Mémoire présenté par
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Qu'est ce qu'un foyer de masse ?

Un foyer de masse est une unité de chauffage en maçonnerie assemblée sur place et qui possède la capacité d'emmagasiner la chaleur par des feux intermittents afin de la redistribuer au besoin dans l'espace.

Sommaire

Nous sommes très favorables au souhait de la ville de Montréal visant à réduire les impacts socio-sanitaires et environnementaux causés par le chauffage au bois dans la grande région de Montréal. Considérant l'augmentation de fréquence des épisode de smog et la dégradation de la qualité de l'air à Montréal, nous croyons que seul les installations à très bas niveau d'émissions de particules fines devraient être autorisées sur le territoire et croyons que la ville devrait réglementer l'usage des installations existantes.

Considérations :

- Les poêles aux granules et les foyer de masse ont des émissions de particules fines équivalente, nous croyons que l'installation de foyers de masses devrait, par le présent règlement, être autorisé à Montréal.

- Compte tenu des faibles émissions de particules fines de ces appareils et du peu d'installations dans la région métropolitaine, l'impact des foyers de masse sur la qualité de l'air pour la région de Montréal sera nul

- Nous croyons que le projet de loi actuel est un pas dans la bonne direction pour l'amélioration de la qualité de l'air mais croyons que cette règlementation devrait cibler les installations existantes par une norme plus sévère et la capacité de mettre à l'amende les mauvais utilisateurs de système de chauffage au bois.

Suggestion de changement du projet de règlement

1. Dans le présent règlement, les mots « combustible solide » signifient : tout matière solide avec laquelle on peut faire du feu.
2. L'installation, à l'intérieur d'un bâtiment, de tout appareil ou foyer permettant l'utilisation de combustible solide est interdite.

Malgré le premier alinéa, l'installation d'un appareil à granules certifié EPA ou CAN/CSA-B415.1 est autorisé.

Suggestion 1

Malgré le premier alinéa, l'installation d'un foyer de masse d'un type définit par la norme ASTM1602-03, comportant les caractéristiques requises par la Masonry Heater Association et installé par professionnel certifié (MHA et/ou RBQ) est autorisé.

Suggestion 2

Malgré le premier alinéa, l'installation d'un foyer de masse préfabriqué testé dont les émissions de particules fines sont inférieure à 3 gr/kg et installé par un professionnel certifié (MHA et/ouRBQ) est autorisé.

Le présent article ne s'applique pas à un appareil utilisé pour la cuisson des aliments, à des fins commerciales, installé dans un immeuble situé à un endroit où l'usage commercial est autorisé.

Foyer de masse, Historique et fonctionnement

Les foyers de masses sont une classe à part dans les installations de chauffage au bois. Le système *Contraflow*, ou foyer finlandais, à été développé il y a environ 400 ans dans les pays scandinaves en raison d'une...crise énergétique ! Une pénurie de bois de chauffage à proximité des villes scandinaves a permis d'optimiser la consommation de combustible pour le chauffage. Le modèle s'est depuis perfectionné mais le principe demeure le même.

Un foyer de masse est un foyer qui a la capacité de **brûler rapidement** une charge de bois, pour ensuite **emmagasiner** cette chaleur afin de la **redistribuer** lentement dans une maison.

L'intérieur d'un foyer de masse ne ressemble en rien à un foyer ordinaire. Le cœur du foyer est constitué d'un âtre qui se dirige vers une seconde chambre de combustion ou les gaz s'enflamment à nouveau, pour ensuite parcourir des canaux d'échange de chaleur. Il suffit d'y faire **un ou deux bons feux par jour pour chauffer une maison de 2000 pi/2**. Le bois brûle rapidement, mais la chaleur emmagasinée dans la maçonnerie continue à rayonner pendant 18 à 24 heures. L'industrie s'accorde pour dire qu'une maison de 2 000 pieds carrée est chauffée avec environ 7 cordes de bois.

Par sa conception spécifique le foyer de masse remplit trois fonctions principales:

1- Développer une température suffisamment élevée pour obtenir une combustion totale du bois

2- Retenir la chaleur au maximum en maintenant l'air chaud dans des canaux d'échange de chaleur localisés à l'intérieur du foyer.

3- Utiliser la structure de maçonnerie pour emmagasiner, telle une batterie, la chaleur pour ensuite la redistribuer lentement dans la maison.

Le foyer de masse est conçu pour développer une excellente **efficacité de combustion** (plus de 97%) en raison des très hautes températures atteintes pendant la combustion. Ces très hautes températures génèrent une combustion complète du bois, propre et avec très peu de fumée et en relâchant une grande quantité de chaleur. 60% de l'énergie contenue dans du bois existe sous forme gazeuse. Un foyer de masse comporte une deuxième chambre de combustion pour brûler complètement ces gaz, donc générer plus d'énergie et moins de polluants. Bien utilisé, **un foyer de masse ne crée pas de gaz à effet de serre** puisque la quantité de CO relâchée est la même que celle absorbé par l'arbre durant sa croissance.

- Un foyer de masse brûle du bois, un combustible renouvelable, de façon propre et efficace.
- Le foyer de masse est sécuritaire, durable et augmente la valeur d'une propriété.
- Le système de chauffage augmente la qualité de vie de ses usagers et procure une autonomie énergétique.
- Le caractère artisanal, l'installation *insitu* et leur coût fait qu'il y a très peu d'installation annuellement.

Tests d'émissions de particules et sécurité

Il faut reconnaître d'emblée que le protocole EPA ne s'applique pas pour tester les foyer de masse. Les foyers de masse sont néanmoins reconnus par l'Environemental Protection Agency *as a clean-burning appliance.*

> *The 800kg cutoff was established as an easy means of excluding high mass fast-burn wood burning appliances known as European tile stove. These devices typically operate at hot, fast burn rates and cannot be damped... The intent of the committee was to exempt from the standards these appliances which rely on clean-burning air-rich condition and which have high combustion efficiencies"*

Le gouvernement du Québec, dans son projet de loi sur la qualité de l'air, autorise les foyers de masse selon les même exigences que l'agence EPA.

Voici une liste des résultats de différents tests de modèles préfabriqué et hybrides de foyer de masse disponibles au Québec. Ces foyers sont constitués de blocs réfractaires pré-moulés en usine et assemblés sur le site. Les chiffres proviennent d'une compilation de tests sur les foyers de masse disponible en Annexe.

• Temp cast 2001	2.96 g/kg	Moy/jour	2.96g/hr
• Heat Kit	1.14 g/kg	Moy/jour	1.14g/hr
• Envirotech	0.8g/kg	Moy/jour	0.8g/hr

Les émissions de particules d'un foyer de masse sont très semblables aux émissions des poêles à granules certifiés EPA

Comparaison des Émissions

Les protocoles de tests sont différents entre les poêles aux granules et les foyers de masse. Néanmoins, en 1991-1992, l'agence EPA a conduit une série de tests sur des système de chauffage installés dans des résidences. Avec un protocole identique, ils on mesurées les émissions de différents systèmes et manipulés des usagers inexpérimentés. Les tests effectués donnent des résultats comparables entre les poêles aux granules et les foyers de masse.
La série de test AP-42 donnait, en 1991-1992 des émissions de particules fines, sur le terrain de 4,2g/kg pour le poêle à granule et 5.6g/kg pour le foyer de masse.
Les avancés technologiques et le perfectionnement des systèmes ont contribué à faire diminuer largement l'émission de particules fines des deux types d'appareils.

Sécurité

Les foyers de masses installés selon le code national du bâtiment pour foyer de maçonnerie et doit se faire conformément aux exigence municipales. Un document regroupes les exigences d'installation relatives au foyer de masse, la norme ASTM1602-03 *Standard guide for Construction of Solid Fuel Burning Masonry Heater.* Ce document définit les principes de construction d'un foyer de masse, stipule les exigences relatives de fonctionnement et comporte un lexique regroupant la terminologie spécifique à ces applications. *Voir Annexe 2*

- Par son fonctionnement particulier et son caractère artisanal, un foyer de masse ne pourra jamais être certifié EPA même si les niveaux d'émissions sont bien en deçà des exigences et équivalent à ceux émises par les poêles aux granules.

