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TESTING OF *STOVETOP FIRESTOP® PLUS (STFS+)*, IN GENERAL ACCORDANCE WITH UL SUBJECT 300A, OUTLINE OF INVESTIGATION FOR EXTINGUISHING SYSTEM UNITS FOR RESIDENTIAL RANGE TOP COOKING SURFACES (ISSUE NO. 3, NOVEMBER 21, 2006)

FINAL REPORT
Consisting of 18 Pages

SwRI® Project No.: 01.21602.16.104
Test Date: January 25-26, 2016
Report Date: February 12, 2016

Prepared for:

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Prepared by:

A handwritten signature in black ink, appearing to read "J. Huczek".

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1.0 INTRODUCTION

The objective of the test program was to evaluate the functionality of the StoveTop FireStop[®] Plus automatic fire suppression units in typical residential indoor cooktop fire situations. Testing was conducted in general accordance with UL Subject 300A, *Outline of Investigation for Extinguishing System Units for Residential Range Top Cooking Surfaces (Issue No. 3, November 21, 2006)*, at the Client's test facility, located in Fort Worth, Texas. The testing was conducted in general accordance, since not all the tests described in UL 300A were performed. However, the test setup and extinguishment tests were very similar to Test No. 8, described in Table 4.1 of UL 300A.

Jason Huczek, representing Southwest Research Institute, was present to witness testing. This report documents the testing performed and the results obtained.

The test methods described in this report are intended to measure and describe the properties of materials or products in response to heat and flame under controlled laboratory conditions. The results should not be used alone to describe or appraise the fire hazard or the fire risk of materials, products, or assemblies under actual fire conditions. However, results of this test may be used as elements of a complete fire hazard for fire risk assessment, which takes into account all the factors that are pertinent to an assessment of the fire hazard or risk of a particular end-use.

The results presented in this report apply specifically to the specimens tested, in the manner tested, and not to the entire production of these or similar materials, nor to the performance when used in combination with other materials.

2.0 FIRE SUPPRESSION SYSTEM DESCRIPTION

The Client identified the system under test as, *Automatic Fire Suppression System for Grease Fires on Indoor Residential Cooktops (Class K)*. The specific product tested was the StoveTop Firestop[®] Plus device (Model No. 679-3). A product data sheet for this device can be referenced in Appendix A.

Figure 1 shows a photograph of the devices in their bulk and individual packaging. Figure 2 provides a close-up photograph of two angles of the device out of the packaging. Figure 3 shows two angles of the devices installed prior to a fire test.



Figure 1. Stovetop Firestop® Bulk and Individual Packaging.



Figure 2. Stovetop Firestop® Close-up View.



Figure 3. Stovetop Firestop® Installed Prior to a Fire Test.

3.0 TEST CONFIGURATION AND PROCEDURE

The testing was conducted in the WilliamsRDM fire test facility which was constructed to replicate a typical kitchen environment. The facility is climate controlled and contains a residential electric stove manufactured by Hotpoint (model number RB526D H1WW). A residential range hood manufactured by Broan (model number 42000) is positioned above the stove and the mounting height is adjustable to allow the distance from the stove to the hood to be varied as desired. Metal partitions are mounted to both sides of the range hood to simulate upper cabinets which are present in typical kitchen arrangements.

Two range hood mounting heights were tested, 22 in. and 32 in., as measured from the burner surface to the unit mounting surface inside the range hood. These mounting heights represent the lower and upper range of typical kitchen arrangements, based on a survey conducted by WilliamsRDM.

Two skillet sizes were tested, 10-in and 13-in diameter. These diameters are at the upper and lower ranges of the majority of skillets used for residential cooking, based on a survey conducted by WilliamsRDM. Cast iron construction was selected for both skillets. This represents a worst case due to its composition and thicker construction and likely makes the re-ignition potential greater because it retains heat longer. The oil depth is to be approximately 3/8-in. for the 10-in. diameter skillet tests and 1/2-in. for 13-in diameter skillet tests.

Two oil types were tested. Vegetable and Canola oil were selected because they are the most common oils used for residential shallow pan cooking, based on a survey conducted by WilliamsRDM. Figure 4 shows a photograph of the oil used during testing.



Figure 4. Oil Used for Fire Tests (Left: Vegetable, Right: Canola).

Instrumentation for the testing included a thermocouple (Omega Engineering, Type K, part number – TJ36-CAXL-14G-18) to measure the oil temperature, a data logger (Extech Instruments, 3 Channel Data logging Thermometer – Model SD200) to record the oil temperature and a video system to document each test and record observations.



