

ILLUSTRATED RESIDENTIAL

ELECTRICAL CODE REQUIREMENTS



ELECTRICAL INSPECTIONS
200 3 STREET NORTH
FARGO ND 58102
476-6626

Addenda to This Booklet

Updated March 21, 2012

This handout does not address any covenants or easements assigned to the property, nor does it relieve you of code compliance with items that may not have been included from the 2008 National Electric Code. If you have any questions or need more information, please contact the electrical inspector at 476-6626.

- For rough-in inspections, only boxes and lights must be spliced out.
- All receptacles on 15 Amp and 20 Amp, 120v circuits **must be tamper-resistant**, as of April 1st, 2008.
- All 120-volt, single phase, 15- and 20-ampere branch circuits supplying outlets installed in dwelling unit family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets, hallways, or similar rooms or areas shall be protected by a listed **arc-fault circuit interrupter, combination-type breaker**, installed to provide protection of the branch circuit.
- When wiring fireplaces, the wire for power and the wire for the gas valve **must** have a barrier between them if mounted in the same box because of the different voltages on the wires.
- Recessed lights can be wired with the clamps provided with them or by using connectors listed for that purpose.
- Be aware of “box fill” when wiring with romex. Each size 14 wire requires 2 cubic inches in the box, size 12 wire requires 2.25 cubic inches, and size 10 wire requires 2.5 cubic inches. The switch or receptacle requires 2 cubic inches per device. The ground wires are counted as 1 wire.
For example:

4 14-2 romex wires	(8x2=16)
1 receptacle	(1x2=2)
+ 1 ground	(1x2=2 total)

This would require a box of a minimum (20 cubic inches)
- When using dimmers and GFCI receptacles, a larger cubic inch box is desirable.
- Code only allows ½” of the outer jacket of NMB cable to be present in switch and outlet boxes.
- You are allowed 1 ¼” of space from the side of a 2x4 to the edge of the cable. Center all cables on studs and use stacker straps if more than two cables are run under a staple.
- No more than two cables may be run through a maximum 5/8” hole in a stud. Such holes must be centered in the stud.
- No outlets are allowed above electric baseboard heaters.

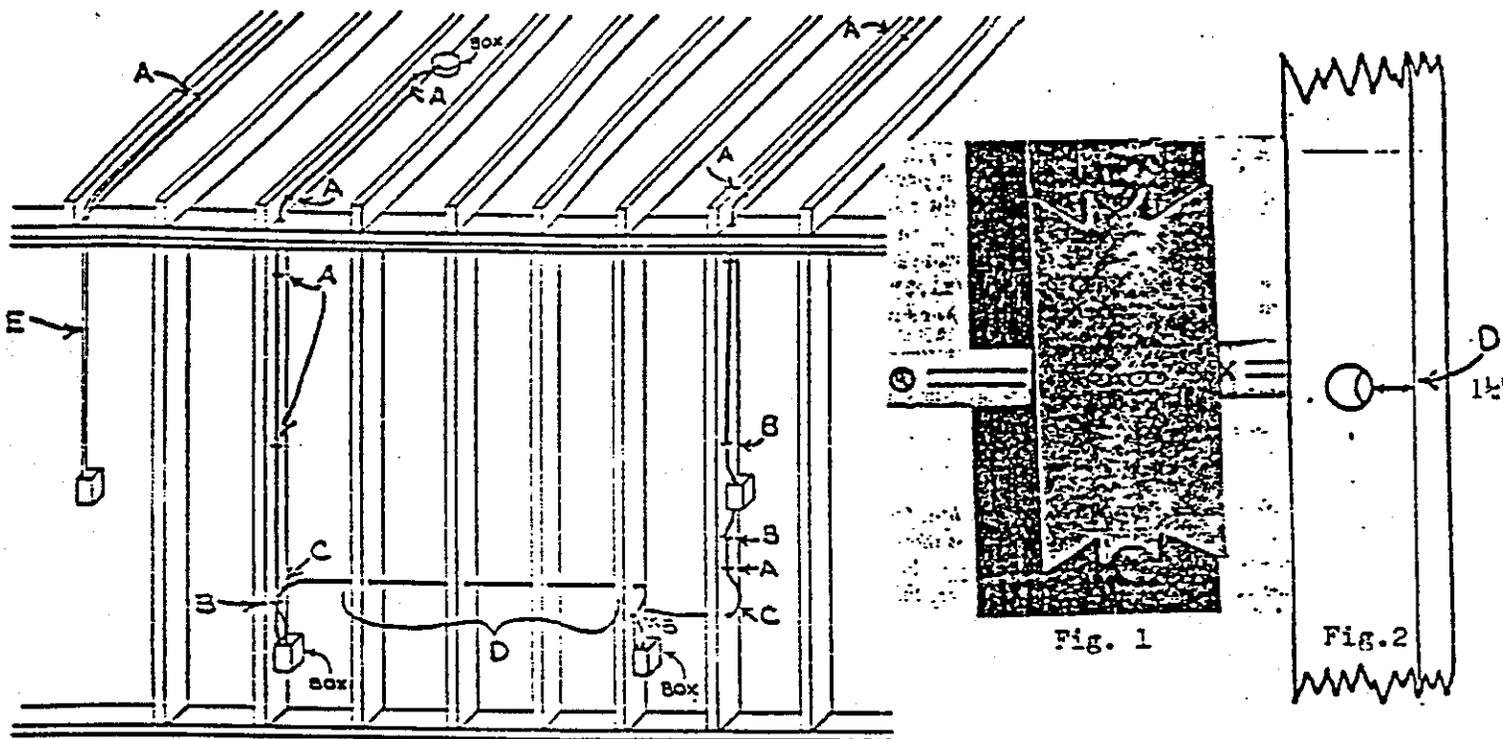
IMPORTANT

NOTICE: ALL MATERIALS USED FOR WIRING MUST MEET RECOGNIZED TESTING LABORATORY REQUIREMENTS. ITEMS USED WHICH ARE NOT LISTED WILL NOT BE APPROVED. MOST ITEMS WILL CARRY A STAMP OR LABEL STATING A LISTING FROM A RECOGNIZED TESTING LABORATORY.

REMEMBER: FARGO MUNICIPAL CODE 23-0209 REQUIRES ALL ELECTRICAL INSTALLATIONS TO BE INSPECTED BEFORE BEING COVERED UP. THIS REQUIRES YOU TO CONTACT YOUR ELECTRICAL INSPECTOR BEFORE YOU SHEETROCK OR INSULATE.