- Des différents tests donnent actuelles donnent des résultats similaires. Les foyers de masse testé actuellement ont des émissions entre 1.1 et 2.8 g/kg

- Les foyers de masse installés selon la norme ASTM-1602 sont reconnus comme très sécuritaires et aucun épisode de feu découlant d'un foyer de masse installé selon cette norme n'est connu à ce jour.

Suggestions

Nous croyons qu'un meilleur contrôle sur les installations de chauffage aura un impact significatif sur la qualité de l'air à Montréal. En raison de l'absence prolongée de règlementations provinciales et municipales, une vaste flotte d'appareils de chauffage non certifié et polluante à été installé. Nous croyons que des résultats tangibles seraient obtenus plus efficacement en réglementant l'utilisation des appareils qui sont déjà en circulation.

Considérant que :

- Il y a environ 85241 installations de chauffage au bois à Montréal, dont une faible proportion sont certifiées EPA;
- Les mauvaises pratiques de chauffage, tel que la combustion lente, sont largement répandues chez les utilisateurs;
- La durée de vie d'un poêle à bois peu être très longue en effectuant des réparations peu coûteuses;
- Les composantes internes de tous les poêles à bois et à granules tendent à se détériorer à la chaleur et à l'usage. Aucun test ne garantit leur durabilité.
- L'efficacité de combustion d'un poêle tend à décroître à l'utilisation.

Notre proposition n'est pas la plus simple ni la moins coûteuse mais elle aurait l'avantage de réduire de façon réelle et mesurable les émissions de particules fines sur la région métropolitaine

Il s'agit d'adopter un règlement sur la qualité de l'air comportant les mêmes éléments que la loi sur la qualité de l'air de l'état de Washington dans laquelle on retrouve :

- Les exigences d'émissions des appareils
- Un standart basé sur l'opacité des émission
- Les combustibles autorisés
- Des périodes d'interdiction de chauffage au bois

Un exemplaire de la loi de l'état de Washigton intitulé *Solid Fuel Burning Device* est disponible en Annexe 3

Annexe 1

Exigences pour la certification de la Masonry Heater Association of North America

1. Introduction

The MHA is a professional association of masonry heater builders that was formed to advance the technology of masonry heating in North America and to increase the knowledge and skills of professional heater masons. The MHA fulfills its mandate by sponsoring laboratory research into masonry heating technology and by publishing information of interest to practitioners. The MHA also maintains a professional training and certification program to recognize the competency of qualified heater builders. This manual has been prepared to assist candidates in achieving and maintaining MHA certification, and to guide the administration of the program. The requirements presented in this manual have been established by the MHA Board of Directors and it is its sole responsibility to apply and interpret them, primarily through its administrative designate. The manual may be amended from time to time to account for changing conditions.

2. Application for Certification

2.1 Application Procedure

To initiate the application procedure, a person must be an MHA member* **in good standing and apply in** writing to the MHA administrator and provide:

(a) a completed application form

(b) a check or money order in the amount of US $300.

*If a person becomes an MHA member and applies for certification in the same year, $100 of the application fee can be waived.

2.2 Administration

Upon receipt of a completed application form and fee, the administrator will supply the applicant with:

(a) a copy of the MHA Heater Mason's Reference Manual,

(b) a copy of the Occupational Analysis Manual,

(c) a copy of the Policies and Procedures Manual,

(d) and such other documentation deemed necessary to prepare the applicant for the certification process.

3. Requirements for Certification

3.1 Professional Credentials Required

A candidate for MHA certification must demonstrate a working knowledge of relevant housing and fuel burning regulations, and sufficient knowledge of masonry work by providing proof* of successful completion of at least
ONE of the following:

(a) a bricklayer apprenticeship program

(b) certification issued by the Hearth Education Foundation (formerly WHERF)

(c) certification issued by Wood Energy Technology Transfer Inc.

(d) or an equivalent professional credential deemed acceptable to the MHA

AND at least **ONE** of the following:

(e) 40 hours of work under the direct supervision of an MHA certified heater mason

(f) successful completion of an MHA Hands-on Workshop and Test

*Proof of certification or participation, i.e. copy of certificate, diploma, letter of successful completion. Other credentials can be judged for their equivalence.

3.2 Field Experience

A candidate must provide evidence of a working knowledge of masonry heater design and construction as set out in the MHA Occupational Analysis Manual. The required evidence must consist of verifiable documentation of THREE masonry heater construction projects professionally contracted and completed within the past five years. The candidate must have served as the lead mason on at least TWO of the required projects. Required documentation for EACH of the three projects must consist of the following:

(a) ONE photograph of the heater in the process of construction and **ONE** photograph of the finished unit.

(b) a thorough description of the heater including firebox dimensions, overall dimensions, wall thicknesses, main materials used, including scale drawings with plan sectionals.

(c) the name and address of the client, and the date of construction.

3.3 Examination

(a) The candidate must achieve a passing grade on the MHA examination. The passing grade is 70 percent.

(b) The taking of the examination may be administered by the MHA or

(c) The examination may be proctored by an independent agency such as a public library which is deemed acceptable by the administrator. The MHA will pay the proctor for the service. All other costs related to the proctoring of the examination will be paid by the candidate.

(d) The fee for the administration of the examination is US $100 which must be received by the MHA before administrative arrangements are made.

(e) The candidate may take the examination before the other certification requirements are met, but certification will not be granted until all requirements are satisfied.

3.4 Summary of Certification Requirements

To achieve certification under the Heater Mason Program, the candidate must:

(a) supply a completed application form	2.1(a)
(b) pay the application fee of $300	2.1(b)
(c) provide proof of relevant professional credentials	3.1
(d) provide documentation of three heater projects	3.2
(e) pay the examination fee of $100	3.3(d)
(f) achieve a passing grade on the MHA examination	3.3(a)

4. Maintaining MHA Certification

4.1 Annual Certification Renewal

To maintain MHA certification in good standing, a certificate holder must be a MHA full voting member and pay an annual renewal fee of $50. The fee covers administrative costs, validation of renewal and information updates. Failure to pay the annual renewal fee will result in the withdrawal of certification after two payment notices have been sent and no response is received by the administrator within 90 days.

4.2 Continuing Education Requirement

Within each five year period after certification, the certificate holder must accrue MHA continuing education workshop points, or other relevant professional credentials deemed equivalent by the MHA. Points accrued must be a minimum of 3 to 5 each year or 24 or more for the five year period.

Presenting an MHA Workshop	5 points
Participating in an MHA Workshop	4 points
Attending an MHA Workshop	3 points

Attending a workshop deemed acceptable by MHA	3 points

Failure to comply with the continuing education requirement will result in withdrawal of certification after two notices have been sent and no response is received by the administrator with 90 days.

4.3 Leave of Absence

Any Certified Heater Mason leaving North America or becoming inactive as a working mason must remain a paid Associate Member of MHA and keep annual certification fees up to date.

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Annexe 2

Norme ASTM 1602-03

Standard Guide for Construction of Solid Fuel Burning Masonry Heaters

Designation: E 1602 – 03

An American National Standard

Standard Guide for Construction of Solid Fuel Burning Masonry Heaters[1]

This standard is issued under the fixed designation E 1602; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This guide covers the design and construction of solid fuel burning masonry heaters. It provides dimensions for site constructed masonry heater components and clearances that have been derived by experience and found to be consistent with the safe installation of those masonry heaters.

1.2 Values given in SI units are to be regarded as standard. Inch/pound units may be rounded (see IEEE/ASTM SI-10). All dimensions are nominal unless specifically stated otherwise. All clearances listed in this guide are actual dimensions.

1.3 This guide applies to the design and construction of masonry heaters built on-site with the components and materials specified herein. It does not apply to the construction/installation requirements for component systems that have been safety tested and listed. The requirements for listed masonry heater systems are specified in the manufacturer's installation instructions.

1.4 The design and construction of solid fuel burning masonry heaters shall comply with applicable building codes.

2. Referenced Documents

2.1 *ASTM Standards:* [2]

C 11 Terminology Relating to Gypsum and Related Building Materials and Systems

C 43 Terminology of Structural Clay Products

C 71 Terminology Relating to Refractories

C 270 Specification for Mortar for Unit Masonry

C 401 Classification of Alumina and Alumina-Silicate Castable Refractories

E 136 Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C

IEEE/ASTM SI-10 Standard for Use of the International System of Units (SI): The Modern Metric System

2.2 *UL Standards:*

UL 103 Chimneys, Factory Built Residential Type and Building Heating Appliances[3]

3. Terminology

3.1 Terms used in this guide are as defined in Terminology C 11, Definitions C 43, Terminology C 71, and Classification C 401.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *approved*—acceptable to the authority having jurisdiction.