Figure 5. Oil Temperature Measurement (Left: Thermocouple Probe, Right: Data Logger).



Figure 6. Photograph of Video Test Screen.

4.0 TEST PROCEDURE

For each test, the skillet is to be placed on the largest burner at the front of the stove. The largest burner produces the most heat input to the skillet and the front position is the location most used in residential cooking applications. This position is also the most difficult to suppress for an automatic fire suppression device, based on a survey conducted by WilliamsRDM. The burner was set at the highest setting for all tests. The general test procedure used for all testing was as follows:

1. Place fire suppression units in range hood per published mounting instructions
2. Place skillet on largest front burner (cast iron 10/13-in. diameter)

3. Pour oil into skillet (vegetable/canola to specified depth)
4. Position thermocouple in oil (tip to be approx. 1/8-in. below the surface)
5. Record unit mounting height
6. Record skillet size and material
7. Record oil type (vegetable or canola)
8. Record oil depth and volume
9. Start video recording
10. Turn on range hood fan
11. Turn on burner to the highest setting
12. Heat oil to auto-ignition point
13. Allow fire to grow
14. Observe actuation of unit and suppression of the fire
15. Turn burner off after unit actuation
16. Observe skillet oil temp until it falls below 650°F (below auto-ignition temp)
17. Observe stove surface for oil splash and record observations
 - a. Splash, yes or no? (y/n)
 - b. If yes, number (no.) drops over dime size
18. Playback video and record data
 - a. Time to oil auto-ignition
 - b. Oil temperature at auto-ignition time
 - c. Time to unit actuation from auto-ignition time
 - d. Oil temperature at unit actuation
 - e. Time to fire extinguishment from unit actuation
 - f. Time from unit actuation to oil temperature decrease to 650°F, or to re-ignition
19. Clean all surfaces and cool the test pan to ambient temperature before next test.

5.0 RESULTS

Testing was conducted in general accordance with UL 300A, and per the procedure outlined above, at the Client's test facility, located in Fort Worth, Texas. Jason Huczek, representing Southwest Research Institute, was present to witness testing. Table 1 provides a summary of the observations and results for each test. The *Stovetop Firestop® Plus Device* successfully extinguished all the test fires without re-ignition and minimal splashing was observed on two of the tests. Test 1 had a single drop approximately 1/8-in diameter on the cooking surface. Test 6 had a single drop with a diameter that was between a dime and a nickel size on the cooking surface. Neither drop was flaming upon landing on the cooking surface. Figures 7-14 provide selected photographs from each test.

Table 1. Summary of Test Results for Stovetop Firestop® Plus Device.

Test Date	Test No.	Skillet Diameter (inches)	Oil Depth (inches)	Amount of Oil (cups)	Oil Type	Mounting Height (inches)	Time to Oil Auto-Ignition (min:s)	Oil Temp at Ignition (°F)	Time to Actuation from Ignition (s)	Oil Temp at Actuation (°F)	Time to Ext. from Actuation (s)	Time from Actuation to 650°F Oil Temp (min:s)	Oil Splash on Stove Surface (Y/N)	No. Splash Drops over Dime Size
01/25/16	1	10	3/8	1.2	Vegetable	22	8:28	712.7	25	809.7	2	6:28	Y	0
	2	10	3/8	1.2	Canola	22	8:21	724.2	18	791.4	2	4:30	N	N/A
	3	13	1/2	3.5	Vegetable	22	19:29	716.3	26	749.8	1	3:20	N	N/A
	4	13	1/2	3.5	Canola	22	20:27	721.0	30	777.2	2	3:07	N	N/A
01/26/16	5	10	3/8	1.2	Vegetable	32	8:55	723.0	33	831.7	5	3:34	N	N/A
	6	10	3/8	1.2	Canola	32	8:54	717.8	27	824.0	2	3:23	Y	1
	7	13	1/2	3.5	Vegetable	32	20:39	672.4	35	767.3	2	3:16	N	N/A
	8	13	1/2	3.5	Canola	32	24:19	676.9	44	811.9	3	3:03	N	N/A

