Canadian Standards Association
Mississauga, Ontario
To the Part I Committee

Subject No. 2960 Chair: R. Leduc Date: November 21, 2002

Title: GFCIs in Kitchens, Rule 26-700(14)

Submitted by: EEMAC's Policy Advisory Committee (EPAC) on September 25, 2000

Proposal: Add Subrule 26-700-(14) as follows:

26-700-(14) Receptacles located in kitchens and installed within 1 m of a kitchen sink along the wall behind counter work surfaces shall be protected by a ground fault circuit interrupter of the Class A type.

Appendix B, Notes on Rules:

26-700-(14) Distance of 1 m is measured from edge of kitchen sink.

Reasons for Request:
Subrule 26-700-(14) is added to mandate the installation of ground fault circuit interrupter protection around kitchen sinks. This Subrule is applicable to both ways presently found in the Code to install receptacles in a kitchen.

Distance of 1 m has been specified in order to emulate other Sections of this Code in their analysis of the potential of electrical shock around a plumbing fixture and to provide for installation of ground fault circuit protection at a minimum cost.

It will be possible to comply with this Subrule by installing ground fault circuit protection on the receptacles immediately adjacent to a kitchen sink by installing two 20 A, T-slot receptacle GFCI=s, two single-pole 20 A GFCI breaker or one double-pole 20 A GFCI breaker when using the prescriptions of Rule 26-706; or, by installing one double-pole 15 A GFCI breaker on one of the multi-wire branch circuit required by Subrule 26-704-(3), when using the prescriptions of 26-702-(7)-(c). Additional cost to the homeowner is evaluated within a range of $30 to $60.

For the record, with the addition of this Subrule, no receptacles mandated to be installed in the proximity of plumbing fixtures will be without ground fault circuit interrupter protection within our Code.

Chair's Comments: Although this proposal certainly provides for an added level of safety for persons working with electric appliances near kitchen sinks, I'd be interested in your comments as to whether this added protection is perceived as being necessary.

For information, this topic was dealt with in Subject 2808 and rejected at that time due to concerns around leakage to ground of some appliances with 3-pin plugs. Perhaps someone has new information in this regard.

I look forward to your comments on the proposal.

Subcommittee Deliberations (1st Round)
I received 9 replies from a possible 14 respondents. The Subcommittee membership included the submitter and one additional participant. This subject appears to be quite controversial since all respondents including those in favour of the submission provided comments. Following are the comments:

Those agreeing

A. I agree with the submission. The NEC has a similar Rule in place, however theirs covers all kitchen counter receptacles.

B. Subject 2808 was limited in its scope, this proposal is covering both 15A split circuits and 20A circuits. It is therefore covering all installations, not only part of them.
Leakage in appliances is a part II matter principally. We did not see physical evidence under subject 2808. I would be very critical of accepting punctual data as a general rule.

C. See 2-page attachment

Those disagreeing

A. The installation of GFCI breakers on multi-wire branch circuits is still a problem due to the higher than 6 ma leakage current of some appliances with 3-pin plugs. I suggest a proposal to the Technical Committee on Consumer and Commercial products to direct all appliance standards to require leakage currents of less than 4 ma.

B. This is the fourth time (1231 in '79, 2049 in '89, & 2808 in '97). Still haven't heard of any problems. But if it is added, we should pick up the receptacles in 26-702(8) too.

C. I feel that this protection is not necessary and will raise other issues if passed (e.g. what about laundry sinks, bar sinks, washers, refrigerators, etc. that all have water lines extended to them.

D. This issue has been around for quite sometime. One of the reasons this proposal was not adopted is for lack of substantiation (documented cases, concerns by consumers, etc.) I could not find any such substantiation in this submission.

E. I agree with Chair's comments. However, I do not agree with the proposal for the following reasons:
1. The additional cost could be more than $30 to $60.
2. This additional cost is not significantly justified by "studies" or "Reports" that prove the real hazard in this area. GFCIs are installed where people can be electrocuted because of wet floor or similar situation. This is not the case here.
3. Millions of installations will become unsafe!!
4. Electrical appliances used in kitchens have usually double insulation but some have 3-pin plugs and can present leakage current to ground.
5. Electric ranges are much more dangerous than kitchen receptacles
6. It will be less expensive to install all kitchen counter receptacles protected by GFCIs.
7. Why not put a GFCI at the service entrance.