WIRE PLACEMENT AND INSTALLATION

WIRE PLACEMENT AND INSTALLATION



A. NM CABLE MUST BE SECURED BY STAPLES, DESIGNED AND INSTALLED SO AS NOT TO DAMAGE THE CABLE EVERY 54".

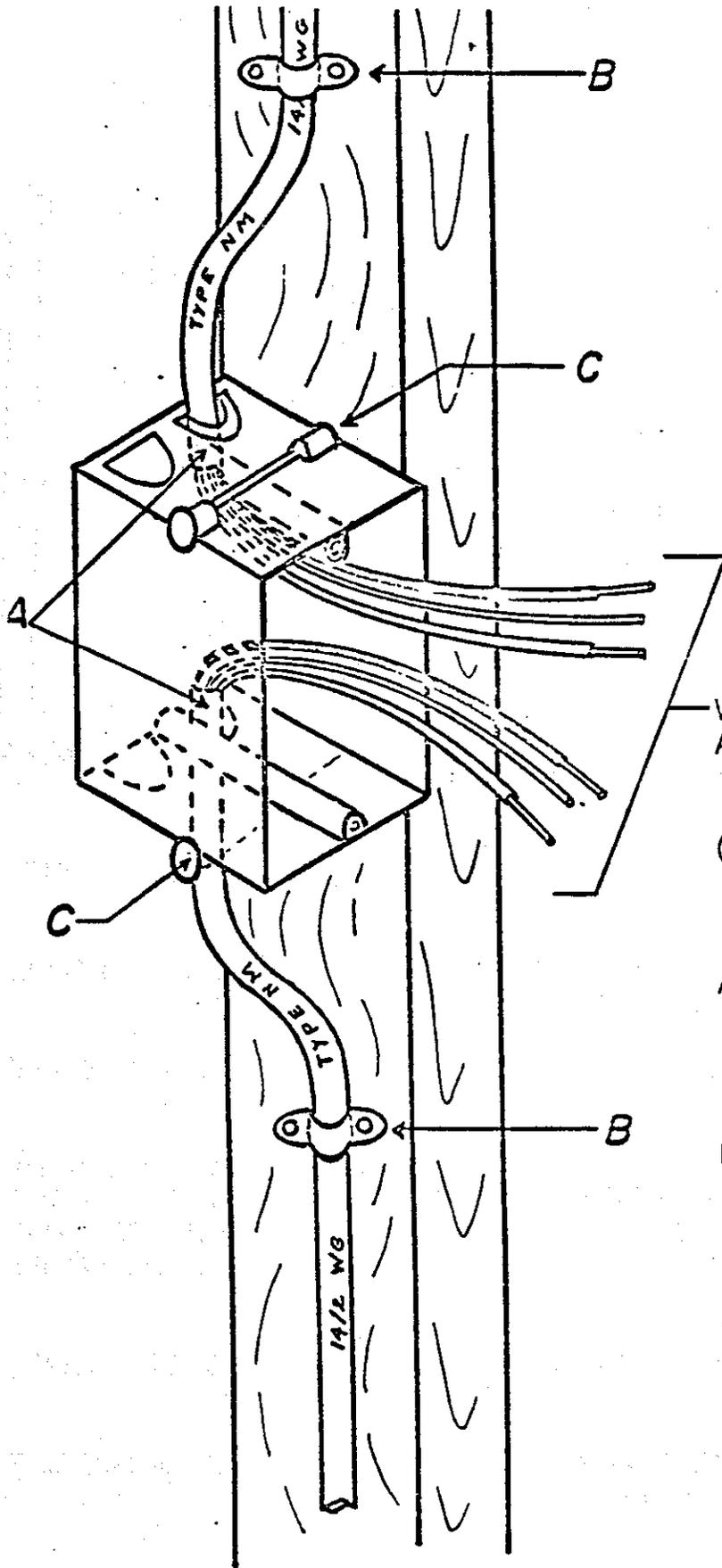
B. A STAPLE MUST BE INSTALLED NO FURTHER THAN 12" FROM A METAL BOX WITH NM CABLE CLAMPS OR 8" FROM A PLASTIC BOX WITHOUT CLAMPS.

C. NM CABLE BENDS MUST NOT BE SHARPER THAN 5 TIMES THE DIAMETER OF THE CABLE. WIRES MUST NOT BE TIGHT.

D. HOLES MUST BE DRILLED IN THE CENTER OF 2 x 4 STUDS AND PLACED IN STRAIGHT LINES. 1 1/4 INCHES OF WOOD MUST COVER WIRE. (CENTER DRILLED 2 x 4'S ARE ACCEPTABLE) IF 1 1/4" COVER CANNOT BE OBTAINED, METAL PROTECTIVE PLATES MUST BE INSTALLED. METAL PLATES MUST BE 1/16" THICK STEEL. SEE FIGURE 1 AND FIGURE 2.

E. ON CONCRETE WALLS OR SURFACE WIRING, CONDUIT (PLASTIC OR METAL), WIREMOLD OR OTHER APPROVED MEANS OF PROTECTION MUST BE USED.

F. IN UNFINISHED BASEMENTS NM CABLE MUST BE RUN AND FASTENED ON THE SIDE OF THE JOISTS OR THROUGH BORED HOLES IN THE JOIST.

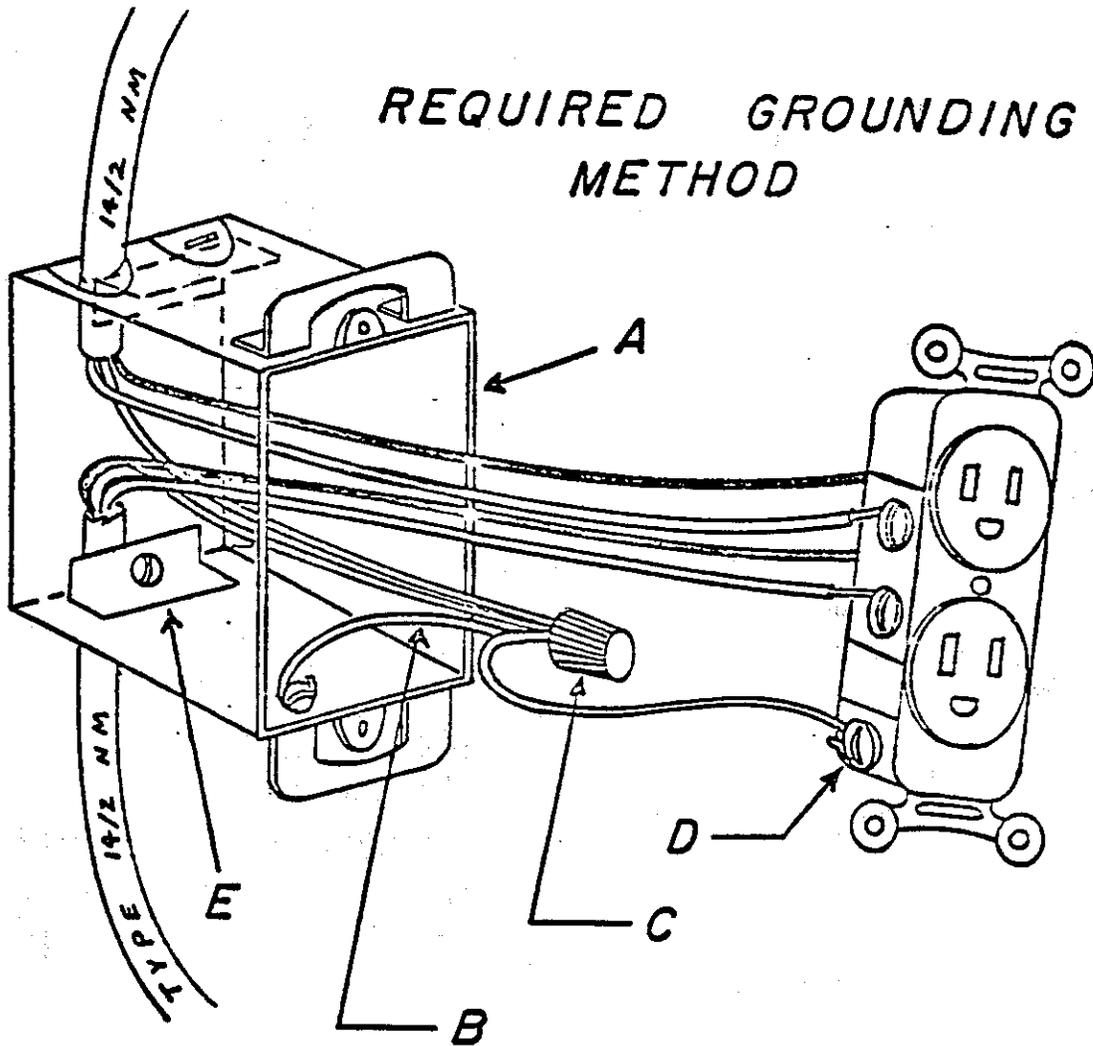


WIRES MUST EXTEND OUT OF BOX
AT LEAST 6"