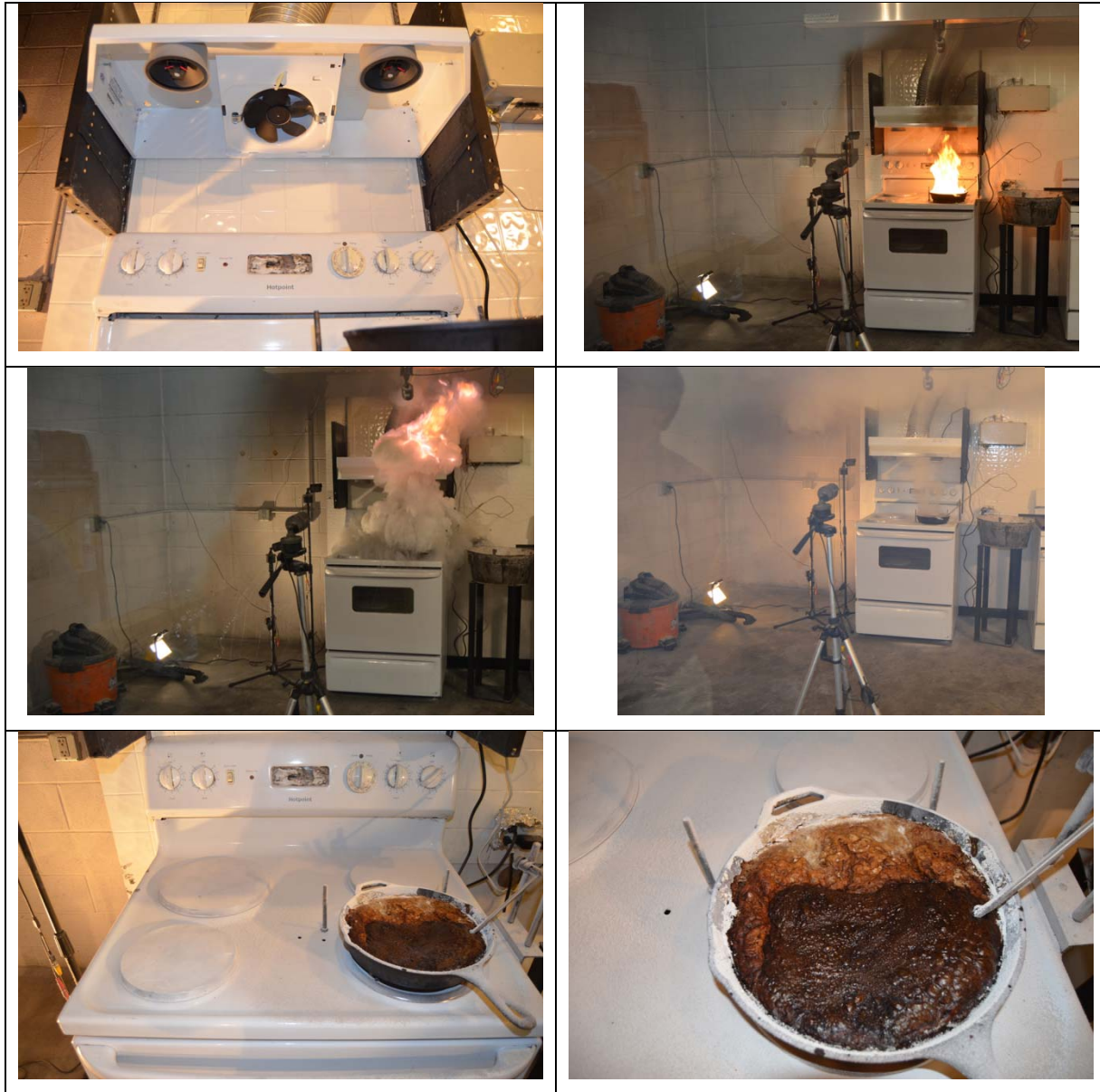


Figure 7. Selected Photographs from Test 1.



Figure 8. Selected Photographs from Test 2.



Figure 9. Selected Photographs from Test 3.



Figure 10. Selected Photographs from Test 4.