Chair's Comments
The response from the S/C members indicates a lack of consensus to accept the proposal. For this reason I will be making a S/C recommendation to reject the proposal and close the subject. However, this subject provides a significant safety feature for the protection of people from electrical shock and I would not want the Part I committee to be

accused of not giving the subject its most careful consideration. I therefore provide the following additional comments for the Part I Committee to consider:

1. One of the reasons for disagreeing with this proposal is the fear of nuisance tripping. I reviewed the Part II standards and found that the only area where a possibility of nuisance tripping exists is regarding appliances that incorporate sheathed heater elements. Here the product is permitted to have a leakage current of 4 ma for up to 10 minutes after which the leakage current must have dropped to .5 ma or less. (See excerpt form C22.2 No. 64 below). Although this permitted leakage current is right on the threshold of the minimum tripping value for a GFCI (See excerpt from C22.2 No. 144 below), the reality is that these products rarely come close to the 4 ma leakage current due to the stringent test requirements. I am not sure that the tripping nuisance argument is a valid one. However from a purely technical point of view, until the Part II requirements are reduced to below 4 ma, we have a conflict between the allowable leakage current in some kitchen appliances and the minimum tripping value of a GFCI.

CAN/CSA-C22.2 No. 64-M91 (Reaffirmed 1999)
Household Cooking and Liquid-Heating Appliances
4.20 Leakage Current
The leakage current for single-phase cord-connected appliances shall not exceed 0.5 mA when tested in accordance with Clause 6.8, except that for appliances having sheathed heater elements the leakage current shall not exceed 4 mA for the first 10 min after power is first applied and 0.5 mA after the 10 min interval.

CAN/CSA-C22.2 No. 144-M91 (Reaffirmed 1997)
Ground Fault Circuit Interrupters
3.4.3.1 Sensitivity
Class A interrupters shall be constructed so that the minimum ground fault current that causes them to operate is between 4 and 6 mA as determined by the tests in Clause 6.5. (When the ambient air temperature is below -5°C or over 40°C, the minimum operating current may be 3.5 mA instead of 4.)

2. Another concern expressed is the cost. This is always a difficult issue. Although we would like to believe that safety should not be dependent on cost, the reality is that cost is a significant factor in determining how safe something should be. That's where reliable risk analysis studies assist in determining whether the added cost for increased safety is warranted. The question is "Is there evidence of a safety risk that warrants the additional cost?" No such evidence was submitted.

3. There was a suggestion that if this proposal is adopted, millions of installations would become unsafe. I think this is an improper analogy. The fact is that installations under existing and past rules are essentially safe and that any change in the rules provides added safety; it does not make existing installations unsafe.

4. The NEC has requirements for GFCI protection for kitchen counter plugs [see NFPA 70, Article 210-8(a)6]. Should we be harmonizing with the NEC? Could the CEC be accused of being negligent if an incident were to occur?

I respectfully submit these subcommittee deliberations for further scrutiny by the Part I Committee. Based on the responses from the S/C members I declare the following:

Subcommittee Recommendation

Reject the proposal and close the subject.

Chair's comments for a 2nd round of Subcommittee deliberations

This subject was sent back to Subcommittee at the 106th meeting of Part I held in St. Johns Newfoundland in June of 2001. The Committee was not convinced that the leakage current concerns was justified and also felt that it is now more practicable to incorporate into the kitchen with the introduction of the 5-20RA receptacles. Another point was that the GFCI in kitchens has been required in the US for several years now.

The Subcommittee Chair agreed to conduct a nationwide poll to try and determine the occurrence of electrical incidents in kitchens. Following is the results of that poll.

Results of Nationwide Poll

Question: Could each of you please look into any local municipal or provincial agency in your jurisdiction that may have statistics identifying incidents of electrical shock occurring in Canadian kitchens?

Responses:

Region	Response
Vancouver	**I actually started to follow up on this subject a while ago, as the question regarding installation of GFCI's in kitchens came to Section 26 S/C about 14 years ago.** **Bob Harris and I dealt with consumer and Insurance Advisory groups stats, information from Fire Commissioners' offices and with replies from the electrically safety regulators.** **As far as I can remember, we could not find sufficient substantiation for requiring GFCI's in kitchens.** **Now GFCI's are much cheaper than 14 years ago and consumers got used to them across the country.** **However, I'm not sure that the stats on this matter have changed significantly. (they may be improved)** **Perhaps, the CSA Consumers Group management and CSA audits and Investigations Division might have some new information on this issue.** **By the copy of this e-mail to Jeanne Bank and to Doug Geralde I'm connecting the CSA Consumer group and Audits and Investigations group to this question.** **By the copy of this e-mail to Rick Porcina I'm asking the management of the BC Electrical Safety Branch to reply on behalf of the province.**
BC	**I've polled my staff and do not have any information that supports or detracts the requirements of GFCIs in Kitchens.**
Yukon	**No incidents of electrical shocks in kitchens have been reported to this department.....but in most cases we would not hear about it unless there have been casualties...people are too proud or embarrassed to report it I suppose.**
Alberta	**Alberta has a mandatory requirement in regulation that requires all incidents of an electrical nature to be reported to the Administrator for electrical safety. These statistics are recorded in an annual report. The last 3 reports can be viewed at http://www3.gov.ab.ca/ma/ss/Electrical.cfm under "General Information". We have no records of electrical incidents occurring in kitchens.**
Saskatchewan	**To my knowledge, we do not have any such statistics for Saskatchewan.**
Northwest Territories	**We do not have stats available in the NWT. Interesting subject that needs to be researched for the public interest.**
Manitoba	**Nothing reported in Manitoba, lets wait awhile till a combination GFCI and Arc-Fault is ready which would protect the people and product.**