3.2.2 *authority having jurisdiction*—the organization, office, individual, or agent thereof, who is responsible for approving construction, materials, equipment, installation, procedure, and so forth. In most cases in which a building permit is required, the authority is typically the building official or his agent. Where a building permit is not required, the authority is typically the owner or his agent.

3.2.3 *bypass damper*—a valve or plate that provides a direct path to the chimney flue for the flue gases or portion thereof.

3.2.4 *capping slab*—a horizontal refractory barrier covering the top of the masonry heater.

3.2.5 *cleanout opening*—an access opening in a flue passageway of the masonry heater or chimney that is designed to allow access to the flue for purposes of inspecting for and removal of ash, soot, and other extraneous matter that may become trapped.

3.2.6 *damper*—an adjustable valve or plate for controlling draft or the flow of gases, including air.

3.2.7 *firebox (firechamber)*—that portion of the masonry heater that is designed for containing and burning the fuel charge.

3.2.8 *gas slot*—a small fixed opening that provides a bypass for unburned flue gases, and is a critical safety feature in certain masonry heater designs (namely those of the Grundofen type with vertical flue runs) (see Fig. 1, Fig. 2, Fig. 3, and Fig. 6).

3.2.9 *hearth extension*—the noncombustible surfacing applied to the floor area extending in front of and beyond each side of the fuel loading door of the masonry heater; also applies

[1] This guide is under the jurisdiction of ASTM Committee E06 on Performance of Buildings and is the direct responsibility of Subcommittee E06.54 on Solid Fuel Burning Applications.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For Annual Book of ASTM Standards volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from Underwriter's Laboratories, 333 Pfingsten Road, Northbrook, IL 60062.

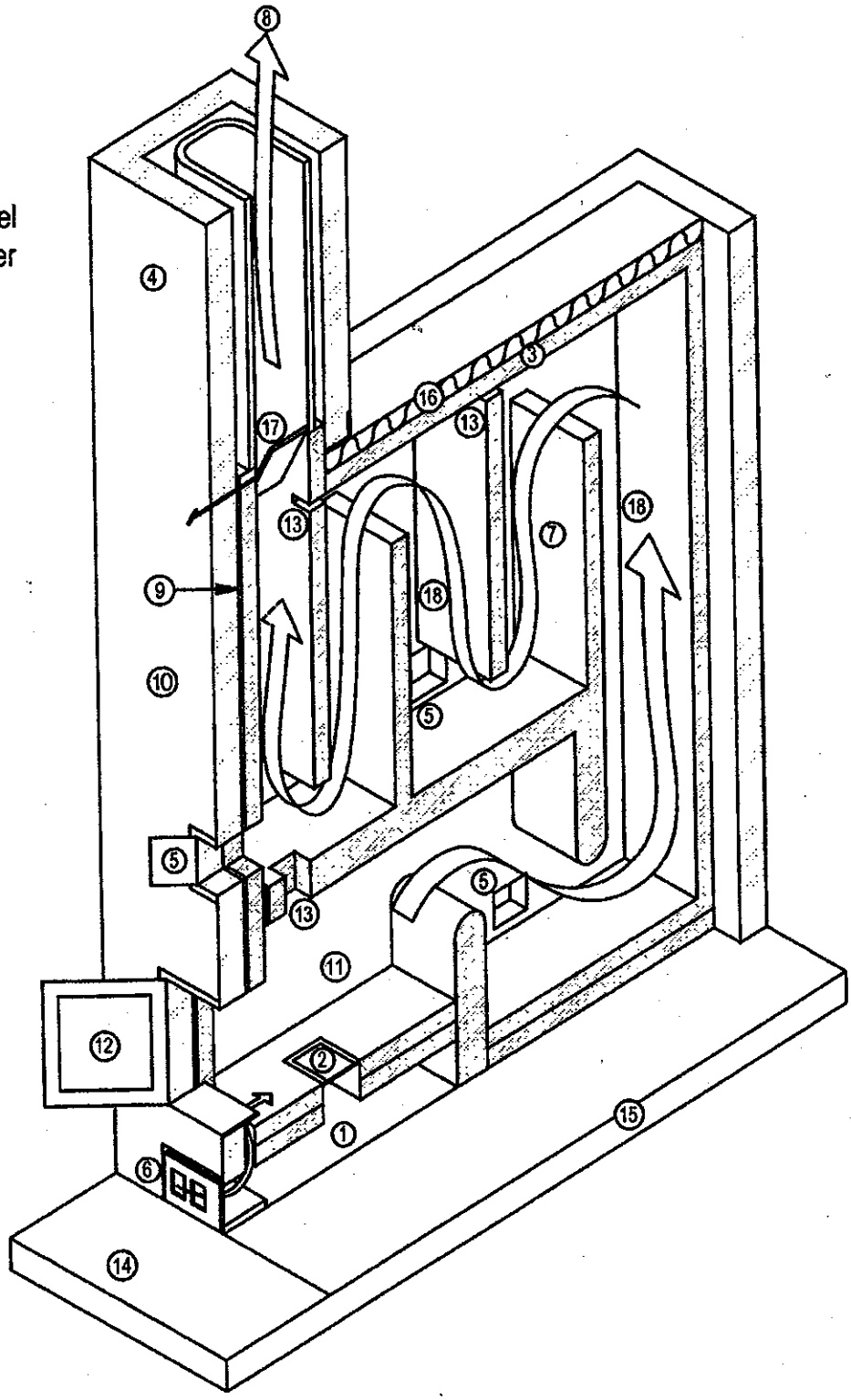


FIG. 1 Vertical Channel Masonry Heater (Russian)

1. Ashbox
2. Ash Drop
3. Capping Slab
4. Chimney
5. Clean-Out
6. Combustion Air
7. Downdraft Channel
8. Exhaust Gas
9. Expansion Joint
10. Exterior Wall
11. Firebox
12. Fuel-Loading Door
13. Gas Slot
14. Hearth Extension
15. Heater Base
16. Insulation
17. Shut-Off Damper
18. Updraft Channel