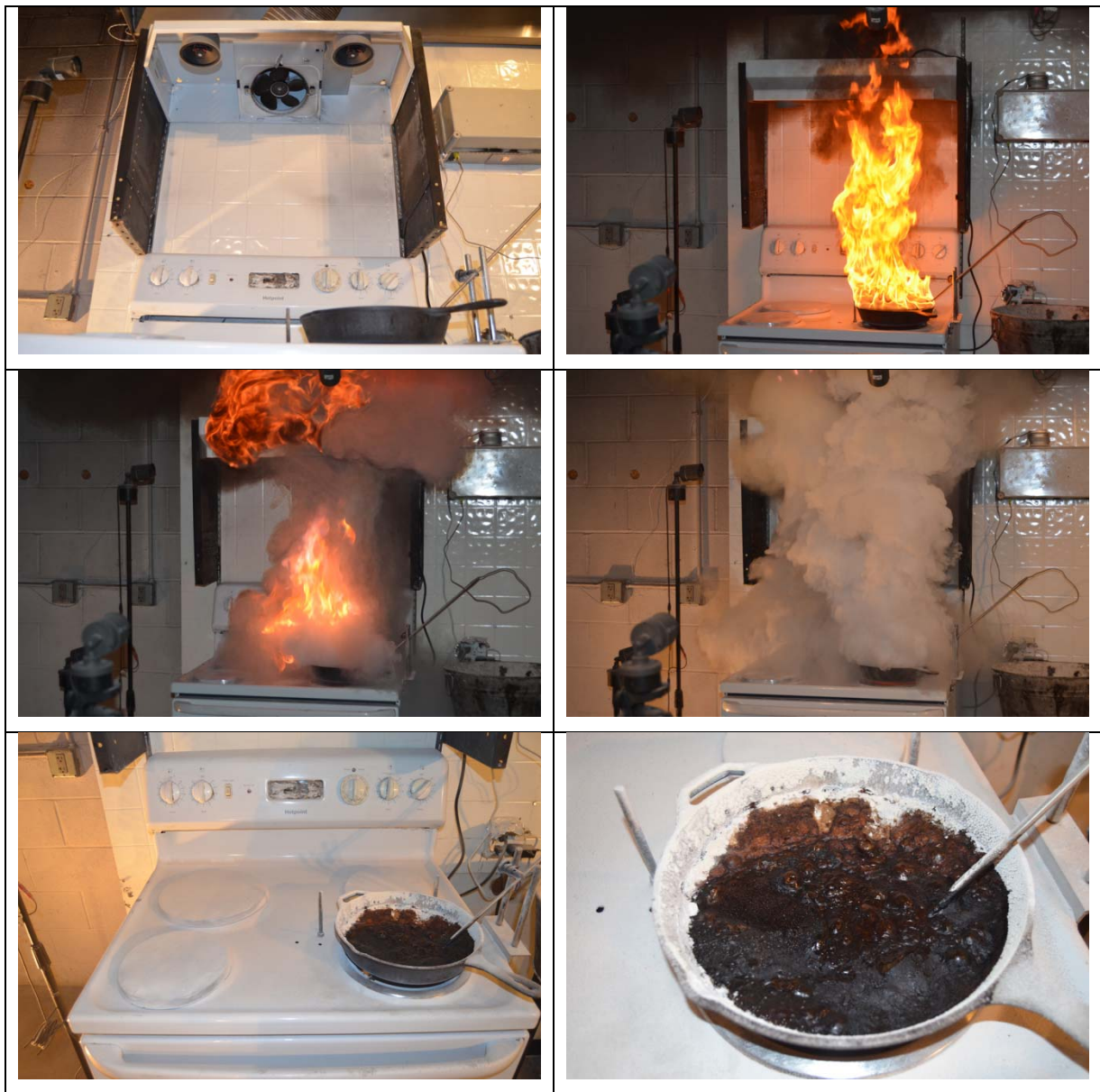


Figure 11. Selected Photographs from Test 5.