(PLASTIC BOX ILLUSTRATED)

- A. CABLE SHEATHING MUST EXTEND AT LEAST 1" INSIDE OF BOX
- B. WIRE MUST BE STAPLED WITHIN 8" OF ANY BOX NOT EQUIPPED WITH CLAMPS AND WITHIN 12" OF ANY BOX EQUIPPED WITH CLAMPS
- C. BOX MOUNTING MUST BE OF AN APPROVED TYPE - NAILS OUTSIDE OF BOX OR IMMEDIATELY INSIDE OF BOX OR BRACKETS SECURED TO BOX

REQUIRED GROUNDING METHOD



A. METAL BOX ILLUSTRATED. IF PLASTIC BOX IS USED, BONDING JUMPER (B) IS NOT REQUIRED.

B. BONDING JUMPER REQUIRED WHEN USING METAL OUTLET BOXES. MUST BE ATTACHED WITH A SCREW OR UL APPROVED CLIP DESIGNED FOR SUCH USE.

C. APPROVED WIRE CONNECTOR MUST BE USED FOR GROUND WIRE JUNCTION. SOLDER IS NOT APPROVED.

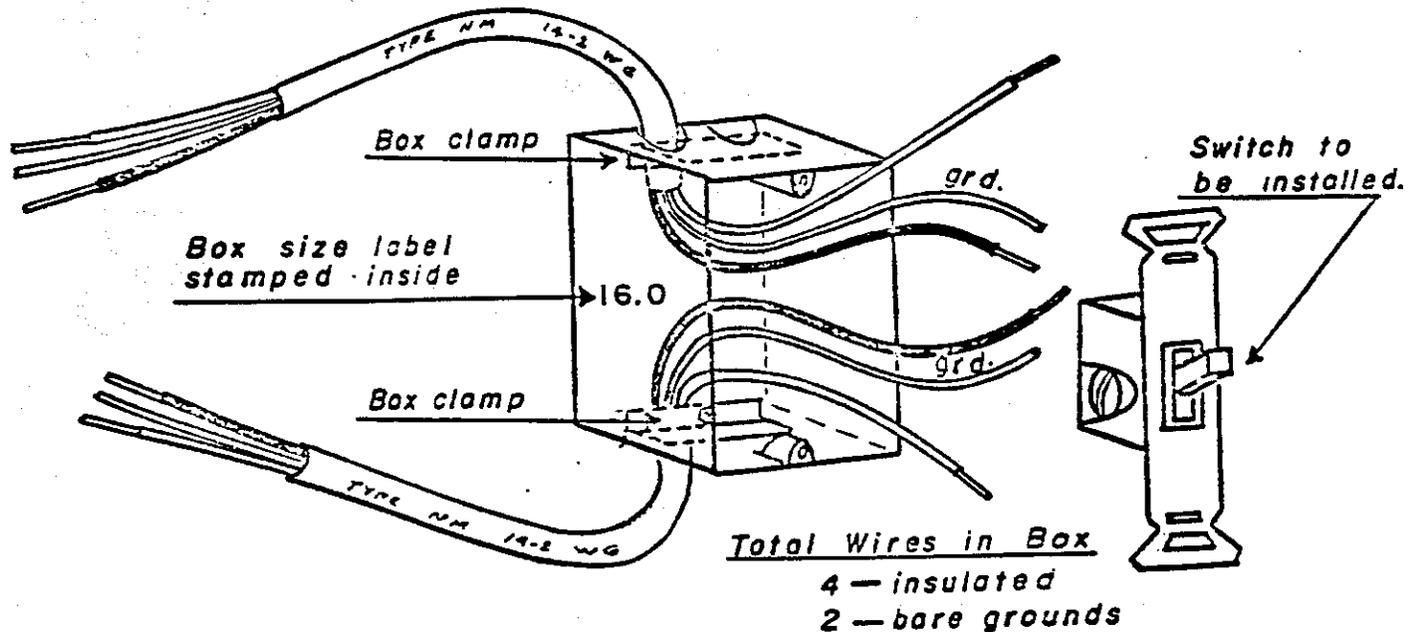
D. ONLY ONE (1) WIRE MAY BE PLACED UNDER A TERMINAL SCREW ON ANY DEVICE (SWITCH, OUTLET, ETC.)

E. CABLE STRAPS REQUIRED IN STEEL BOXES AND PLASTIC CUT-IN BOXES.

WHAT SIZE BOX MEETS CODE ?

1. ALL BOXES ARE CALCULATED IN CUBIC INCHES OF VOLUME
2. WIRES, CLAMPS, SWITCHES AND OUTLETS ARE DESIGNATED CU. IN. NUMBERS FOR CALCULATIONS PURPOSES.

EXAMPLE



NOTES:

- (A) EACH INSULATED WIRE IN THE BOX (NOT CABLE SHEATH) MUST BE COUNTED. IN THE EXAMPLE ABOVE, WE HAVE FOUR INSULATED WIRES IN THE BOX.
- (B) GROUND WIRES (NO MATTER HOW MANY) COUNT ONLY THE SAME AS ONE INSULATED WIRE.
- (C) CABLE CLAMPS (IF IN BOX) COUNT AS ONE WIRE.
- (D) THE SWITCH OR OUTLET COUNTS AS TWO WIRES.
- (E) THE TABLE FOR CALCULATING IS:
2.0 CU. IN. FOR EACH #14 WIRE
2.25 CU. IN. FOR EACH #12 WIRE
2.50 CU. IN. FOR EACH #10 WIRE

WHAT SIZE BOX MEETS CODE?

THE ILLUSTRATED BOX IN THE EXAMPLE (PAGE 5) WOULD REQUIRE _____ SIZE BOX.

4 - INSULATED WIRES #14 @ 2.0 CU. IN. FOR EA. WIRE = 8.0 CU. IN.
(SEE NOTE A & E)

2 - GROUND WIRES #14 COUNT AS 1 - INSULATED WIRE = 2.0 CU. IN.
(SEE NOTE B & E)

1 - SET OF CLAMPS = 2.0 CU. IN.
(SEE NOTE C & E)

1 - SWITCH = 4.0 CU. IN.

TOTAL 16.0 CU. IN.

THEREFORE, THE MINIMUM SIZE BOX WHICH CODE WOULD ALLOW WOULD BE 16.0 CU. INCHES.

KEEP IN MIND THAT A LARGER BOX IS LEGAL, IS MUCH EASIER TO WORK WITH, AND THE DIFFERENCE IN COST IS MINIMAL. THIS IS ESPECIALLY TRUE WHEN INSTALLING GFCI OUTLETS AND DIMMER SWITCHES.