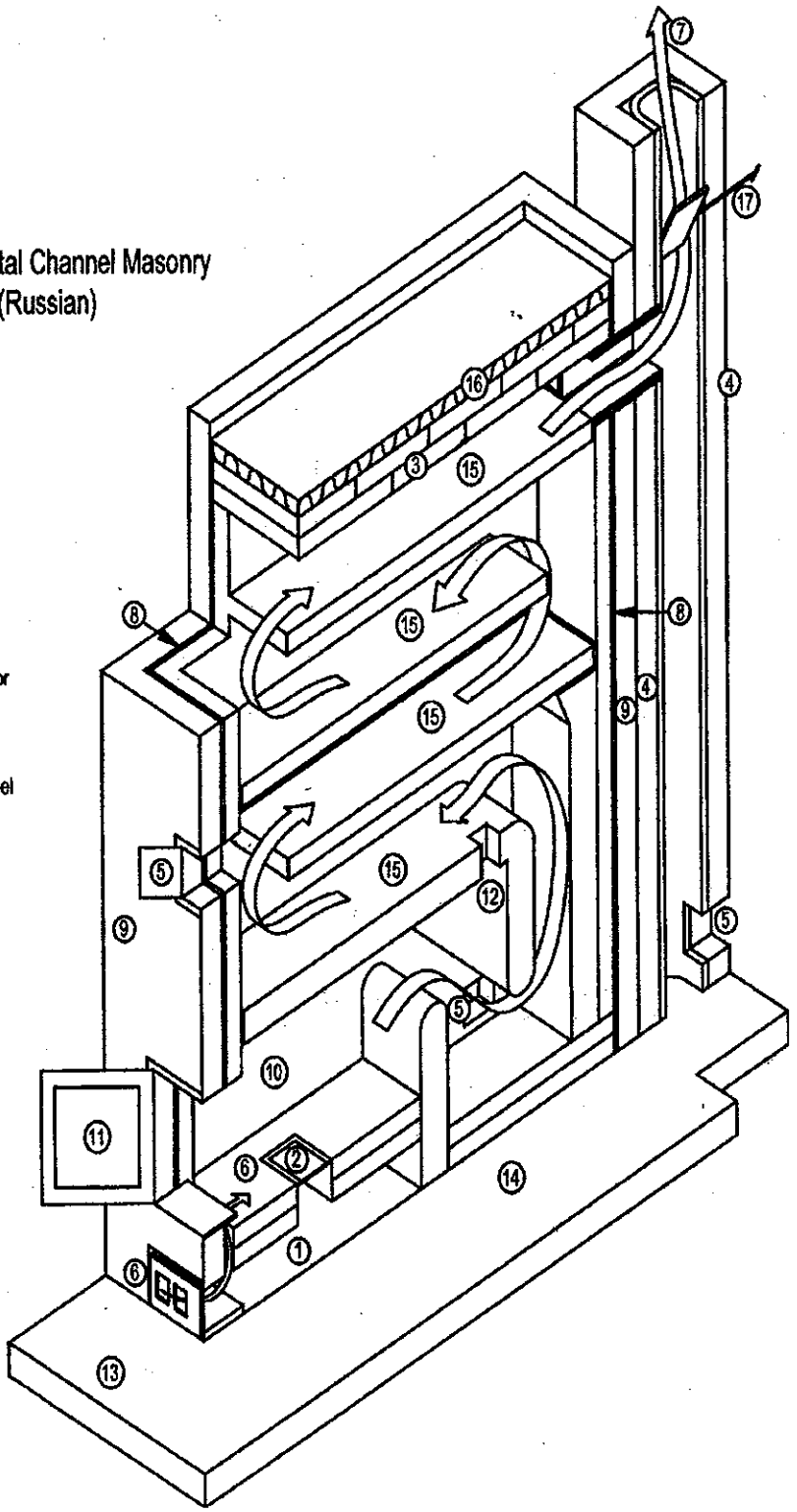
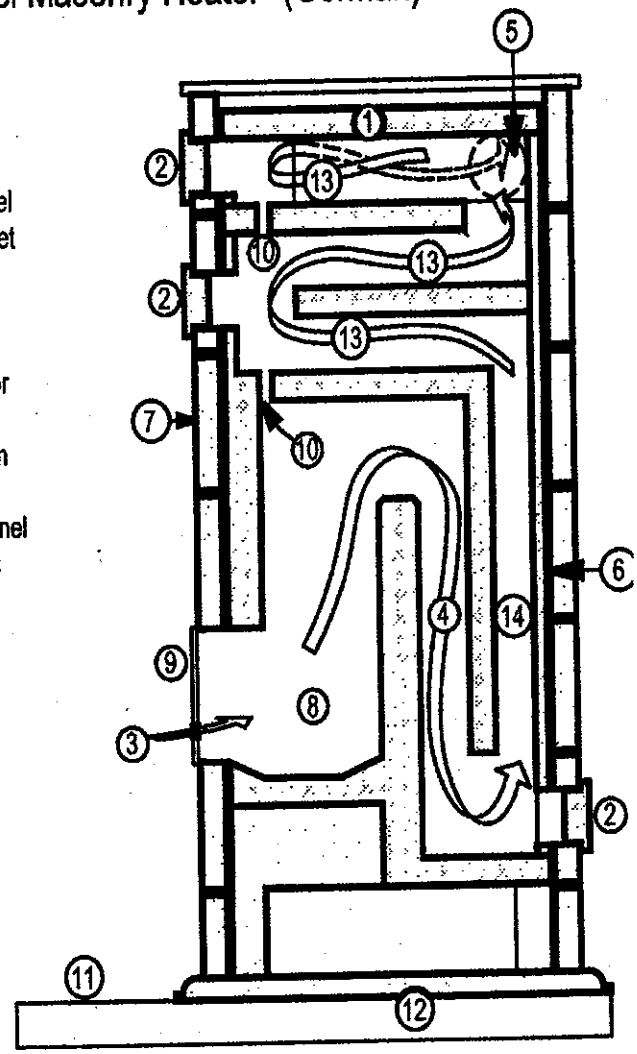


FIG. 2 Horizontal Channel Masonry Heater (Russian)

1. Ashbox
2. Ash Drop
3. Capping Slab
4. Chimney
5. Clean-Out
6. Combustion Air
7. Exhaust Gas
8. Expansion Joint
9. Exterior Wall
10. Firebox
11. Fuel-Loading Door
12. Gas Slot
13. Hearth Extension
14. Heater Base
15. Horizontal Channel
16. Insulation
17. Shut-Off Damper

FIG. 3 Combination Vertical and Horizontal Channel Masonry Heater (German)



to the floor beneath a masonry heater or beneath an elevated overhanging masonry heater hearth.

3.2.10 *masonry heater base*—that portion of the support for the masonry heater, between the masonry heater and the foundation, that is below the firebox or the heat exchange areas.

3.2.11 *heat-exchange flue channel*—a chamber or passageway between the firebox and the chimney flue in which heat resulting directly from combustion of fuel is transferred to the surrounding masonry.

3.2.12 *kachel*—a European term used to describe a masonry heater tile; a refractory ceramic tile intended for the outer wall of a masonry heater that is designed specifically to store and transfer heat.

3.2.13 *listed*—equipment or materials included in a list published by an organization concerned with product evaluation acceptable to the authority having jurisdiction to conduct periodic inspection of production of listed equipment or materials and whole listing states either that the equipment or materials meet appropriate standards or have been tested and found suitable for use in a specified manner.

3.2.14 *masonry heater*—a vented heating system of predominantly masonry construction having a mass of at least 800 kg (1760 lbs), excluding the chimney and masonry heater base. In particular, a masonry heater is designed specifically to capture and store a substantial portion of the heat energy from a solid fuel fire in the mass of the masonry heater through internal heat exchange flue channels, enable a charge of solid fuel mixed with an adequate amount of air to burn rapidly and more completely at high temperatures in order to reduce emission of unburned hydrocarbons, and be constructed of sufficient mass and surface area such that under normal operating conditions, the external surface temperature of the

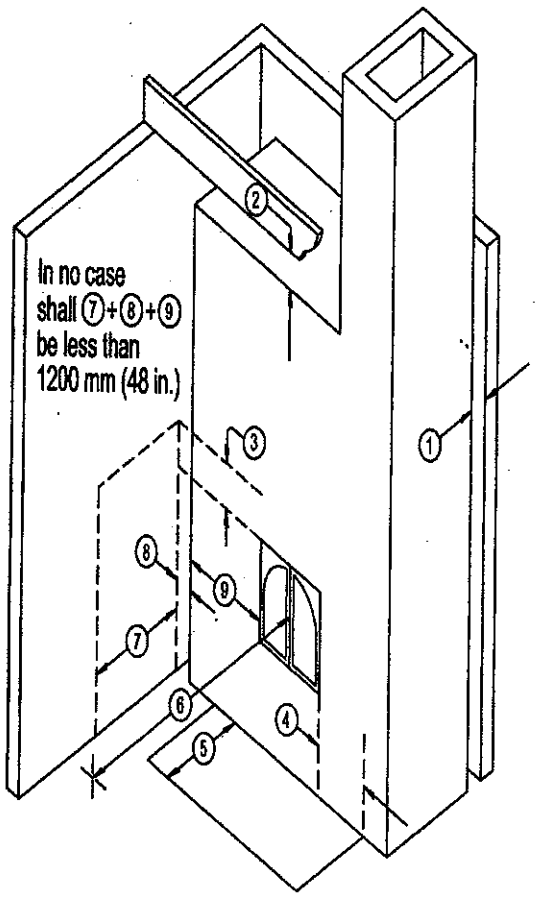


FIG. 4 Clearances to Combustibles

1- 100 mm (4 in.) to combustible framing from masonry heater
2- 200 mm (8 in.) to ceiling
3- 200 mm (8 in.) minimum extent of side wall heat shield above firebox door
4- 300 mm (12 in.) hearth extension (sides)
5- 500 mm (20 in.) hearth extension (front)
6- 1200 mm (48 in.) in front of fuel-loading doors to combustible framing
7- extent of mandatory heat shield in front of masonry heater; required only when clearance to combustible material from fuel-loading door (8+9) is less than 1200 mm (48 in.)
8- 100 mm (4 in.) minimum clearance from side wall of masonry heater to heat shield (if used) or combustible framing
9- distance from fuel-loading doors to side wall of masonry heater
7+8+9- The sum of these must be greater than or equal to 1200 mm (48 in.)