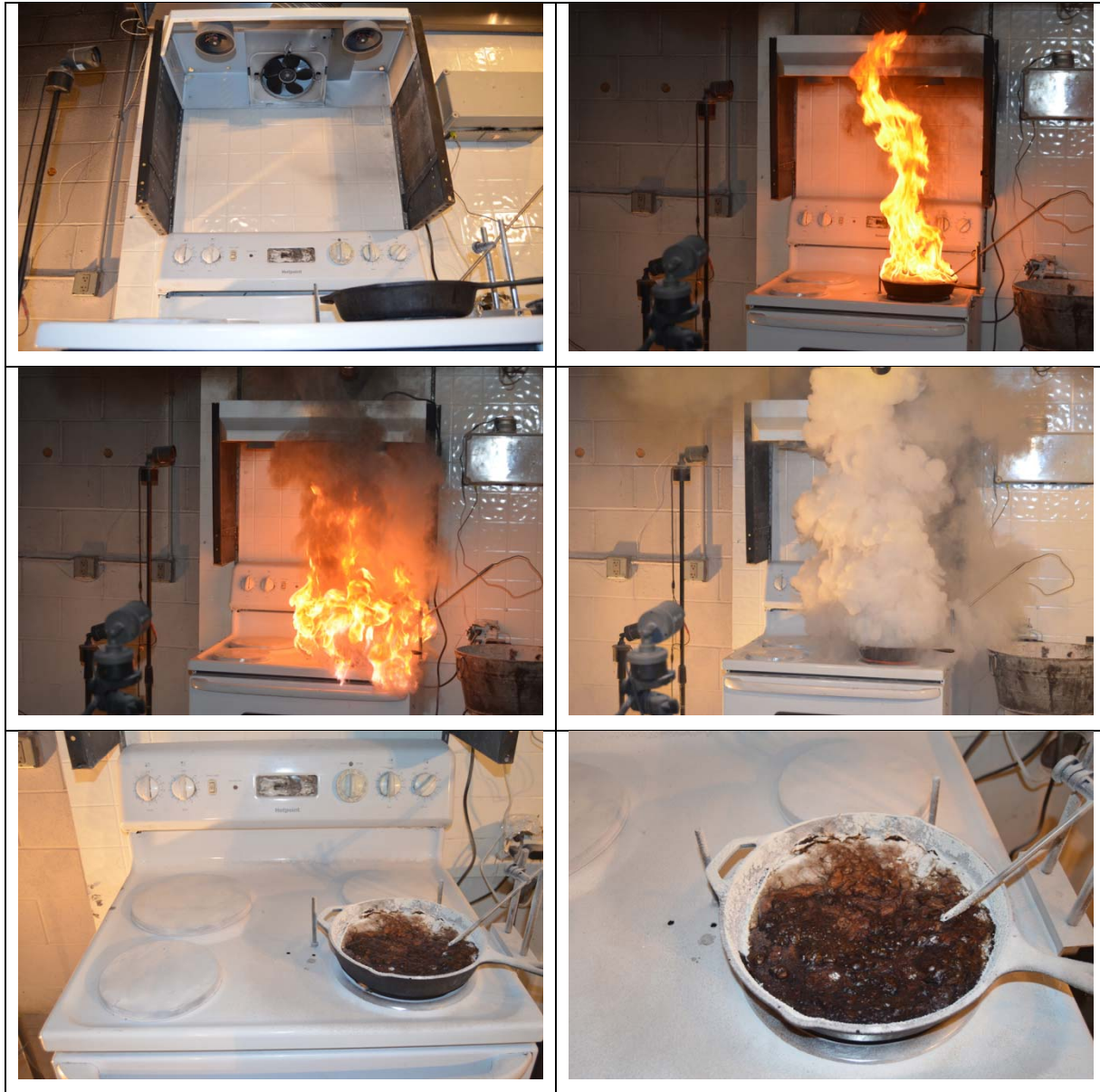


Figure 12. Selected Photographs from Test 6.



Figure 13. Selected Photographs from Test 7.



Figure 14. Selected Photographs from Test 8.

APPENDIX A
CLIENT-SUPPLIED PRODUCT DATA SHEET
(CONSISTING OF 2 PAGES)



from The Original StoveTop FireStop

STFS-Plus.com

**AUTOMATIC FIRE SUPPRESSION
FOR GREASE FIRES ON INDOOR
RESIDENTIAL COOKTOPS
(CLASS K)**

⚠WARNING

- For use only on electric cooktops.
- Turn burner OFF after activation.
- Reignition is possible.
- Failure to install product according to instructions could result in excessive splashing of grease and/or failure to suppress fire.
- Falling powder may cause grease to splash.
- NOT intended for cooking with more than 1/2" oil depth before food is added.
- Follow NFPA Cooking Safety Tips.
- WilliamsRDM, Inc. does not warranty this product to suppress all fires.

⚠ADVERTENCIA

- Para uso exclusivo en superficies de cocción eléctricas.
- APAGUE el quemador después de la activación.
- Es posible un nuevo encendido.
- Si el producto no se instala según las instrucciones, puede tener lugar la salpicadura excesiva de grasa y/o la no extinción del incendio.
- La caída del polvo puede causar salpicaduras de grasa.
- NO fue diseñado para cocinar con más de 1/2" de profundidad de aceite antes de agregar los alimentos.
- Siga los Consejos de Seguridad para Cocinar de la NFPA.
- WilliamsRDM, Inc. no garantiza que este producto extinguirá todos los incendios.