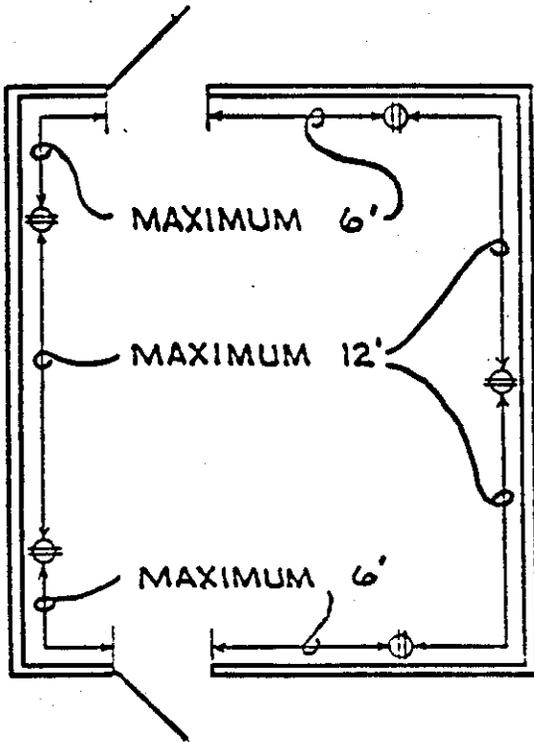
PROPER WIRE SIZES

GENERAL LIGHTING AND OUTLET CIRCUITS = MINIMUM #14 FUSED 15 AMPS. APPLIANCE CIRCUITS IN KITCHEN, DINING ROOM, PANTRY, FAMILY OR BREAKFAST ROOM = MINIMUM #12 (3 CIRCUITS MINIMUM-FUSED 20 AMPS) LAUNDRY = ONE 20 AMP (#12) CIRCUIT.

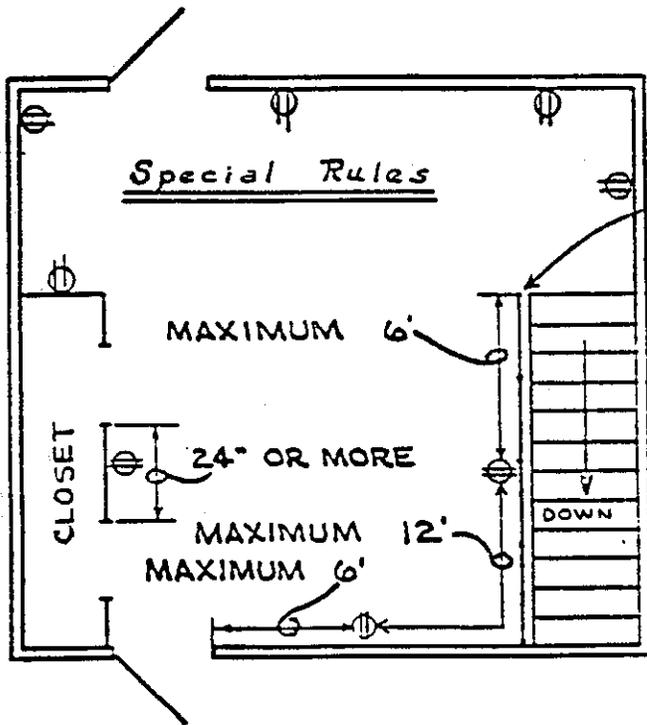
CIRCUIT LOAD

A MAXIMUM OF 10 LIGHTS AND OUTLETS PER CIRCUIT SHOULD BE USED AS A GUIDELINE WHERE MINIMUM LOADS ARE EXPECTED.

REQUIRED OUTLETS



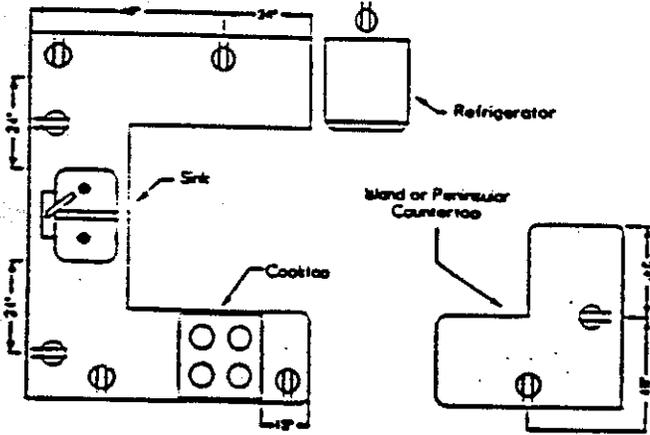
RULE - MAXIMUM OF 6' TO FIRST OUTLET FROM ANY OPENING - PLUS A MAXIMUM OF 12' BETWEEN ANY TWO OUTLETS MEASURED ALONG THE WALL LINE. (THIS IS A MINIMUM, YOU MAY ADD MORE IF YOU WANT)



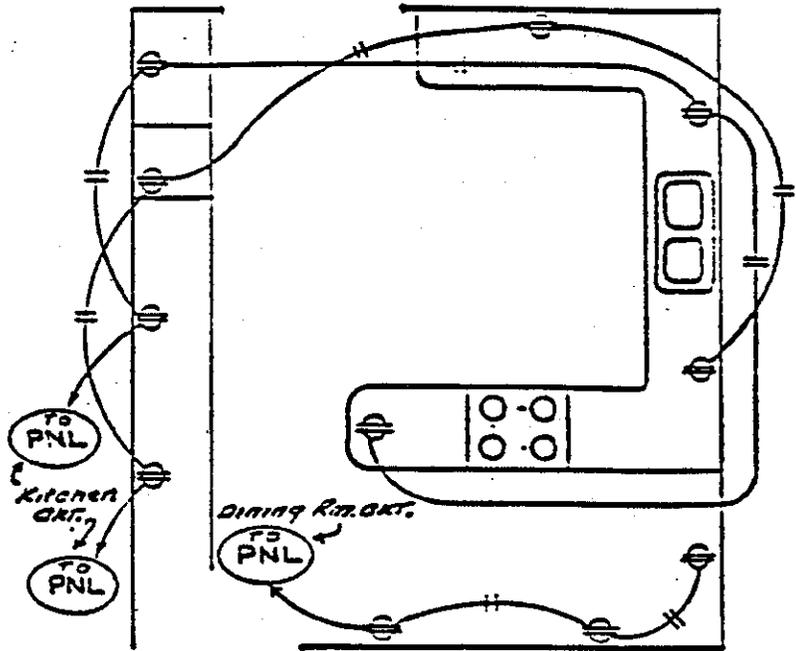
- RAILING ALONG STAIRWELL COUNTS AS WALL SPACE
- ANY WALL SPACE 24" OR MORE REQUIRES AN OUTLET
- STATIONARY PART OF SLIDING DOOR INCLUDED AS WALL SPACE

- OUTLETS MUST BE WITHIN 5 1/2' OF THE FLOOR TO COUNT AS REQUIRED OUTLETS.
- FLOOR OUTLETS MUST BE WITHIN 18" OF THE WALL TO COUNT AS REQUIRED OUTLETS. ALL FLOOR OUTLETS MUST HAVE A LISTED FACEPLATE.