Region	Response
Winnipeg	**After a little research, I am not aware of any statistics in our jurisdiction compiled for this application.**
Ontario	**In Ontario GFCIs in kitchen will be mandated as of January 2003.** **Local stats is like pulling teeth, everyone knows someone who received a shock, but no records.** **The Ontario Committee which is composed of membership from industry, COs, manufacturers, electrical contractors, government and others all agreed that more and more the equipment that is available for the kitchen is portable in nature and are not three pin.** **Our membership performed random tests in using the bathroom GFCIs on equipment that was supposed to trip the GFCIs and guess what nothing happened. Interesting it was the committee who pushed it through; therefore, I had to accept the voting of the group.** **I keep hearing about equipment tripping but as of yet have not seen any report that substantiates these allegations.** **Interesting I was driving and listening to a radio talk show and their topic was accidents that people had around their home, and shocks in kitchen was tops, All the people stated that they did nothing about it and attributed this to a nuisance. I am not sure if anyone noticed but the kitchen sink is bonded to ground (majority stainless steel) and WET.** **I have included a collection of notes that was used to address the issue.** **I will have our safety person try to dig up some stats**
Province of Quebec	
New Brunswick	**We do not have any stats here on this particular issue. The US must have some stats since they require kitchen counter receptacles to be GFCI protected.**
Nova Scotia	**We have no stats here in NS on this subject either.**

Other comments

1.	**One of the concerns we had over the years was that in Canada, unlike the USA, most if not all of our kitchen counter equipment is grounded. Also many of the heating type units use a calrod type element which is permitted a fairly high leakage for the first few seconds of energization.** **CSA certification staff were going to run some tests to see if this was an issue and to date I have heard nothing from them. Perhaps Nino could clarify this issue.** **There are certainly issues that I remember reported in the IAEI magazine where in one case a child sitting on the metal running board at the sink stuck a fork down the toaster. We also had all the problems with the type HPN cord, which has now been changed but some of the old stuff is still operating on equipment. The GFCI would not help this too much anyway as it was gases blowing up due to arcing in one leg. Most of us have experienced shocks in the kitchen but survived. Coming down and finding breakfast on the table and the wife still upstairs. The modern child syndrome.**

	Anyway, I would like the tests run so we do not go ahead then experience nuisance tripping which creates other problems.
2.	**I don't know if you are aware that Ontario has included the Kitchen GFCI in there 2002 Ontario Electrical Safety Code. The Rule is not effective until January 2003. It was discussed at the last meeting of the Ontario Provincial Advisory Committee and was accepted by all but one member. Since that time I have acquired some electrocutions statistics from the U.S. They do not specifically apply to kitchens, but I think they are indicative of the improved safety with the use of more GFCI's. I have attached the U.S. information for you to review.**

The results of the poll are inconclusive and provide little in the way of determining any pattern of electrical safety issues regarding the use or lack thereof of GFCIs in kitchens.

So in order to resolve this subject, the Chair will again ask the Subcommittee members to indicate their support for the original proposal, which reads as follows:

Add Subrule 26-700(12) as follows:

(12) Receptacles located in kitchens and installed within 1 m of a kitchen sink along the wall behind counter work surfaces shall be protected by a ground fault circuit interrupter of the Class A type.

Add an Appendix B note:

26-700(12) *Distance of 1 m is measured from the edge of the kitchen sink.*

In reassessing your views on this proposal, following are a number of points that have been raised throughout the deliberations on this issue.

1. Despite the concerns around leakage current in some appliances potentially causing nuisance tripping, test conducted in Ontario (see comments in poll results above) and by others do not indicate a problem with nuisance tripping.
2. Notwithstanding the Ontario tests, the requirements of CAN/CSA C22.2 No. 64 still conflict with the CAN/CSA C22.2 No. 144 (see Chair=s comments following the 1st round of deliberations).
3. Will this proposal introduce significant increases in cost of installation?
4. US and Ontario have mandated GFCIs in kitchens. Are there any liability issues for not adopting an installation practice supported by Ontario and the US?
5. Canada requires appliances to be bonded to ground (3-wire cords with ground-pin on appliance plug); the US does not require appliances to be grounded (2-wire cords)
6. What will be the impact on installers where current Canadian installation practices generally give preference to the 3-wire split receptacle installations in kitchens?

