THE STATE OF SOUTH CAROLINA
In The Court of Appeals

APPEAL FROM CHARLESTON COUNTY
Court of Common Pleas

Diane Goodstein, Circuit Court Judge

RECEIVED
AUG 15 2019
SC Court of Appeals

Case No. 2012-CP-10-7594
Appellate Case No. 2018-001230

One Belle Hall Property Owners Association, Inc., and Marvin T. Meek and Francis E. Hill, individually and on behalf of all others similarly situated,..... Respondents,

v.

Builders FirstSource-Southeast Group, LLC, ... Appellant.

RECORD ON APPEAL
VOLUME IV

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Nelson Mullins Riley & Scarborough LLP
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Attorneys for Respondents One Belle Hall Property Owners Association, Inc., and Marvin T. Meek and Francis E. Hill, Individually and on behalf of all others similarly situated

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Certificate of Counsel

DATE: January 16, 2006

PO #: 0410230-34 Southeast Group LLC @

TO: Builders First Source- ~~Total Opening Sales~~
430 Leisure Lane
Catawba, SC 29704
Contact: Larry Bratton
Phone #: 803-328-3685
Fax #: 803-328-3839
Tax ID #:

SHIP TO: TCR NC Construction I Limited Partnership
Belle Hall Condominiums
1000 South Egypt Road
Mt. Pleasant, SC 29464
ATTN: Micky Rodgers: 843-200-1019
WHEN TO SHIP: When Requested
SHIP VIA: Sellers Truck
INVOICE DUE: 1st of the month
PAID ON OR ABOUT: 5th of the month
COST CODE: 10-08-510

Qty	Model No.	Description	Unit Price	Totals
		ESP Industries-vinyl/single hung/insulated,		
		Impacted rated, 2031 Series. Factory mulled, 4 lite		
		Over 1 lite window. Screens Included		
45	Window A2	2/8 x 6/0 ESP 2031 Series Window 4/1	$350.87	$15,789.15
66	Window A2	2/8/ x 6/0 ESP 2031 Series Window 4/1 Tempered	$416.13	$27,464.58
208	Window B2	(2) Twin 2/8 x 6/0 ESP 2031 Series Window 4/1-Factory Mulled	$758.60	$157,788.80
5	Window C2	2/0 x 4/0 ESP 2031 Series Window 4/1	$210.36	$1,051.80
				$202,094.33
		Sub Total:		$13,136.13
		Tax Total @ 6.5%		$215,230.46
		TOTAL		
		Windows to be delivered in truck loads quantities		
		ordered by the project superintendent. Windows		
		will be counted and inspected after and while		
		unloading. Supplier shall replace any damaged		
		windows from shipment.		

Please Mail Invoices To:

TCR NC Construction I
Limited Partnership
230 Seven Farms Drive, Suite 104
Charleston, SC 29492
T: 843-278-2892 F: 843-278-2894

Acceptance of Offer: The Vendor does hereby accept the above offer subject to the terms on all pages hereof, said acceptance being made this

14 Day of April, 2006

RECEIVED
AUG 18 2006
BY:

AGREED TO:

Dave Clements- Vice President

SIGNED BY:

TITLE: AVP

Subject to Attached Contract Addendum

PLAINTIFF'S EXHIBIT 44

TCR
0005024

(a) Immediately sign and return the confirmation copy of this order. Until this executed copy is received by the Vendee, the right to cancel by oral or written notice is reserved.

(b) The entire contract between the parties consists of this purchase order and any documents incorporated by reference as stated herein and no other acceptance or acknowledgment or other conditions will apply. Amendments, if any, will be made in writing by mutual agreement only and must be signed by both parties."

2. INVOICING:

(a) Invoices shall be rendered ~~in quadruplicate~~ for each and every shipment.

(b) Original ~~and two copies of~~ express or freight bill, with transportation charges shown thereon, and stamped by the carrier, shall ~~accompany all invoices~~ be left at time of delivery.

(c) this purchase order number must appear on all copies of the invoice. The articles or services must be described in terms used in this order, must itemize all components and be complete as to quantity, grade, type, size, weight, etc.