RECEPTACLE SPACING OF KITCHEN AND DINING ROOM COUNTERTOPS



THE SPACING FOR RECEPTACLES AT COUNTER TOPS IN KITCHENS AND DINING AREAS OF DWELLING UNITS HAS BEEN REVISED SO THAT NO POINT ALONG THE WALL LINE IS MORE THAN 24 INCHES MEASURED HORIZONTALLY FROM A RECEPTACLE OUTLET. ISLAND AND PENINSULAR COUNTER TOPS 12 INCHES OR WIDER SHALL HAVE AT LEAST ONE RECEPTACLE FOR EACH FOUR FEET OF COUNTER TOP



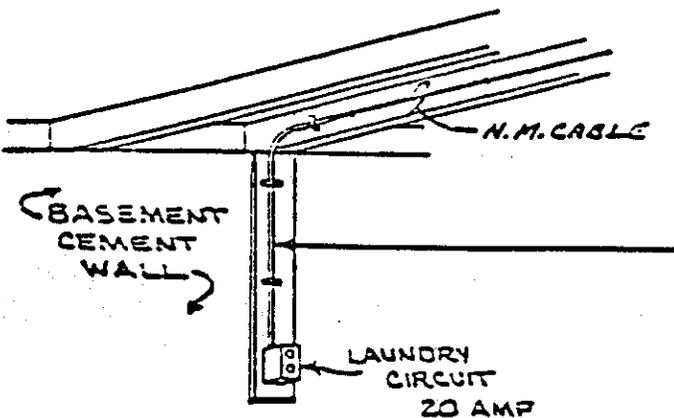
#12 WIRE - 20 AMP CKTS. WIRING OF KITCHEN OUTLETS HOP SCOTCH SO NO TWO ADJACENT OUTLETS ARE ON THE SAME CIRCUIT. (AS ILLUSTRATED)

KITCHEN

All 20-ampere receptacles required by Section 210-52(b) for counter top surfaces shall have ground fault circuit interrupter protection for personnel. They shall be located within 18" above the countertop.

TWO 20 AMP KITCHEN CIRCUITS ARE REQUIRED AS IS ONE 20 AMP DINING ROOM CIRCUIT. KITCHEN AND DINING ROOM 20 AMP CIRCUITS ARE ALLOWED TO FEED OUTLETS ONLY. RANGE HOODS, DISPOSAL UNITS AND OTHER APPLIANCES MUST BE FED FROM OTHER CIRCUITS.

LAUNDRY OUTLET IN UNFINISHED BASEMENT



PROTECTED IN PIPE OR STAPLED ON WOOD STRIP

CODE REQUIRED A SEPARATE 20 AMP CIRCUIT FOR LAUNDRY ROOM RECEPTACLE(S). THE OUTLET(S) IN THE LAUNDRY ROOM MUST BE LOCATED WITHIN 6' OF APPLIANCES.

A. AT LEAST ONE WALL-SWITCHED LIGHTING OUTLET MUST BE INSTALLED IN EVERY
HABITABLE ROOM
HALLWAY
STAIRWAY
ATTACHED GARAGE, AND AT EACH OUTDOOR ENTRANCE.

B. AT LEAST ONE WALL-SWITCHED OR PULLCHAIN LIGHTING OUTLET MUST BE INSTALLED IN EVERY
ATTIC
UNDERFLOOR SPACE
UTILITY ROOM AND
BASEMENT USED FOR STORAGE OR CONTAINING EQUIPMENT REQUIRING SERVICE.

(NOTE) - WALL-SWITCHED RECEPTACLE(S) MAY BE USED INSTEAD OF A LIGHTING OUTLET IN HABITABLE ROOMS OTHER THAN KITCHENS AND BATHROOMS.

RECEPTACLE OUTLETS REQUIRED

AT LEAST ONE RECEPTACLE OUTLET MUST BE INSTALLED IN EACH BASEMENT OF A DWELLING OCCUPANCY.

ANY DWELLING OCCUPANCY HAVING AN ATTACHED OR DETACHED GARAGE ALSO MUST HAVE AT LEAST ONE RECEPTACLE OUTLET IN THE GARAGE.

FOR A ONE FAMILY DWELLING AND EACH UNIT OF A TWO FAMILY DWELLING THAT IS GRADE LEVEL, AT LEAST ONE RECEPTACLE OUTLET WITHIN 6 1/2' OF GRADE SHALL BE INSTALLED AT THE FRONT AND BACK OF DWELLING.

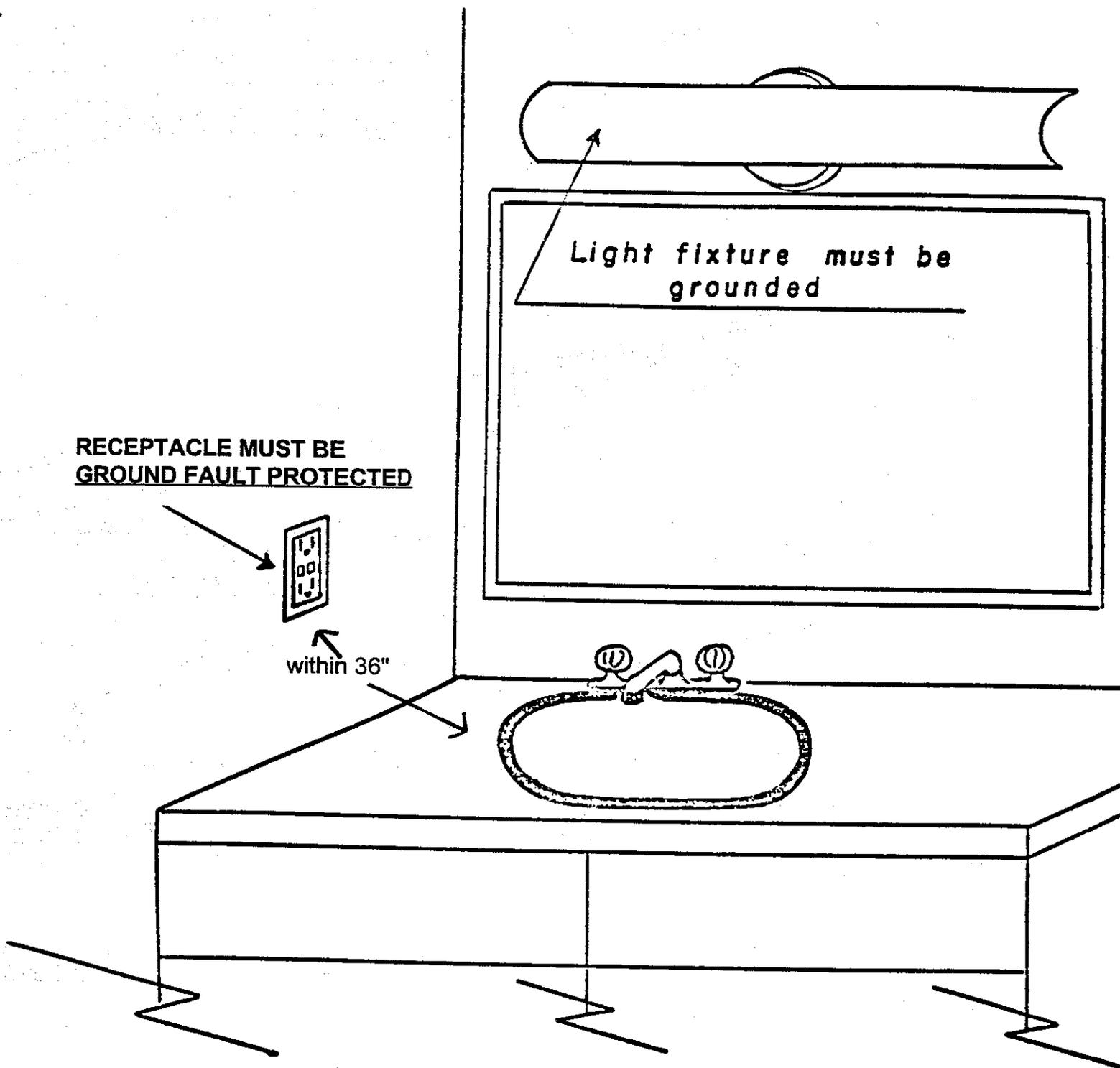
RECEPTACLES MAY NOT BE INSTALLED DIRECTLY OVER ELECTRIC BASEBOARD HEATERS.