⚠AVERTISSEMENT

- À utiliser uniquement sur les plaques de cuisson électriques.
- ÉTEINDRE le brûleur après l'activation.
- Le réallumage est possible.
- Si le produit n'est pas installé suivant les instructions, des éclaboussures excessives de graisse pourraient se produire et/ou le feu pourrait ne pas être éteint.
- La chute de la poudre peut causer des éclaboussures de graisse.
- NON prévu pour une cuisson avec plus de 1,27 cm (1/2 po) d'huile avant ajout des aliments.
- Suivre les conseils de sécurité de la NFPA.
- WilliamsRDM Inc. ne garantit pas que ce produit peut supprimer tous les incendies.

⚠CAUTION

- Keep away from children.
- Avoid exposure to suppressing powder if wearing contacts, or have respiratory illness or skin allergies.
- Contents may be harmful if swallowed.
- Suppressing powder is non-toxic but could cause skin irritation. In case of contact with powder, flush from affected area with clean, cool water.
- If irritation persists, contact a physician immediately.
- Discard product after use.
- Discard product if dropped or damaged.

⚠PRECAUCIÓN

- Mantenga fuera del alcance de los niños.
- Evite la exposición al polvo de extinción si utiliza lentes de contacto o sufre enfermedades respiratorias o alergias de la piel.
- El contenido puede ser dañino si se ingiere.
- El polvo de extinción no es tóxico pero puede causar irritación de la piel. En caso de contacto con el polvo, enjuague la zona afectada con agua limpia y fría.
- Si la irritación persiste, comuníquese con un médico inmediatamente.
- Deseche el producto después del uso.
- Deseche el producto si se deja caer o está dañado.

⚠ATTENTION

- Maintenez hors de portée des enfants
- Évitez l'exposition à la poudre à éteindre le feu si vous portez des lentilles de contact, avez une maladie respiratoire ou des allergies cutanées.
- Le contenu peut être nocif s'il est avalé.
- La poudre à éteindre le feu n'est pas toxique, mais pourrait causer des irritations cutanées. En cas de contact avec la poudre, rincez la zone touchée avec de l'eau fraîche et propre.
- Jetez le produit après usage.
- Jetez le produit en cas de chute ou s'il est endommagé.

<p>[A]</p>	<p>[B]</p>	<p>[C]</p>	<p>[D]</p>
<p>INSTALLATION</p> <p>A) Must have 22-32" (56-81 cm) between surface of cooktop and mounting point in range hood.</p> <p>B) Position canisters in range hood at the midpoint between the center of front and back burners on each side.</p> <p>C) Clean and dry areas in range hood where both magnets will attach.</p> <p>D) Raise canisters to the spot directly above in range hood.</p> <p><i>If the magnet does not attach, contact us for a free installation kit.</i></p>	<p>INSTALACION</p> <p>A) Debe tener 22-32" (56-81 cm) entre la superficie de cocción y el punto de montaje en la campana de extracción.</p> <p>B) Coloque las latas en la campana de extracción en el punto intermedio entre el centro de los quemadores delanteros y traseros de cada lado.</p> <p>C) Limpie y seque las zonas de la campana de extracción en las que se fijarán ambos imanes.</p> <p>D) Levante las latas al lugar directamente arriba en la campana de extracción.</p> <p><i>Si el imán no se fija, comuníquese con nosotros para obtener un juego de instalación gratis.</i></p>	<p>INSTALLATION</p> <p>A) Il doit y avoir un espace de 56-81 cm (22-32 po) entre la surface de la plaque de cuisson et le point de montage dans la hotte.</p> <p>B) Placez les cartouches dans la hotte à un point central entre le milieu des brûleurs avant et arrière de chaque côté.</p> <p>C) Nettoyez et séchez les endroits de la hotte où les deux aimants seront fixés.</p> <p>D) Soulevez les cartouches au point directement au-dessus dans la hotte.</p> <p><i>Si l'aimant ne se fixe pas, veuillez communiquer avec nous pour une trousse d'installation gratuite.</i></p>	