Notes: Clearances from combustible walls or framing may be reduced with an engineered protection system, other than in front of fuel-loading doors.

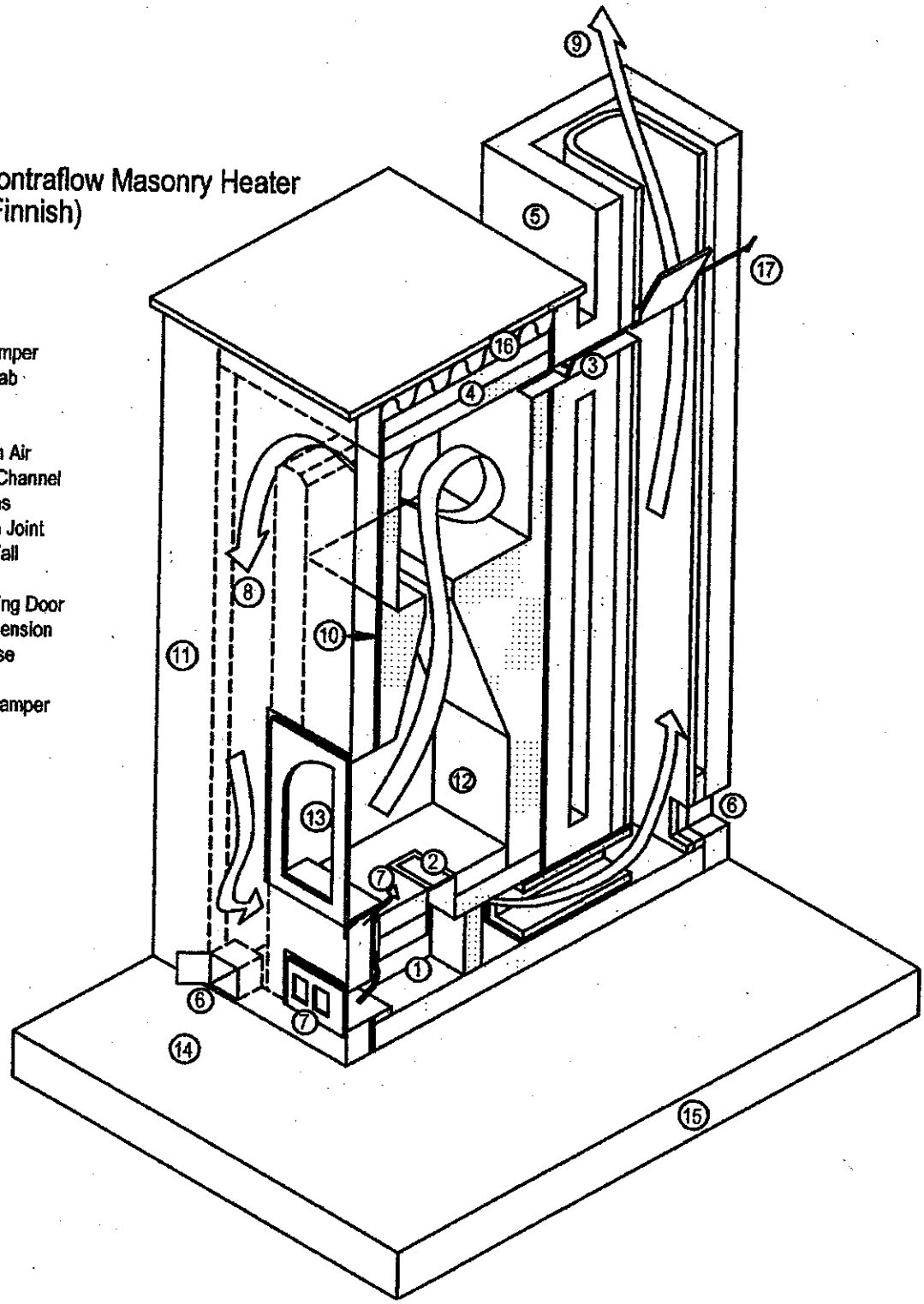
masonry heater (except in the region immediately surrounding the fuel loading door(s)), does not exceed 110°C (230°F).

3.2.15 *mortar, masonry*—a mixture of cementitious materials (consisting of Portland or blended cement and hydrated lime, masonry cement, masonry cement and Portland cement, or masonry cement and blended cement), fine aggregate, and sufficient water to produce a workable consistency (see Specification C 270).

3.2.16 *mortar, fire clay*—mortar consisting of fine aggregate and fire clay as a binding agent.

FIG. 5 Contraflow Masonry Heater (Finnish)

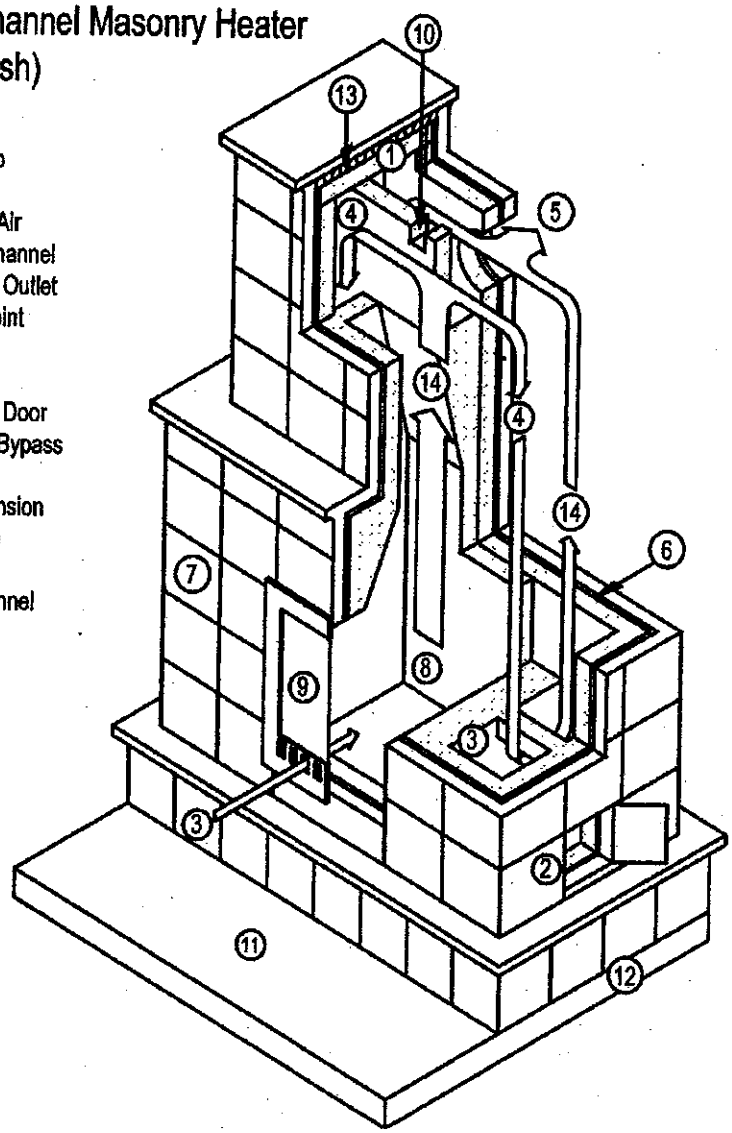
1. Ashbox
2. Ash Drop
3. Bypass Damper
4. Capping Slab
5. Chimney
6. Clean-Out
7. Combustion Air
8. Downdraft Channel
9. Exhaust Gas
10. Expansion Joint
11. Exterior Wall
12. Firebox
13. Fuel-Loading Door
14. Hearth Extension
15. Heater Base
16. Insulation
17. Shut-Off Damper



3.2.17 *mortar, soapstone refractory*—a mixture of powdered soapstone and sodium silicate.