GFCI PROTECTED OUTLETS ARE REQUIRED IN:

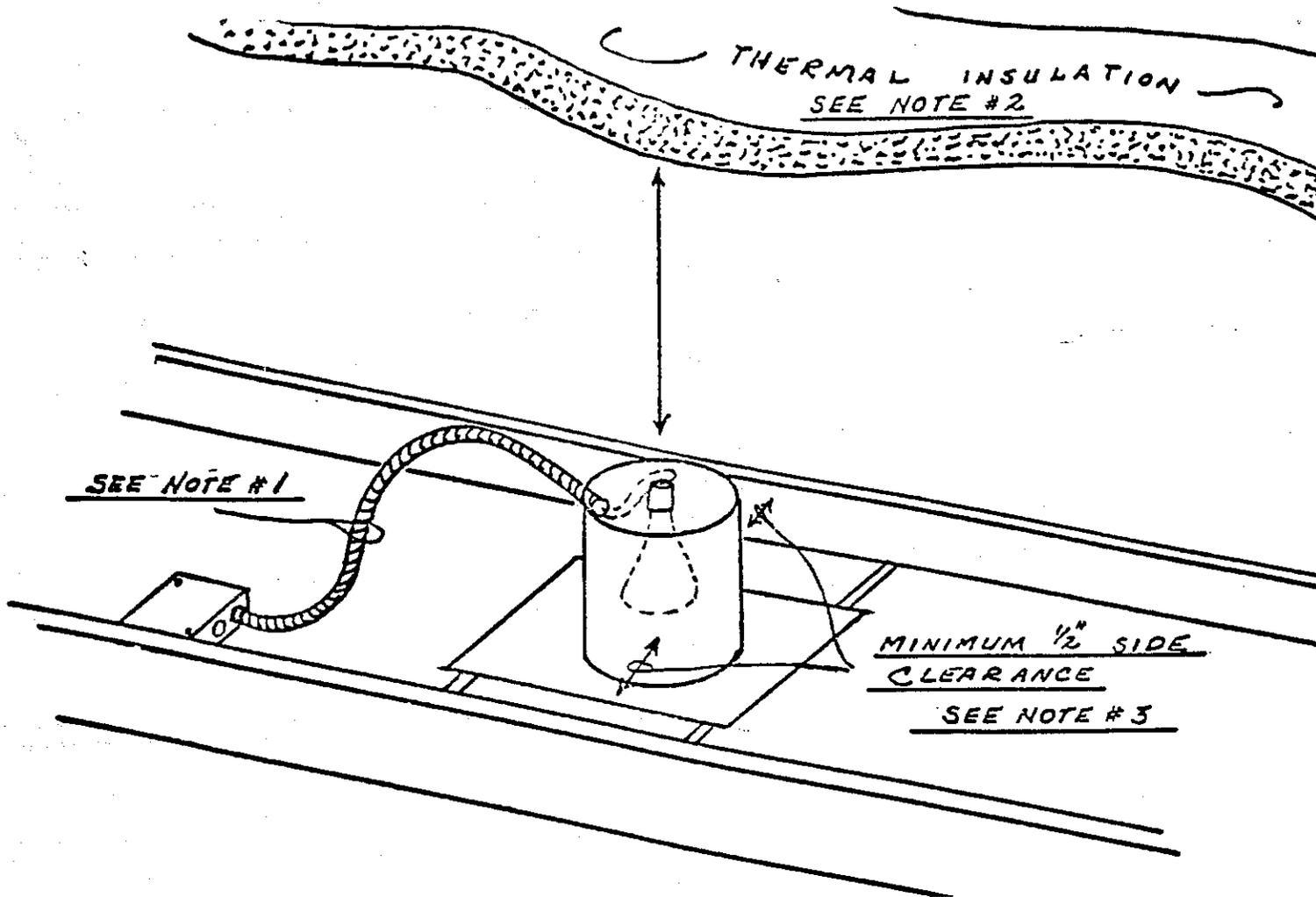
1. BATHROOMS
2. GARAGES (ATTACHED OR DETACHED) & ACCESSORY BUILDINGS
3. OUTDOORS
4. CRAWL SPACES
5. UNFINISHED BASEMENTS
6. KITCHENS (OUTLETS THAT SERVE COUNTERTOP)
7. WET BAR SINKS (WITHIN 6' OF SINK)

BEDROOMS

ALL BRANCH CIRCUITS THAT SUPPLY 125 VOLT, SINGLE PHASE, 15-AND 20- AMPERE OUTLETS INSTALLED IN DWELLING UNIT BEDROOMS SHALL BE PROTECTED BY AN ARC-FAULT CIRCUIT INTERRUPTER LISTED TO PROVIDE PROTECTION OF THE ENTIRE BRANCH CIRCUIT.



CODE RULE SECTION 210 11-(C)(3): AT LEAST ONE 20 AMP BRANCH CIRCUIT SHALL BE PROVIDED TO SUPPLY BATHROOM RECEPTACLES, SUCH CIRCUITS SHALL PROVIDE NO OTHER OUTLETS. BATHROOM OUTLETS SHALL BE WITHIN 36" OF THE SINK(S).
 EXCEPTION: WHEN 20 AMP CIRCUIT SUPPLIES A SINGLE BATHROOM, OUTLETS FOR OTHER EQUIPMENT WITHIN THE SAME BATHROOM SHALL BE PERMITTED. OTHER EQUIPMENT SHALL NOT EXCEED 10 AMPS.



RECESSED LIGHTING FIXTURE REQUIREMENTS

NOTE 1:

FLEX CONDUIT NOT LESS THAN 18" BUT NOT MORE THAN 6' WIRED WITH 90 DEG. C WIRE UNLESS U.L. APPROVED "PREWIRED" AND DESIGNED FOR CONNECTION TO 60 DEG. RATED WIRE.

NOTE 2:

THERMAL INSULATION SHALL NOT BE INSTALLED ABOVE OR WITHIN 3" OF THE SIDE OF A RECESSED FIXTURE ENCLOSURE, WIRING COMPARTMENT, OR BALLAST UNLESS LABELED FOR THE PURPOSE.

NOTE 3:

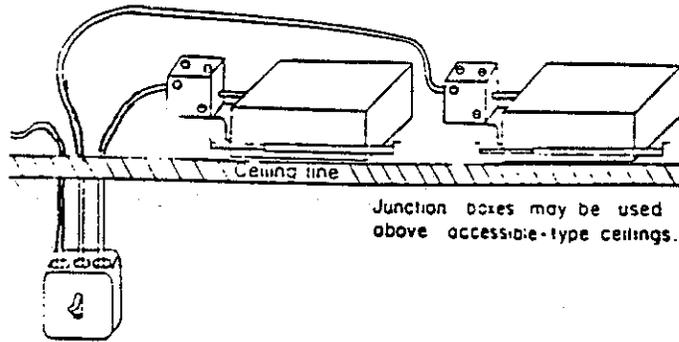
RECESSED PORTIONS OF ENCLOSURES OTHER THAN AT POINTS OF SUPPORT, SHALL BE SPACED AT LEAST 1/2" FROM COMBUSTIBLE MATERIAL.

