders, etc., the space should also be provided with circuits as if the space was a kitchen.

If your kitchenette may contain a variety of appliances such as microwaves, refrigerator, garbage disposal, toaster ovens, ice makers, wiring the area to meet all of the requirements of a kitchen is recommended. To wire the kitchenette to meet the requirements for kitchens provide:

- Two 20-amp small appliance circuits to serve the countertop receptacles – GFCI protection required.
 - Receptacle required for each counter space wider than 12 inches.
 - Receptacles shall be spaced so no counter space is more than 24 inches measured horizontally along the wall or counter edge from a receptacle.
- 15- or 20- amp circuits to serve individual appliances (it is not recommended that these be provided with GFCI protection):
- 20-amp circuit for dishwasher
- Garbage disposal circuit.
- It is recommended that a separate 15- or 20- amp circuit for the refrigerator be provided.



Common Electrical Requirements That Get Overlooked

- ALWAYS follow the manufacturer's installation instructions.
- Everything metallic that is part of the electrical circuit should be properly bonded to the equipment grounding conductor (the bare or green wire).

- Attach junction boxes to studs so that the edge of the box will end up flush with the sheetrock.
- All connections for wiring shall be within approved electrical boxes. All junction boxes shall remain accessible and shall not be concealed within walls or ceilings.
- The gap between the edge of the junction box and the sheetrock should be no larger than 1/8 inch.
- Access to the grounding electrode conductor (large bare copper wire) connection to the water line must be provide/maintained.
- Properly label new circuits in the breaker panel box.
- Electrical conductors (wires) are required to be properly color coded. The most common coding is white is for the grounded conductor (neutral), green is for the equipment grounding conductor, and black or red for the ungrounded (hot) conductor.
- The maximum size of breaker to protect the circuit conductors is 15 amps for #14 gauge conductors, 20 amp for #12 gauge conductors, and 30 amps for #10 gauge conductors.
- Do not mix conductor sizes on a single circuit.
- Normally, only one conductor is allowed under each screw on the breaker.
- Switches and outlets (plugs) must be securely fastened to the junction box, and covered with a compatible cover.
- GFCI protection is required for receptacles in unfinished portions of the basement.
- A cover is required for all junction boxes.
- Breaker boxes are not allowed in closets or bathrooms.

PLUMBING

All plumbing fixtures shall be provided with approved drains and vents. Vents shall be connected to the venting system for the building or where installed compatible with the listing approved air admittance valves may be used.

Materials:

Approved water piping materials include welded or seamless copper tubing (WK, WL, WM, K, L or M), chlorinated polyvinyl chloride (CPVC), cross-linked polyethylene (PEX) and other materials as listed in the code.

Underground building drain and vent piping may be ABS plastic, polyvinyl chloride (PVC-Type DWV) and other materials as listed in the code.

Above ground sanitary drains and vent piping may be ABS plastic, polyvinyl chloride (PVC-Type DWV) and other materials as listed in the code.

All piping materials shall be labeled with the manufacturer's mark or name and the quality or grade of the product.



Access – valves and cleanouts:

The code requires that access for maintenance and repair be maintained for plumbing drain clean-outs and floor drains. A door or a re-moveable panel is acceptable means for providing access.



Venting – Air Admittance valve

Where plumbing fixtures are installed for kitchenettes, bathrooms, and sinks, venting of the fixtures is required. Venting prevents trap siphonage, and helps wastes drain more efficiently. An air admittance valve may be used for fixture venting. Air admittance valves must remain accessible for inspection and maintenance and may not be concealed within walls (an access panel is permitted). Install the valves a minimum 4 inches above the horizontal branch drain of the fixture being vented. Stack type air-admittance valves must be installed at least 6 inches above the flood level rim of the highest fixture being vented.



Additional information about venting with air admittance valves can be found at the following website:

http://www.oatey.com/aav_public/why_vent.html

A very detailed discussion of the principles and practices of plumbing venting is found at

http://www.aspe.org/ASPE_Publications/Catalog/db/vol2_chap3.pdf

Backwater Valve

Backwater valves are required where plumbing fixtures are installed in a basement and the flood level rim of the fixtures are located below the elevation of the next upstream manhole cover. Normally, this means all basement plumbing fixtures must be protected by a backwater valve. This valve must be installed in the branch drain line serving only the basement fixtures. It should not have other fixtures from upstairs passing through it. Access is required for routine maintenance of the valves. Note: Some cities have amended their codes to make sewer district responsible for identifying where backwater valves are required. Consult with your city for their application of this requirement.



Common Plumbing Requirements That Get Overlooked

- The minimum slope for drain lines is $\frac{1}{4}$ " of fall for each 12" of run for drain pipe that is 2 inches or smaller, and must slope at least $\frac{1}{8}$ " of fall for each 12" of run for drain pipe that is 2.5 inches or larger.

- Access panels must be provided for hydro massage bathtubs and air admittance valves (studor vents) as required by the manufacturer.
- An individual shutoff valve is required on the fixture supply water pipe to each plumbing fixture other than a bathtub or a shower.
- All shower control valves must be the anti-scald type (pressure balance, thermostatic mixing, or combination pressure balance/thermostatic mixing per ASSE 1016).
- Some municipalities require the use of purple primers and solvent cements for PVC drain waste and vent piping connections.
- **ALWAYS** follow the manufacturers' installation instructions.