3. SHIPPING:

(a) At the time of delivery to the carrier at point or origin, written notice of shipment is to be furnished the Vendee.

(b) All shipments must be packed, crated, bundled, etc., in accordance with the special conditions shown herein. No extra charge will be allowed for packing, crating, bundling, etc., unless agreed to and specified in this purchase order.

(c) Weights, measurements, and other identification shall be clearly marked on each box, crate, bundle, package, piece, etc. by the Vendor prior to shipment. No extra charge will be allowed for this marking unless agreed to and specified in this order.

4. QUALITY AND DESIGN OF PRODUCT OR SERVICES:

(a) Articles furnished hereunder shall be of new material of the most suitable grade of their respective kind for the purposes intended and Vendor warrants all to be free from defect in materials, design and workmanship. No used or second hand material and/or equipment shall be furnished or incorporated in any articles furnished hereunder, unless specified as such and recited in this order.

(b) All services furnished hereunder by Vendor are to be performed by qualified, careful and efficient mechanics in the best and most workmanlike manner and in exact accordance with the provisions hereof.

(c) Vendor shall verify and be responsible for all measurements, dimensions, layouts, colors, qualities, quantities, etc. insofar as same are pertinent to the articles or services furnished hereunder. Vendor shall replace at its own cost and expense defective items, articles, services, etc. furnished hereunder and shall indemnify Vendee for any costs or expenses attributable to errors in Vendor's performance.

(d) Vendor shall furnish samples, shop drawings, certificates, affidavits, reports, or any other written or physical data that may be required by the Vendee for the proper performance hereunder.

5. WORKER'S COMPENSATION AND INSURANCE

(a) Vendor shall provide and keep in force Worker's Compensation Insurance and Public Liability and Property Damage Insurance to protect the Vendee against claims arising out of the Vendor's operations. Vendor shall save and hold the Vendee harmless from any and all such claims.

(b) The Vendor shall hold and save Vendee harmless from liability of any nature or kind, for or on account of the use of any patented article, device or appliance furnished or used in performance hereof.

6. CHANGES AND/OR EXTRAS:

(a) No changes as to quantities, qualities, descriptions, prices extent of services, etc. shall be made, nor will any charge for extras be allowed unless same has been authorized in writing by the Vendee. No charge will be allowed for freight, express, cartage, demurrage or other transportation or storage unless agreed to and specified in this order.

7. PERFORMANCE AND DEFAULT:

(a) Time is of the essence of this transaction and therefore it is agreed that for failure to comply with the terms and conditions hereof, or failure to prosecute the work with promptness and diligence, or for failure to make shipment within the time specified or any extension thereof, the Vendor shall be declared in default; except that the Vendor shall not be responsible or considered in default for delay in shipment due to Acts of God, Acts of the Vendee, War, Floods, Freight Embargoes, or unusually severe weather, and in the event of delay from such cause the promised delivery date shall be extended for a period of such delay.

8. REMEDY FOR DELAYS AND DEFAULT:

(a) If the Vendor fails or is unable to proceed with all or any of his obligations hereunder, makes and assignment for the benefit of his creditors, is bankrupt or insolvent, or declared in default, the Vendee at his option may procure the articles or services from other sources, by purchase in the open market, or by negotiated contract, or otherwise, and the Vendor shall be liable to the Vendee for any excess costs and damages occasioned by said default or the Vendee may elect to complete performance of the obligations of the Vendor hereunder, in which event the Vendor shall also be liable to the Vendee for any excess costs and damages occasioned by said default.

9. COMPLIANCE WITH THE LAW:

(a) Vendor shall comply with all applicable Federal, State and local laws and regulations.

(b) [illegible] existing taxes or any taxes which may hereafter be imposed by Federal, State and Local governments, including, without limitation, any Sales, Use and Personal Property Taxes.

10. PRICE ADJUSTMENT:

(a) The purchase price hereunder shall not be increased on account of any changes in the cost of any materials, labor, freight, storage or other charges.