NOTE 4:

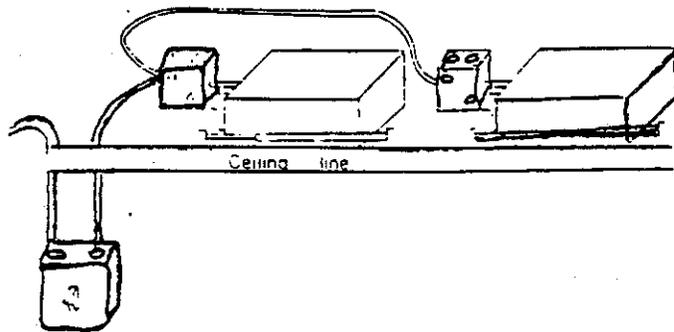
ALL RECESSED FIXTURES MUST BE LABELED AS THERMALLY PROTECTED.

NOTE 5:

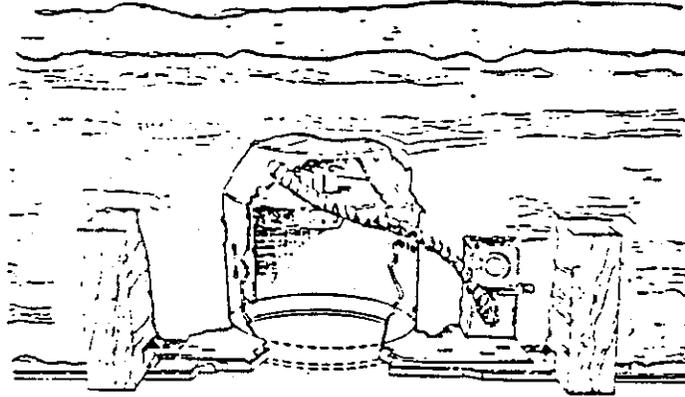
LIGHT FIXTURES MUST BE INSTALLED ACCORDING TO MANUFACTURES INSTRUCTIONS. BE CAREFUL ON LIGHT FIXTURES WITH JUNCTION BOXES MOUNTED ON TOP OF HOUSING.



**FIGURE 1: BRANCH-CIRCUIT CONDUCTORS
TERMINATING AT EACH FIXTURE
(NO FEEDTHROUGH)**



**FIGURE 2: LIGHTING FIXTURES THAT ARE
DESIGNED FOR "FEED-THROUGH" BRANCH-
CIRCUIT CONDUCTORS**



**FIGURE 3: A LISTED RECESSED FIXTURE SUITABLE FOR USE IN INSULATED CEILINGS IN
DIRECT CONTACT WITH THERMAL INSULATIONS (THOMAS INDUSTRIES INC)**

NOTE 1: THESE ARE CLASSIFIED AS PRE-WIRED FIXTURES AND THEREFORE DO NOT NEED THE FLEX AND JUNCTION BOX AS SHOWN ON PAGE 11 NOTE 1. SEE FIGURES 1 & 2

NOTE 2: THIS TYPE OF FIXTURE CAN BE USED IN DIRECT CONTACT WITH THERMAL INSULATION BUT MUST BE LISTED OR LABELED AS I.C. RATING. SEE FIGURE 3.

SERVICE SPECIFICATIONS

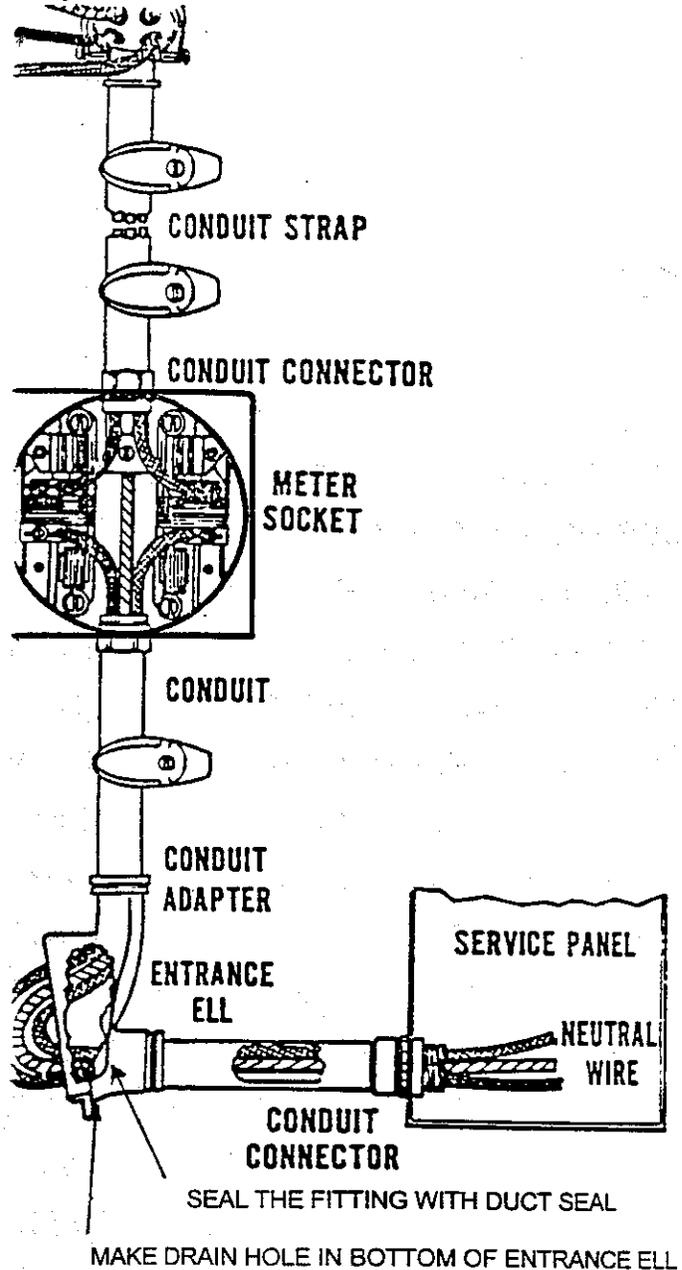
ALL SIZES ARE MINIMUM

AMP SIZE	CONDUIT SIZE	ALUMINUM CONDUCTOR	COPPER CONDUCTOR	CONDUIT SIZE	COPPER GROUNDING CONDUCTOR SIZE
100	1 1/4"	2	4	1"	8
110	1 1/4"	1	3	1 1/4"	8
125	1 1/2"	1/0	2	1 1/4"	8
150	1 1/2"	2/0	1	1 1/4"	6
175	2"	3/0	1/0	1 1/2"	6
200	2"	4/0	2/0	1 1/2"	4

THE SERVICE ENTRANCE CAN BE RIGID STEEL, STEEL THIN WALL (E.M.T.), RIGID NON-METALLIC (PVC) MAY BE USED WHEN USING INSTALLATION TYPE. FIGURE A AS ON PAGE 15

IF A MAST INSTALLATION, SEE FIGURES B & C ON PAGE 15, IS USED, 2" RIGID STEEL CONDUIT MUST BE USED FOR THE UPPER PART OR FROM THE METER BASE UP THROUGH THE ROOF AND A ROOF FLASHING KIT INSTALLED.