I look forward to your comments.

Subcommittee Deliberations (2nd Round)

The Chair received a total of 10 responses (8 of 13 members plus 2 responses from representatives of industry) to the question of whether or not they agreed with the original proposal. One respondent would like to see more information, 4 agreed with the proposal and 5 disagreed.

The person wanting more information was concerned with liability if the proposal was not adopted and would like to see the US statistics.

Those agreeing offered the following comments:

- As long as leakage currents do not create a problem
- Sufficient information to make an informed decision but would be nice to have the US statistics
- Additional costs are relatively minor and we are seeing more acceptance of the 20A kitchen circuit.

Those disagreeing offered the following comments:

- Lends to inconsistent application of GFCIs. What about laundry sinks and bar sinks? What is the justification for the 1m restriction?
- Remains a technical inconsistency with Part II
- Lack of good statistics
- Increases cost of installation without justifiable statistics
- Recent statistics on the efficacy of GFCIs further complicates the issue

Chair's Comments:
Again, the S/C fails to reach a consensus on this subject.

For the benefit of those wishing an indication of the US statistics, I have extrapolated them on the following page. Due to the general nature of the statistics, I find that a reasonable conclusion cannot be drawn from them.

If you look closely at the table, the 3 columns dealing with consumer products and the last column identifying changes to the NEC where GFCIs were introduced are the relevant ones. The columns dealing with consumer products is all encompassing, which makes it difficult to determine where kitchen counter appliances are involved. In any case we find that overall, the number of electrocutions related to consumer products have declined over time. When expressed as a percentage of the total however, we find that consumer product electrocutions do not change significantly from the time that GFCIs were introduced for kitchen counter receptacles in 1987 right up to 1998.

The overall downward trend is likely attributable to a number of factors including public awareness and better electrical installations and products. However, it is impossible to conclude from the information whether the introduction of GFCIs contributed to any significant degree.

Based on the polarized views at the Subcommittee, and the lack of quantifiable statistics, the Chair concludes that consensus will not be achieved on this matter until we have conclusive evidence to suggest that a change is necessary. Therefore, I submit the following:

Subcommittee Recommendation:

Reject the proposal and close the subject.

ELECTROCUTIONS FROM ALL CAUSES AND THOSE ESTIMATED TO INVOLVE CONSUMER PRODUCTS[1]					Key NEC Changes where GFCIs are Introduced[2]
		Consumer Product Related Electrocutions			
Year	U.S Total Electrocutions	Number	Percent of Total	Death Rate per Million U.S Population Age-Adjusted Rate	
1968					Swimming pools and underwater lighting
1971					Swimming pool receptacles, Storage pool equipment.
1975	1,224	650	53	3.0	Outdoors of dwellings, Fountains, Construction sites
1976	1,046	580	56	2.7	
1977	1,187	630	53	2.9	
1978	989	480	49	2.2	Garages of dwellings, Outdoors and bathrooms of mobile homes, recreational vehicles and parks
1979	1,028	490	48	2.2	
1980	1,103	540	49	2.4	
1981	1,013	480	47	2.1	Spas and hot tubs, therapeutic tubs
1982	979	480	49	2.1	
1983	876	400	46	2.1	
1984	888	330	37	1.4	Bathrooms of hotels and motels
1985	806	340	42	1.4	
1986	854	350	41	1.5	
1987	760	310	40	1.3	Kitchen receptacles within 6’ of sink
1988	710	290	41	1.2	
1989	710	300	42	1.2	
1990	670	270	40	1.1	Appliances subjected to immersion, Mobile home sinks
1991	630	250	40	1.0	
1992	530	200	38	0.8	
1993	550	210	38	0.8	Replacement of 2w receptacles, Wet Bars, Bathrooms of non-dwelling occupancies
1994	560	230	41	0.9	
1995	560	230	41	0.9	
1996	480	190	40	0.7	All kitchen counter top receptacles, Outdoor balconies
1997	490	190	39	0.7	
1998	550	200	39	0.7	
1999					Temporary wiring, Floor heating, exhibition floor, Trailer Park pipe heating, Various small application modifications.

[1] Extrapolated from U.S Consumer Product Safety Commission reports “Electrocutions Associated with Consumer Products – 1991 and 1998. To see recent reports visit: http://www.cpsc.gov/library/data.html

[2] Overcurrents and Undercurrents by Earl W. Roberts – pp. 103-105