11. ARBITRATION:

(a) Any controversy or claim arising out of or relating to this purchase order or the breach thereof, provision for the determination of which is not made elsewhere, shall be settled by arbitration in Raleigh, North Carolina, in accordance with the rules then obtaining of The American Arbitration Association. The Vendor and Vendee hereby submit to such Raleigh, North Carolina, jurisdiction and to arbitration as herein provided. Service of an application for arbitration or of a notice of submission to arbitration hereunder shall be sufficient if made by registered mail-directed to the party at its respective address given above.

(b) Work shall not be interrupted or delayed during any arbitration proceedings, except on written agreement by both parties.

12. ASSIGNMENT BY VENDER:

(a) The Vendor shall not assign this order, nor any moneys due or to become due hereunder, without the Vendee's prior written consent, and any attempted assignment without the Vendee's consent shall be null and void.

13. CANCELLATION OF MECHANICS LIENS, ETC.:

(a) After payment by General Contractor of undisputed amounts, vendor does hereby waive all right of liens or conditional bills of sale and does waive all right to file any notices in relation thereto, and does agree to remove, at his own cost and expense, all such notices or liens or conditional bills of sale or encumbrances which may be placed against said premises or any part thereof as a result of the work contracted to be done and materials agreed to be furnished by the Vendor, whether such notice or notices be placed thereon by the Vendor or any other person employed or otherwise engaged by the Vendor in relation to said work or any material man furnishing any material to such job, and the Vendor does hereby agree to hold the owner harmless on account thereof. This agreement of waiver and indemnity shall remain in full force and effect even should any dispute arise respecting payment and/or should there by any delay on account thereof and/or should there be any default by the Vendee in relation to any of the agreements herein contained on the Vendee's part to be performed and/or in relation to payments required to be made by the Vendee as set forth in this contract.

(b) Vendor agrees within five (5) days after payment of undisputed amounts, notice and demand by the Vendee to cancel and discharge any notices of liens filed for work or labor performed for, materials furnished to, the Vendee, and the Vendor agrees further to reimburse the Vendee for any damage the Vendee may suffer by reason of the filing of such notices or liens or the failure to obtain cancellation and discharge thereof as herein provided, including all costs and a reasonable attorney's fee

14. FAILURE TO EXECUTE:

(a) In event the Vendor fails to acknowledge this order in accordance with the provisions hereof within ten (10) days from its date, then it shall be deemed canceled, null and void and inoperative at the option of the Vendee.

15. In the event that parties herein have heretofore entered into a separate agreement with respect to the same subject matter, then the provisions of contract shall prevail in the event of a conflict, except to the extent that no conflict exists with respect to price or delivery, wherein the provisions of the within agreement shall prevail.

16. The vendor is required to pay all sales taxes if required. Vendor is to provide proof of payment to the General Contractor.

COPY

BFSSE069-0306
Project: Belle Hall Condominiums
Purchase Order: 0410230-34 Cost Code: 10-08-510

CONTRACT ADDENDUM

This CONTRACT ADDENDUM (the "Addendum") amends and supplements the Purchase Order between Builders FirstSource – Southeast Group, LLC ("Vendor") and TCR NC Construction 1, Limited Partnership ("Vendee"). To the extent the terms of the Purchase Order conflict with or are dealt with by this Addendum, the terms of this Addendum shall prevail. Capitalized terms used herein shall have the same meaning given to them in the Purchase Order.

1. Vendor agrees to provide insurance coverage at the limits stated in the Purchase Order. Vendor's Commercial General Liability and Business Auto insurance policies will list Vendee or other parties reasonably requested as an additional insured for claims against Vendee to the extent of liability resulting from Vendor's negligence or willful misconduct. The additional insured coverage herein shall end when Vendor's ongoing operations for Vendee on each applicable project are concluded.

2. Vendor shall indemnify, defend, and hold harmless Vendee from claims to the extent of liability resulting from Vendor's negligence or willful misconduct. This indemnification obligation shall last for one (1) year following the completion of Vendor's portion of the Work. Vendor shall have no obligation to indemnify, hold harmless or defend Vendee or any other person unless set forth above.