- * 2" RIGID FOR SERVICE MAST (WHEN USED FOR SUPPORT)
- * BY PASS METER SOCKET (REQUIRED BY UTILITY)
- * 40 SPACE PANEL FOR 200 AMP SERVICE



MAKE DRAIN HOLE IN BOTTOM OF ENTRANCE ELL

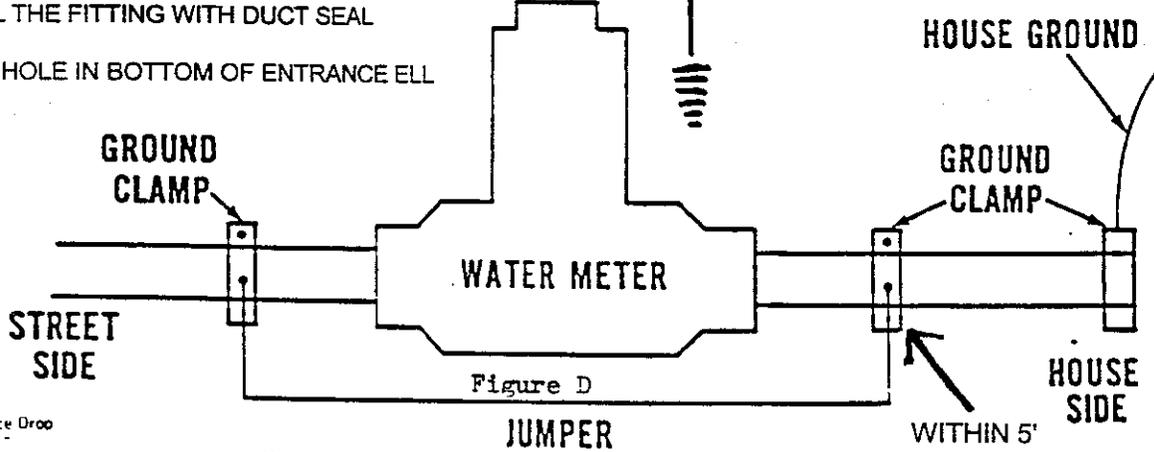
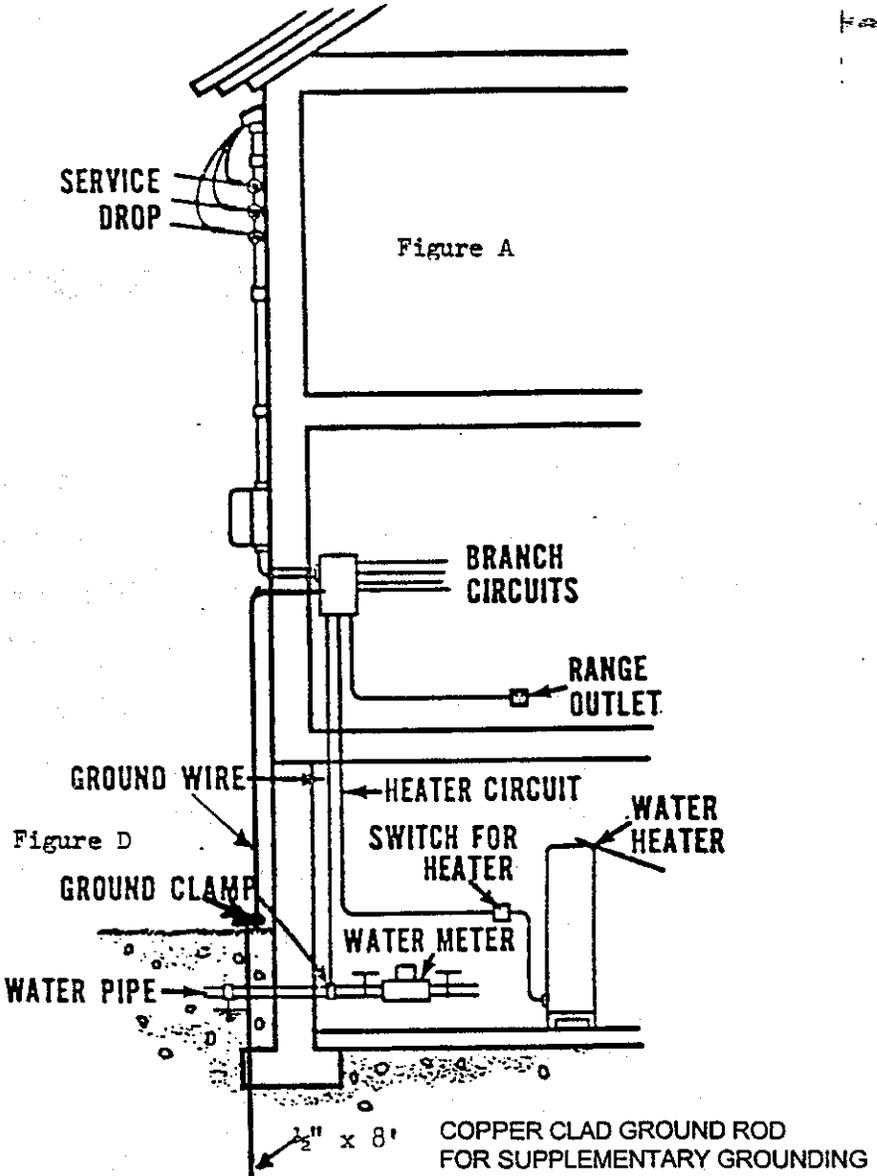
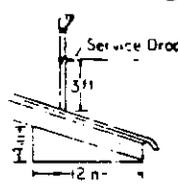
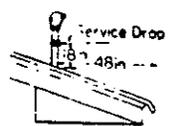


Figure D

JUMPER



300 VOLTS OR LESS
3 FT MINIMUM
CLEARANCE IS
PERMITTED IF ROOF
SLOPE IS STANDARD
4 x 12



300 VOLTS OR LESS
18 IN CLEARANCE IS
PERMITTED IF CON-
DUCTORS PASS OVER
NOT MORE THAN 48 IN
OF ROOF OVERHANG

Figures B & C

SMOKE DETECTORS

IN DWELLING UNITS, A DETECTOR MUST BE INSTALLED IN EACH SLEEPING ROOM AND AT A POINT CENTRALLY LOCATED IN THE CORRIDOR OR AREA GIVING ACCESS TO EACH SEPARATE SLEEPING AREA. WHEN THE DWELLING UNIT HAS MORE THAN ONE STORY AND IN DWELLINGS WITH BASEMENTS, A DETECTOR MUST BE INSTALLED ON EACH STORY AND IN THE BASEMENT. IN DWELLING UNITS WHERE A STORY OR BASEMENT IS SPLINT INTO TWO OR MORE LEVELS, THE SMOKE DETECTORS MUST BE INSTALLED ON THE UPPER LEVEL, EXCEPT THAT WHEN THE LOWER LEVEL CONTAINS A SLEEPING AREA, A DETECTOR MUST BE INSTALLED ON EACH LEVEL. WHEN SLEEPING ROOMS ARE ON AN UPPER LEVEL, THE DETECTOR SHALL BE PLACED AT THE CEILING OF THE UPPER LEVEL IN CLOSE PROXIMITY TO THE STAIRWAY. IN DWELLING UNITS WHERE THE CEILING HEIGHT OF A ROOM OPEN TO THE HALLWAY SERVING THE BEDROOMS EXCEEDS THAT OF THE HALLWAY BY TWENTY-FOUR INCHES (60.96 CENTIMETERS) OR MORE, SMOKE DETECTORS MUST BE INSTALLED IN THE HALLWAY AND IN THE ADJACENT ROOM. DETECTORS MUST BE INSTALLED IN ACCORDANCE WITH THE APPROVED MANUFACTURER'S INSTRUCTIONS.