3.2.18 *noncombustible material*—a material that, in the form in which it is used and under the conditions anticipated, does not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat. Materials reported as passing the requirements of Test Method E 136 are, for the purpose of this guide, considered noncombustible.

FIG. 6 Five Channel Masonry Heater (Swedish)



3.2.19 *soapstone*—a variety of natural stone (hydrated silica of magnesium) that is suitable for high-temperature applications in masonry heaters.

3.2.20 *wing wall*—a noncombustible lateral projection from the exterior wall of a masonry heater for use in bridging the space between a masonry heater and a combustible partition wall.

4. Significance and Use

4.1 This guide can be used by code officials, architects, and other interested parties to evaluate the design and construction of masonry heaters. It is not restricted to a specific method of construction, nor does it provide all specific details of construction of a masonry heater. This guide does provide the principles to be followed for the safe construction of masonry heaters.

4.2 This guide is not intended as a complete set of directions for construction of masonry heaters.

4.3 Construction of masonry heaters is complex, and in order to ensure their safety and performance, construction shall be done by or under the supervision of a skilled and experienced masonry heater builder.[4]

5. Requirements

5.1 *Foundation*—Masonry heater foundations and foundation walls shall meet local building codes for standard masonry fireplaces and shall be designed with consideration given to the mass and size of the masonry heater.

[4] The Masonry Heater Association of North America, 1252 Stock Farm Road, Randolph, VT 05060, web site: http://www.mha-net.org, is one organization that represents a body of knowledge on masonry heater construction and qualified builders.

The Masonry Products Caucus of the Hearth Products Association, 1601 N. Kent Street, Suite 1001, Arlington, VA 22209, web site: http://www.hearthassoc.org, is another organization that represents both manufacturers and qualified builders of masonry heaters.

5.2 *Clearance from Combustibles*—Clearances shall be in conformance with this section, as illustrated in Fig. 4.

5.2.1 *Clearance from Foundation*—All combustible structural framing members shall have a clearance of not less than 50 mm (2 in.) from the masonry heater foundation.

5.2.2 *Clearance from Fuel-Loading Door*—Maintain a minimum clearance of 1200 mm (48 in.) from combustible materials to fuel-loading doors, unless an engineered protection system as specified in 5.2.2.1 is provided, except for clearance directly in front of fuel-loading doors. A minimum clearance of 1200 mm (48 in.) shall be maintained in front of fuel-loading doors. This dimension shall not be reduced for any reason.

5.2.2.1 Clearance from fuel-loading doors to combustible materials may be reduced, other than in front of fuel-loading doors, if the combustible material is protected by an engineered protection system acceptable to the authority having jurisdiction. Engineered systems installed for the protection of combustible material shall limit the temperature of the combustible material to 50°C (90°F) above ambient temperature. Systems shall be designed upon applicable heat transfer principles, taking into account the geometry of the system, the heat loss characteristics of the structure behind the combustible material, and possible abnormal operating conditions of the masonry heater.

5.2.2.1.1 When an engineered protection system is used to reduce the perpendicular clearance from fuel-loading doors, it must extend a minimum of 200 mm (8 in.) above the fuel-loading doors or firebox opening. In addition, the sum of the dimensions from the fuel-loading doors, the distance from the heater to combustible material, and the length of the protection system in front of the heater face shall be no less than 1200 mm (48 in.).

5.2.3 *Clearance from Rear, Side, and Front Walls*—Clearance from a masonry heater to combustible structural framing and other combustible materials shall be not less than 100 mm (4 in.), unless an engineered protection system is provided, or a protection system accepted by the authority having jurisdiction is provided.

5.2.3.1 Clearance from a masonry heater to combustible materials may be reduced by the use of materials or products listed for protection purposes. Materials and products listed for the purpose of reducing clearance to combustibles shall be installed in accordance with the conditions of the listing and the manufacturer's instructions and shall meet the criteria of Section 5.2.2.1.

5.2.4 *Clearance from the Ceiling*—The clearance from the masonry heater capping slab to the ceiling shall be a minimum of 200 mm (8 in.).

5.2.4.1 *Extensions of Exterior Wythes to Ceiling*—When exterior masonry wythes of the masonry heater are carried to the ceiling, insulate and vent the top of the masonry heater above the heat exchange channels to reduce possible static heat buildup.

5.2.5 *Wing Walls*—Wing walls may be added to a masonry heater and used as room partitions. Wing walls located at the corners of a masonry heater for the purpose of forming a room divider shall be a minimum of 100 mm (4 in.) in length and a maximum of 100 mm (4 in.) in thickness and be constructed with noncombustible materials. Wing walls located more than 200 mm (8 in.) from a corner of the masonry heater shall be a minimum of 200 mm (8 in.) in length and a maximum of 100 mm (4 in.) in thickness and be constructed with noncombustible materials.

5.3 *Firebox Floor*—The firebox floor shall be a minimum thickness of 100 mm (4 in.) of noncombustible material and at least the top 50 mm (2 in.) shall be refractory material. The firebox floor or a portion thereof may also contain a cast iron grating.

5.4 *Hearth Extension*:

5.4.1 Masonry heaters shall have hearth extensions of brick, concrete, stone, tile, or other approved noncombustible material properly supported. Remove wooden forms used during the construction of hearth and hearth extension once construction is completed.

5.4.2 *Closed Door Fireboxes*—With a masonry heater designed to be fired with a closed door of glass or metal, the hearth extension shall be at least 500 mm (20 in.) in front of the facing materials and at least 300 mm (12 in.) beyond each side of the masonry heater opening. When a raised hearth of at least 200 mm (8 in.) in height is used and the hearth extension is located at the base of the door, the hearth extension can be reduced to 400 mm (16 in.) in front of the facing materials.

5.4.3 *Open Fireboxes*:

5.4.3.1 Where the firebox opening is less than 0.6 m^2 (6 ft^2), the hearth extension shall extend at least 400 mm (16 in.) in front of the facing materials and at least 200 mm (8 in.) beyond each side of the firebox opening.

5.4.3.2 Where the firebox opening is 0.6 m^2 (6 ft^2) or larger, the hearth extension shall extend at least 500 mm (20 in.) in front of the facing materials and at least 300 mm (12 in.) beyond each side of the firebox opening.

5.4.4 Where a firebox opening overhangs a floor, the hearth extension shall also cover the area beneath the overhang and extend beyond the firebox opening as specified in 5.4.2.

5.5 *Cleanout Openings*:

5.5.1 Chimney flues shall have a cleanout access at their base.

5.5.2 *Heat Exchange Channels*—If the design limits natural access, install cleanout openings or a means for cleaning all chimney flues and heat exchange areas. If an ash dump or grate is provided in the firebox, provide a tight-fitting cover of noncombustible material, 3 mm (⅛ in.) minimum thickness, at the base of the ash pit. Cleanout doors for the foundation shall have a minimum size of 200 by 200 mm (8 by 8 in.). Situate the opening to facilitate inspection, cleaning, and maintenance of the masonry heater.

5.6 *Outside Combustion Air*—When required by the local building code, provide a duct with a minimum cross-sectional area of 7700 mm^2 (12 $in.^2$) or equivalent. When outside combustion air is required by the authority having jurisdiction the duct shall have a damper that can be fully closed when not in use. Materials shall be non-combustible and methods of construction shall comply with the requirements of the authority having jurisdiction.

5.6.1 In applications in which outside air is introduced directly into the firebox, the air duct must enter the building at a level below the firebox.

5.6.2 Design and position the air inlet to prevent live coals from entering the air duct. To prevent rodents from entering the air duct, cover the outside entry opening of the duct with a 6 mm (¼ in.) corrosion resistant wire mesh.

5.6.3 *Ash Pit Located in Foundation*—When outside air is introduced into the firebox via the ash pit, introduce the air duct through the upper region of the ash pit wall.

5.6.4 When outside air is introduced into the firebox, construct the air duct from noncombustible materials.

5.7 *Heat exchange channels*:

5.7.1 Heat exchange channels shall be built with firebrick, soapstone, or other refractory materials laid in refractory mortar, fire clay mortar, or soapstone refractory mortar. Masonry units shall be laid with full mortar joints.

5.7.2 *Capping Slab*—A capping slab shall be of at least 57 mm (2¼ in.) in actual thickness above the uppermost heat exchange channels.