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<p>NOTICE</p> <ul style="list-style-type: none"> Read entire product label and user's manual, available at stfs.com/safety. Failure to remove or replace by noted "remove or replace before" date could diminish effectiveness of product. This product activates automatically by direct sustained contact with flame. At time of activation, a loud "POP" will occur. This is normal and meant to alert occupants, if present. Do NOT use if product cannot be installed correctly. Fuse and label should NOT come in contact with water or other liquids. When suppressing powder comes in contact with fire, it may briefly flare. This is normal and a temporary reaction before powder suppresses fire. 	<p>AVISO</p> <ul style="list-style-type: none"> Lea la etiqueta del producto y el manual del usuario completos (el manual está disponible en www.STFS.com/safety). No retirar o reemplazar el producto según la fecha de "retirar o reemplazar" puede disminuir la eficacia del mismo. Este producto se activa automáticamente mediante el contacto directo sostenido con las llamas. Al momento de la activación, se escuchará un "POP" sonoro. Esto es normal y fue diseñado para alertar a los ocupantes, si están presentes. NO utilice el producto si no puede instalarlo correctamente. El fusible y la etiqueta NO deben entrar en contacto con agua ni otros líquidos. Cuando el polvo de extinción entra en contacto con el fuego, puede producirse una breve llamarada. Esto es normal y se trata de una reacción temporal antes de que el polvo extinga el incendio. 	<p>AVIS</p> <ul style="list-style-type: none"> Lisez en entier l'étiquette du produit, ainsi que le manuel de l'utilisateur (le manuel est disponible à www.STFS.com/safety). S'il n'est pas retiré ou remplacé à la date indiquée pour son retrait ou son remplacement, le produit pourrait perdre de son efficacité. Le produit s'active automatiquement en cas de contact direct soutenu avec une flamme. Au moment de son activation, un fort bruit sec se fera entendre. C'est normal et prévu pour alerter les occupants, s'ils sont présents. N'utilisez PAS le produit s'il est impossible de l'installer correctement. Le fusible et l'étiquette ne doivent PAS entrer en contact avec de l'eau ou d'autres liquides. Lorsque la poudre a éteint le feu entre en contact avec le feu, elle peut flamboyer brièvement. C'est normal, il s'agit d'une réaction temporaire avant que la poudre n'étouffe le feu.
<p>FIRE SAFETY</p> <ul style="list-style-type: none"> Unattended cooking is the leading cause of fires in the kitchen. Many injuries occur when occupants attempt to fight the fire themselves. Never leave anything cooking on the cooktop unattended! If you have to leave the kitchen—even for a short time—turn off the cooktop. Never leave home while you are cooking. If you pick up a flaming pan, you may be burned, or if the pan is dropped, flames may quickly spread to other more flammable areas. Never use water to fight a grease fire! A violent explosion may result. Wet dishcloths or towels are also dangerous. 	<p>SEGURIDAD CONTRA INCENDIOS</p> <ul style="list-style-type: none"> La falta de supervisión cuando se cocina es la causa principal de incendios en la cocina. Muchas de las lesiones tienen lugar cuando los ocupantes intentan apagar el incendio ellos mismos. ¡Nunca deje nada cocinándose en la superficie de cocción sin supervisión! Si tiene que salir de la cocina, aun si es por un periodo breve, apague la superficie de cocción. Nunca salga de su casa mientras está cocinando. Si levanta una sartén en llamas puede quemarse, o si se le cae la sartén las llamas pueden propagarse rápidamente a otras zonas más inflamables. ¡Nunca utilice agua para extinguir un incendio de grasa! Puede tener lugar una explosión violenta. Los paños o toallas húmedas también son peligrosos. 	<p>SÉCURITÉ INCENDIE</p> <ul style="list-style-type: none"> Une cuisson sans surveillance est la cause principale des feux dans la cuisine. De nombreuses blessures sont causées lorsque des occupants tentent de lutter par eux-mêmes contre le feu. Ne laissez jamais quelque chose cuire sans surveillance! Si vous devez quitter la cuisine—même pour un court moment—éteignez la plaque de cuisson. Ne sortez jamais de chez vous pendant que vous cuisinez. Si vous saisissez une poêle en feu, vous risquez de vous brûler et, si vous la laissez tomber, les flammes peuvent rapidement s'étendre à d'autres zones plus inflammables. N'employez jamais d'eau pour lutter contre un feu de graisse! Une violente explosion peut en résulter. Les torchons ou les serviettes mouillées sont aussi dangereux.