MECHANICAL SYSTEMS –

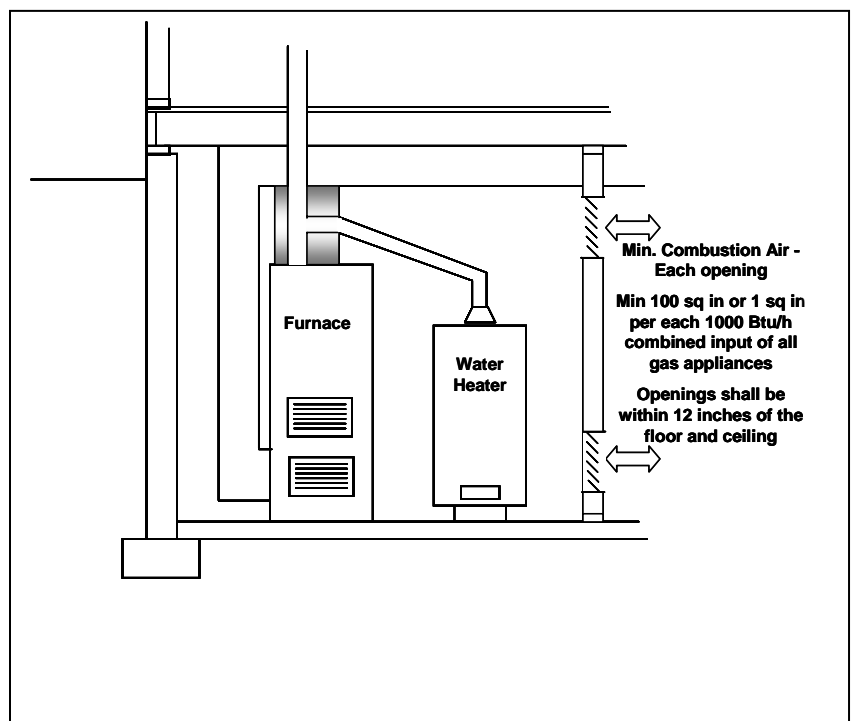
Access – Access must be maintained to unions, valves, equipment in the ceilings walls and floor, such as, water valves, unions in gas piping, sump pump pits, etc. Provide an identified readily accessible opening with enough clearance to maintain and inspect the devices.

Clearances for Furnaces and Water Heaters – Clearances around appliances to elements of permanent construction including other installed equipment and appliances, shall be sufficient to allow inspection, service, and repair or replacement without removing such elements or appliance. Clearances shall be provided on the sides and rear of each appliance to comply with the manufacturer's installation instructions or a minimum of 3 inches whichever is greater.

Combustion Air – If walls are to be placed around the furnace and hot water heater areas, adequate combustion air must be maintained to the appliance for proper operation. Access and clearance must also be maintained to access and replace and service the equipment without the removal of other equipment. Comply with the manufacturer's installation instructions for minimum clearance. Generally at least 30 inches of clearance is required in front of a furnace or water heater unless more is required by the manufacturer.

For air from inside the building the room occupied by a gas appliance must have a total volume of 50 square feet for each 1000BTU/h combined input rating of the appliances. An adjacent room may be included in the minimum volume if openings between the room are provided as noted below for inside air (see diagram).

- Outside air - the opening area depends on the method used. Contact the City if you have specific questions regarding this method.
- Inside air - inside air may also be provided from an adjoining room through openings located within 12 inches of the floor and ceiling. Each opening shall equal 1 square inch for each 1,000 BTU/hr of total input rating of all



appliances and a total minimum of 100 square inches. The adjoining room must have a volume equal to at least 50 cubic feet for each 1,000 BTU/hr of aggregate input rating of the appliances.

Bathroom Exhaust Fans - Each room containing a water-closet, bathtub or shower shall be provided with a mechanical ventilation system with an intermittent capacity of not less than 50 cfm. Ventilation air from the space shall discharge directly to the outside.

Kitchens - Areas or spaces that have a range, sink, and refrigerator are considered kitchens for purposes of determining code requirements. The code prohibits return air vents in kitchens. Check with your Building Official to see if you are creating a kitchen and if a return air grills will be permitted in that area.

Common Mechanical Requirements That Get Overlooked

- Vent bathroom exhaust fans to the exterior.
- Maintain minimum working clearances (as listed on the equipment or the installation instructions) around furnace and water heater, and be sure to provide adequate width for future replacement.
- Provide adequate combustion air to the furnace/hot water heater room.
- New duct joints should be made airtight by using tapes or mastics.
- **ALWAYS** follow the manufacturers' installation instructions.

HELPFUL LINKS

Johnson County, KS

<http://buildingcodes.jocogov.org/>

City of Leawood, KS

www.leawood.org/pw/cadgeneral.asp

City of Shawnee, KS

<http://www.cityofshawnee.com/publicworks/Codes/codes.htm>

City of Lenexa, KS

<http://www.ci.lenexa.ks.us/planning/permittypes.html>

City of Overland Park, KS

http://www.opkansas.org/Bus/Permits/res_permits.cfm

Johnson County Building Officials Association

<http://jocobo.jocogov.org>

City of Merriam, KS

<http://www.merriam.org/>

City of Olathe, KS

<http://www.olatheks.org/>