5.7.3 *Gas Slot*—When required, a gas slot shall have a cross-sectional area of at least 1/30 of the firebox floor area and a height of 30 mm (1¼ in.). Refer to Fig. 1, Fig. 2, Fig. 3, and Fig. 6 for typical locations.

5.8 *Shut-off Damper(s)*—One or more shut-off dampers may be installed near the juncture of the masonry heater and chimney or in the chimney. Each damper shall have external controls and be constructed of cast iron or steel of at least 12 gauge, 2.5 mm (0.10 in.) in thickness. To reduce the possibility of toxic gases escaping into the room, the cross-sectional area of the damper's opening shall be not less than 5 % of the interior cross sectional area of the flue.

5.9 *Chimney*—Vent masonry heaters with a low-heat type masonry chimney approved by the authority having jurisdiction or with a factory-built residential type chimney that meets the requirements of UL 103 HT.

5.9.1 The chimney shall not be supported by the interior walls of the masonry heater unless specifically designed to do so. The chimney can be built integrally with an exterior wythe of the masonry heater, provided the exterior wythe is constructed of solid masonry and has a minimum thickness of 100 mm (4 in.).

5.9.2 Flue sizes shall be in accordance with the design specification of the builder or the designer of the masonry heater.

5.10 *Chimney Connector*—The chimney connector shall be accessible for inspection and cleaning. Chimney connectors shall be airtight and fitted with airtight joints. Where differential movement can take place between a masonry heater and chimney, make provision for this movement in such a way as to maintain the integrity of the connector joints. Materials and methods of construction shall comply with the requirements of the authority having jurisdiction.

6. Typical Masonry Heater Types

6.1 There are several different masonry heater types. Fig. 1, Fig. 2, Fig. 3, Fig. 5, and Fig. 6 show the names and schematic sections of typical masonry heater designs.

7. Keywords

7.1 brick; Contraflow; firebrick; fire clay mortar; Grundofen; Kachelofen; Kakelugn; masonry heater; mortar; refractory mortar; Russian; soapstone refractory mortar

Annexe 3

Loi de l'état de Washington

173-433 WAC

Solid Fuel Burning Devices

Chapter 173-433 WAC

SOLID FUEL BURNING DEVICES

Last Update: 9/6/07

WAC

WAC 173-433-010 Purpose. This chapter, promulgated under chapters 43.21A and 70.94 RCW, establishes emission standards, certification standards and procedures, curtailment rules, and fuel restrictions for solid fuel burning devices.

[Statutory Authority: Chapters 70.94 and 43.21A RCW. 88-01-056 (Order 87-44), § 173-433-010, filed 12/16/87.]

WAC 173-433-020 Applicability. The provisions of this chapter apply to solid fuel burning devices in all areas of the state of Washington.

[Statutory Authority: Chapters 70.94 and 43.21A RCW. 88-01-056 (Order 87-44), § 173-433-020, filed 12/16/87.]

WAC 173-433-030 Definitions. The definitions of terms contained in chapter 173-400 WAC are incorporated by reference. Unless a different meaning is clearly required by context, the following words and phrases as used in this chapter, shall have the following meanings:

(1) "Adequate source of heat" means the ability to maintain seventy degrees Fahrenheit at a point three feet above the floor in all normally inhabited areas of a dwelling.

(2) "Certified" means that a woodstove meets emission performance standards when tested by an accredited independent laboratory and labeled according to procedures specified by the EPA in "40 CFR 60 Subpart AAA - Standards of Performance for Residential Wood Heaters" as amended through July 1, 1990.

(3) "Coal-only heater" means an enclosed, coal burning appliance capable of and intended for residential space heating, domestic water heating, or indoor cooking, which has all of the following characteristics:

(a) An opening for emptying ash which is located near the bottom or the side of the appliance;

(b) A system which admits air primarily up and through the fuel bed;

(c) A grate or other similar device for shaking or

[Statutory Authority: Chapter 70.94 RCW. 91-07-066 (Order 90-58), § 173-433-030, filed 3/20/91, effective 4/20/91. Statutory Authority: RCW 70.94.331. 90-19-062 (Order 90-10), § 173-433-030, filed 9/17/90, effective 10/18/90. Statutory Authority: Chapters 70.94 and 43.21A RCW. 89-02-054 (Order 88-38), § 173-433-030, filed 1/3/89; 88-01-056 (Order 87-44), § 173-433-030, filed 12/16/87.]

WAC 173-433-100 Emission performance standards. (1) Woodstoves. On or before January 1, 1995, a person shall not advertise to sell, offer to sell, sell, bargain, exchange, or give away a new woodstove in Washington unless it has been tested to determine its emission performance and heating efficiency and certified and labeled in accordance with procedures and criteria specified in "40 CFR 60 Subpart AAA - Standards of Performance for Residential Wood Heaters" as amended through July 1, 1990. After January 1, 1995, woodstove sales shall comply with the requirements of subsection (3) of this section, Solid fuel burning devices.

(2) Fireplaces. After January 1, 1997, a person shall not advertise to sell, offer to sell, sell, bargain, exchange, or give away a factory built fireplace unless it meets the 1990 United States Environmental Protection Agency standards for woodstoves or equivalent standard that may be established by the state building code council by rule. Subsection (3) of this section shall not apply to fireplaces, including factory built fireplaces, and masonry fireplaces.

(3) Solid fuel burning devices. After January 1, 1995, a person shall not advertise to sell, offer to sell, sell, bargain, exchange, or give away a solid fuel burning device in Washington unless it has been certified and labeled in accordance with procedures and criteria specified in "40 CFR 60 Subpart AAA - Standards of Performance for Residential Wood Heaters" as amended through July 1, 1990, and meets the following particulate air contaminant emission standards and the test methodology of the United States Environmental Protection Agency in effect on January 1, 1991, or an equivalent standard under any test methodology adopted by the United States Environmental Protection Agency subsequent to such date:

(a) Two and one-half grams per hour for catalytic woodstoves; and

(b) Four and one-half grams per hour for all other solid fuel burning devices.

(c) For purposes of this subsection, "equivalent" shall mean the emissions limits specified in this subsection multiplied by a statistically reliable conversion factor determined by ecology that relates the emission test results from the methodology established by the United States Environmental Protection Agency prior to May 15, 1991, to the test results from the methodology subsequently adopted by that agency.

[Statutory Authority: Chapter 70.94 RCW and 501-506 ESHB 1028, 1991. 93-04-105 (Order 91-55), § 173-433-100, filed 2/3/93, effective 3/6/93. Statutory Authority: Chapter 70.94 RCW.

(7) Waste petroleum products;
(8) Paints and chemicals; or
(9) Any substance which normally emits dense smoke or obnoxious odors other than paper to start the fire, properly seasoned fuel wood, or coal with sulfur content less than 1.0% by weight burned in a coal-only heater.

[Statutory Authority: Chapter 70.94 RCW. 91-07-066 (Order 90-58), § 173-433-120, filed 3/20/91, effective 4/20/91. Statutory Authority: RCW 70.94.331. 90-19-062 (Order 90-10), § 173-433-120, filed 9/17/90, effective 10/18/90. Statutory Authority: Chapters 70.94 and 43.21A RCW. 89-02-054 (Order 88-38), § 173-433-120, filed 1/3/89; 88-01-056 (Order 87-44), § 173-433-120, filed 12/16/87.]

WAC 173-433-130 General emission standards. In addition to the general applicability of chapter 173-400 WAC to all emission sources;
(1) Emissions detrimental to persons or property. No person shall cause or permit the emission of any air contaminant from an identifiable solid fuel burning device, including any air contaminant whose emission is not otherwise prohibited by this chapter, if the air contaminant emission causes detriment to the health, safety, or welfare of a person, plant or animal, or causes damage to property or business.
(2) Odors. Any person who shall cause or allow the generation of any odor from any solid fuel burning device which may interfere with any other property owner's use or enjoyment of his property must use recognized good practice and procedures to reduce these odors to a reasonable minimum.