3. Vendor warrants that the installation services provided by Vendor shall be of industry standard quality, free from defects, and completed in a workmanlike manner in material conformance with specific requirements set forth in the Purchase Order or related documents and customary industry standards for a period of one (1) year from the date of completion of the Vendor's portion of the Work. VENDOR HEREBY DISCLAIMS ANY OTHER REPRESENTATIONS OR WARRANTIES, WHETHER WRITTEN, EXPRESS, ORAL, OR IMPLIED, AS TO ANY MATERIALS OR SERVICES PROVIDED UNDER THE PURCHASE ORDER (INCLUDING WITHOUT LIMITATION ANY REPRESENTATION OR WARRANTY REGARDING SUITABILITY, DURABILITY, FITNESS FOR USE, FITNESS FOR A PARTICULAR PURPOSE, OR MERCHANTABILITY OF ANY OF THE MATERIALS OR SERVICES).

4. Vendor shall provide lien releases conditioned on payment. Vendor shall promptly cause to be released or bonded, and shall indemnify Vendee against, any lien placed on the property by Vendor's subcontractors or material suppliers relating to Work that has been paid for. Vendee shall have the right to pay any lien placed on the property after fifteen (15) days following Vendor's receipt of notice of the lien. Affidavits and/or evidence regarding payment to and/or lien releases from subcontractors and material suppliers will not be required. Failure of Vendor to promptly pay subcontractors and/or material suppliers shall not be a breach of the Purchase Order. Vendee shall not issue joint checks for any payment under the Purchase Order or pay Vendor's subcontractors or material suppliers directly. Vendee shall place no requirements on the Vendor's contracts with subcontractors and/or material suppliers. Vendor does not waive or forfeit any cause of action, the right to file any lien, or entitlement to any portion of the Purchase Order or amount of the Purchase Order. Vendor does not waive the right to a trial by jury.

Agreed to as of this 14 day of April, 2006.

"Vendor"

Builders FirstSource – Southeast Group, LLC

By: _____
Name:
Title: RVP

"Vendee"

TCR NC Construction 1, Limited Partnership

By: _____
Name: David Clemons
Title:

COPY

TCR
THOMAS CROW RESIDENTIAL

Subcontract Change Order

Detailed, TCR SE Standard

Belle Hall Condominiums
1000 South Egypt Road
Mt. Pleasant, SC 29464

Project # 0410-230
Tel: 843-856-4496 Fax: 843-856-4497

TCR NC Construction I LP

Date: 10/16/2006

To Subcontractor/Vendor:
Builders First Source
430 Leisure Lane
Catawba, SC 29704

Architect's Project No:
Contract Date: 1/16/2006
Contract Number: 0410230-034
Change Order Number: 001

The Contract is hereby revised by the following items:
Replacement Window Glass

PCO # - Item #	Cost Code	Description		Amount
123-001	10-08510	45 - Window "A2" Single 2/8 x 6/0 (Top Glass EA. / No Screen)	$	6,161.60
123-002	10-08510	33 - Window "A2" Single 2/8 X 6/0 (Bottom Sash EA. / No Screen)	$	4,751.01
123-003	10-08510	2 - Window "A2" Single 2/8 x 6/0 (Bottom Sash EA. / No Screen)	$	383.94
123-004	10-08510	6.5% Sales Tax	$	668.63

Notes

The original Contract Value was	$	215,230.46
Sum of changes by prior Subcontract Change Orders	$	0.00
The Contract Value prior to this Subcontract Change Order was	$	215,230.46
The Contract Value will be changed by this Subcontract Change Order in the amount of	$	11,965.18
The new Contract Value including this Subcontract Change Order will be	$	227,195.64
The Contract duration will be changed by		0 Days
The revised Substantial Completion date as of this Subcontract Change Order is		

The work covered by this change will be performed under the same Terms and Conditions as those in the original Subcontract Agreement. Payment for the changed work or the granting of a time extension, as set forth herein, shall be full and final compensation for the change, including payment for costs of all delays in connection with such change and including the full and final payment for any expense or inconvenience, disruption of schedule and/or loss of efficiency or productivity by the Subcontractor and/or his forces, including Subcontractor's subtier subcontractors and suppliers.