<p>MANUFACTURER'S INFORMATION</p> <p>Designed solely for suppressing cooktop grease fires in indoor residential kitchens only.</p> <p>Products do not need to be recharged or inspected by a fire service professional.</p> <p>For storage and disposal information, or to learn more about StoveTop FireStop, please visit our website at www.STFS.com or call 1-888-616-7976.</p> <p>Designed & manufactured by WilliamsRDM, Inc., Fort Worth, TX, USA.</p>	<p>INFORMACIÓN DEL FABRICANTE</p> <p>Diseñado exclusivamente para la extinción de incendios de grasa en superficies de cocción de cocinas residenciales interiores únicamente.</p> <p>No es necesario recargar los productos ni se deben someter a la inspección de un profesional de servicios contra incendios.</p> <p>Para obtener información sobre almacenamiento y eliminación, o para obtener información adicional sobre StoveTop FireStop, visite nuestro sitio web en www.STFS.com o llame al 1-888-616-7976.</p> <p>Diseñado y fabricado por WilliamsRDM, Inc., Fort Worth, TX, USA.</p>	<p>INFORMATIONS DU FABRICANT</p> <p>Conçu uniquement pour éteindre les feux dus à la graisse sur des plaques de cuisson, dans les cuisines à l'intérieur des résidences seulement.</p> <p>Il n'est pas nécessaire de recharger les produits ou de les faire inspecter par un professionnel des services d'incendie.</p> <p>Pour obtenir des renseignements sur l'entreposage et l'élimination, ou pour en apprendre plus sur le StoveTop FireStop, veuillez consulter notre site web à www.STFS.com ou appeler le 1-888-616-7976.</p> <p>Conçu et fabriqué par WilliamsRDM, Inc., Fort Worth, TX, É-U.</p>
<p>LIMITED WARRANTY</p> <div> <div data-bbox="293 1297 651 1684"> <p>WilliamsRDM, Inc. ("WRDM") warrants this StoveTop FireStop® product against defects in material or workmanship for the time periods and under the terms set forth below. Pursuant to this Limited Warranty, WRDM will, at its option, (i) repair the product using new or refurbished parts or (ii) replace the product with a new or refurbished product. For purposes of this Limited Warranty, "refurbished" means a product or part that has been returned to its original specifications. In the event of a defect, these are your exclusive remedies.</p> <p>WRDM warrants to the original retail purchaser all WRDM products for a period of one (1) year against defective material and faulty workmanship. Any unit found to be defective during the warranty period will be repaired if possible, or replaced free of charge upon the buyer's prepaid return of the defective unit—only after receipt of an official Return Material Authorization (RMA) number. Proof of retail purchase is required. This warranty gives the buyer specific legal rights which may vary by state (or country).</p> <p>THE FORGOING WARRANTY IS MADE IN LIEU OF ALL OTHER WARRANTIES WITH RESPECT TO THIS PRODUCT, INCLUDING</p> </div> <div data-bbox="662 1297 1019 1684"> <p>ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE—WHICH ARE HEREBY DISCLAIMED. THERE ARE NO IMPLIED WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF. NO PERSON IS AUTHORIZED TO GIVE ANY OTHER WARRANTY, OR TO ASSUME FOR WRDM ANY OTHER LIABILITY IN CONNECTION WITH THE SALE OR INSTALLATION OF ITS PRODUCTS.</p> <p>REPLACEMENT OF THE PRODUCT WILL BE THE SOLE REMEDY WITH RESPECT TO ANY LOSS OR DAMAGE TO PROPERTY. BUYER IS NOT RELYING ON SELLER'S JUDGMENT REGARDING BUYER'S PARTICULAR REQUIREMENTS AND BUYER HAS HAD AN OPPORTUNITY TO INSPECT THE PRODUCT TO BUYER'S SATISFACTION. UNAUTHORIZED SERVICE OF ANY KIND INVALIDATES ALL WARRANTY PROVISIONS.</p> <p>This Limited Warranty covers only the hardware components packaged with this product. It does not cover technical assistance for hardware. Any parts or product replaced under this Limited Warranty will become the property of WRDM.</p> <p>LIMITATION ON DAMAGES: WRDM SHALL NOT BE LIABLE FOR</p> </div> <div data-bbox="1031 1297 1383 1684"> <p>ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO ANY SUCH DAMAGES FOR ANY BREACH OF ANY EXPRESS OR IMPLIED WARRANTY ON THIS PRODUCT.</p> <p>Instructions: To obtain warranty service, you must deliver the product, freight prepaid, in either its original packaging, or packaging affording an equal degree of protection, to WRDM's specified manufacturing facility.</p> <p>This Limited Warranty only covers product issues caused by defects in material or workmanship during ordinary consumer use; it does not cover product issues caused by any other reason, including but not limited to product issues due to commercial use, acts of God, misuse, limitations of technology, or modification of or to any part of the WRDM product. This Limited Warranty is invalid if either the factory-applied work order number or date code has been altered or removed from the product. This Limited Warranty is valid only in the United States.</p> <p>For StoveTop FireStop customer service: go to www.STFS.com or call 1-888-616-7976.</p> </div> </div>		