[Statutory Authority: Chapter 70.94 RCW. 91-07-066 (Order 90-58), § 173-433-130, filed 3/20/91, effective 4/20/91. Statutory Authority: RCW 70.94.331. 90-19-062 (Order 90-10), § 173-433-130, filed 9/17/90, effective 10/18/90. Statutory Authority: Chapters 70.94 and 43.21A RCW. 89-02-054 (Order 88-38), § 173-433-130, filed 1/3/89.]

WAC 173-433-140 Impaired air quality criteria. Impaired air quality shall be determined by ecology or an authority in accordance with the following criteria:
(1) "First stage impaired air quality" - the first stage indicates the presence of:
(a) Particulate matter ten microns and smaller in diameter (PM_{10}) at or above an ambient level of seventy-five micrograms per cubic meter; or
(b) Carbon monoxide at or above an ambient level of eight parts of contaminant per million parts of air by volume (ppm).
(2) "Second stage impaired air quality" - the second stage indicates the presence of particulate matter ten microns and smaller in diameter (PM_{10}) at or above an ambient level of one hundred five micrograms per cubic meter.
(3) On or after July 1, 1995, if an authority has

a residence or commercial establishment within that geographical area with an adequate source of heat other than a solid fuel burning device shall not operate any solid fuel burning device.

(3) Whenever ecology has declared an air pollution episode at a level above forecast a person in a residence or commercial establishment within that geographical area with an adequate source of heat other than a solid fuel burning device shall not operate any solid fuel burning device.

(4) The following matrix graphically illustrates the applicability of different types of solid fuel burning devices to the provisions of subsections (1) through (3) of this section:

Burn Condition / Type of Device	Impaired Air Quality		Episode	
	First Stage	Second Stage	Forecast	Alert, Warning, or Emergency
Pellet Stove (nonaffected)	OK	NO	OK	NO
EPA Certified Woodstove	OK	NO	OK	NO
DEQ Phase 2 Woodstove	OK	NO	OK	NO
EPA Exempted Device	NO	NO	OK	NO
All Other Devices	NO	NO	OK	NO

NOTES: "OK" indicates that the device may be operated
"NO" indicates that the device may not be operated

(5) On or after July 1, 1995, an authority may prohibit use of solid fuel burning devices within specific geographical areas:

(a) The following factors shall be considered in the exercise of this limitation:

(i) The contribution of solid fuel devices that do not meet the standards set forth in "40 CFR 60 Subpart AAA -Standards of Performance for Residential Wood Heaters" as amended through July 1, 1990, to nonattainment of national ambient air quality standards;

(ii) The population density of the applicable geographical area; and

(iii) The public health effects of the use of solid fuel devices which do not meet the standards set forth in "40 CFR 60 Subpart AAA - Standards of Performance for Residential Wood Heaters" as amended through July 1, 1990.

(b) The following solid fuel devices are exempted from this limitation:

(i) Fireplaces;

(ii) Woodstoves certified and labeled by the EPA under "40 CFR 60 Subpart AAA - Standards of Performance for Residential Wood Heaters" as amended through July 1, 1990; or

(iii) Nonaffected pellet stoves.

(c) An authority shall allow an exemption from this subsection for low-income persons who reside in the geographical area affected by this subsection.

(6) On or after July 1, 1995, whenever an authority has

Annexe 4

Défénition d'un foyer de masse selon la Masonry Heater Association

Un foyer de masse est une unité de chauffage en maçonnerie assemblée sur place et qui possède la capacité d'emmagasiner la chaleur par des feux intermittents afin de la relâcher tranquillement dans un bâtiment. Il possède une boîte à feu des canaux d'échange de chaleur construits l'aide de composantes réfractaires.

Selon la définition établie et votée par la Masonry Heater Association of North America, un foyer de masse doit répondre à ces exigences :

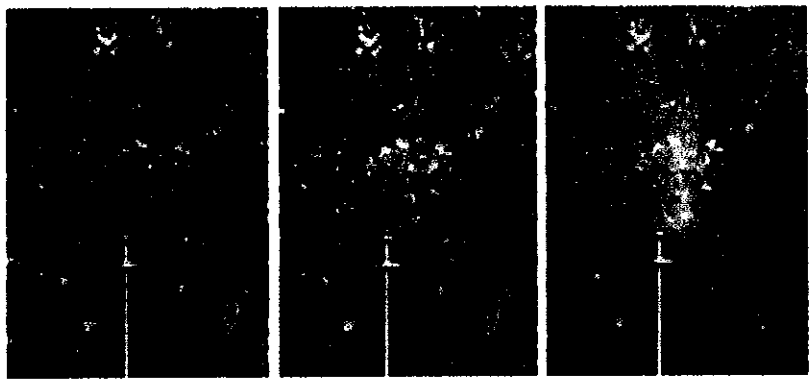
- Un poids minimum de 800 kg
- Une porte hermétique fermée lors des feux
- La surface externe du foyer ne doit pas dépasser 230F (110 C)
- L'épaisseur totale de la maçonnerie ne doit pas excéder 250mm
- Les canaux d'échange de chaleur doivent comporter au moins un changement de direction d'au minimum 180 degrés avant d'atteindre la cheminée
- Le plus court chemin entre la boite à feu et l'entrée de la cheminée doit être au moins deux fois plus long que la dimension maximale de la boite à feu.

pscleanair.org
Puget Sound Clean Air Agency

Washington State Opacity Standards

Generating excessive smoke is not only un-neighborly, it's illegal. Under state regulations, smoke from your solid fuel burning device cannot exceed 20 percent opacity for six consecutive minutes. When a burn ban is in effect, it is illegal to generate any visible smoke at all (excluding the first 20 minutes of start-up). Violating smoke emission regulations could result in fines from the Puget Sound Clean Air Agency.

Excessive chimney smoke



20% (legal) **40% (illegal)** **80% (egregious)**

Additional resources

Washington Administrative Code, Section 173-433-110.

For tips on how to minimize smoke, visit "**Burning Basics.**"

Mark Twain wrote the following description in *'Europe and Elsewhere'*. Although he spoke of German fireplaces specifically, his words are now true (in proportion) for all of the Masonry Heaters that we install.

"Take the German stove, for instance ... where can you find it outside of German countries? I am sure I have never seen it where German was not the language of the region. Yet it is by long odds the best stove and the most convenient and economical that has yet been invented.

To the uninstructed stranger it promises nothing; but he will soon find that it is a masterly performer, for all that. It has a little bit of a door which seems foolishly out of proportion to the rest of the edifice; yet the door is right; for it is not necessary that bulky fuel shall enter it. Small-sized fuel is used, and marvelously little at that. The door opens into a tiny cavern which would not hold more fuel that a baby could fetch in its arms. The process of firing is quick and simple. At half past seven on a cold morning the servant brings a small basketful of slender pine sticks - say a modified armful - and puts half these in, lights them with a match, and closes the door. They burn out in ten or twelve minutes. He then puts in the rest and locks the door, and carries off the key. The work is done. He will not come again until the next morning.

All day long and until past midnight all parts of the room will be delightfully warm and comfortable, and there will be no headaches and no sense of closeness or oppression. In an American room, whether heated by steam, hot water, or open fires, the neighborhood of the register or the fireplace is warmest - the heat is not equally diffused throughout the room; but in a German room one is as comfortable in one part of it as in another. Nothing is gained or lost by being near the stove. Its surface is not hot; you can put your hand on it anywhere and not get burnt.

Consider these things. One firing is enough for the day; the cost is next to nothing; the heat produced is the same all day, instead of too hot and too cold by turns; one may absorb himself in his business and peace; he does not need to feel any anxieties or solicitudes about his fire; his whole day is a realized dream of bodily comfort.

America could adopt this stove, but does America do it? The American wood stove, of whatsoever breed, it is a terror. There can be no tranquility of mind where it is. It requires more attention than a baby. It has to be fed every little while, it has to be watched all the time; and for all reward you are roasted half your time and frozen the other half. It warms no part of the room but its own part; it breeds headaches and suffocation, and makes one's skin feel dry and feverish; and when your wood bill comes in you thin you have been supporting a volcano.

We have in America many and many a breed of coal stove also - fiendish things, everyone of them. The base burner sort are heady and require but little attention; but none of them distributes its heat uniformly through the room, or keeps it at an unwavering temperature, or fails to take the life out of the atmosphere and leave it stuffy and smothery and stupefying..."

from *'Europe and Elsewhere'* by Mark Twain