CONTRACTOR
TCR NC Construction I Limited Partnership
By TCR SE Construction II, Inc.

By _____
David Clements
Vice President

DATE _____

SUBCONTRACTOR/VENDOR
Builders First Source

By _____
Dan Glass

DATE _____

TCR
TRAVASOS CRAIG RESIDENTIAL

Subcontract Change Order

Detailed, TCR SE Standard

Belle Hall Condominiums
1000 South Egypt Road
Mt Pleasant, SC 29464

Project # 0410-230
Tel: 843-856-4496 Fax: 843-856-4497

TCR NC Construction I LP

Date: 2/2/2007

To Subcontractor/Vendor:
Builders First Source, Corp.
430 Leisure Lane
Catawba, SC 29704

Architect's Project No:
Contract Date: 1/16/2006
Contract Number: 0410230-034
Change Order Number: 002

The Contract is hereby revised by the following items:
Replacement Window

PCO # - Item #	Cost Code	Description		Amount
160-001	10-08510	1- Window "A2" Single 2/8 x 6/0 (window unit)	$	380.91
160-002	10-08510	35- Windows "A2" Single 2/8 x 6/0 (screens only)	$	256.55
160-003	10-08510	2- Windows "A2" Single 2/0 x 4/0 (screens only)	$	7.34
160-004	10-08510	6.5% Sales Tax	$	41.91

Notes

The original Contract Value was	$	216,230.46
Sum of changes by prior Subcontract Change Orders	$	11,965.18
The Contract Value prior to this Subcontract Change Order was	$	227,195.64
The Contract Value will be changed by this Subcontract Change Order in the amount of	$	686.71
The new Contract Value including this Subcontract Change Order will be	$	227,882.35
The Contract duration will be changed by		0 Days
The revised Substantial Completion date as of this Subcontract Change Order is		

The work covered by this change will be performed under the same Terms and Conditions as those in the original Subcontract Agreement. Payment for the changed work or the granting of a time extension, as set forth herein, shall be full and final compensation for the change, including payment for costs of all delays in connection with such change and including the full and final payment for any expense or inconvenience, disruption of schedule and/or loss of efficiency or productivity by the Subcontractor and/or his forces, including Subcontractor's subtier subcontractors and suppliers

CONTRACTOR
TCR NC Construction I Limited Partnership
By TCR SE Construction II, Inc.

By _____
Jim McDonough
Assistant Vice President

DATE _____

SUBCONTRACTOR/VENDOR
Builders First Source, Corp.

By _____
Dan Glass

DATE _____

TCR
0005087

RE[illegible]
MAY-[illegible]
BY:

TCR [illegible] CONSTRUCTION I Limited Partnership
(To Be Used Only for Purchases Over $500.00)

PURCHASE ORDER

DATE: January 16, 2006

PO #: 0410230-34 Southeast Group LLC

TO: Builders First Source- ~~Total Opening Sales~~
430 Leisure Lane
Catawba, SC 29704
Contact: Larry Bratton
Phone #: 803-323-3685
Fax #: 803-328-3839
Tax ID #:

SHIP TO: TCR NC Construction I Limited Partnership
Belle Hall Condominiums
1000 South Egypt Road
Mt. Pleasant, SC 29464
ATTN: Micky Rodgers: 843-200-1019
WHEN TO SHIP: When Requested
SHIP VIA: Sellers Truck
INVOICE DUE: 1st of the month
PAID ON OR ABOUT: 5th of the month
COST CODE: 10-08-510

Qty	Model No.	Description	Unit Price	Totals
		ESP Industries-vinyl/single hung/insulated,		
		Impacted rated, 2031 Series. Factory mulled, 4 lite		
		Over 1 lite window. Screens Included		
45	Window A2	2/8 x 6/0 ESP 2031 Series Window 4/1	$350.87	$15,789.15
66	Window A2	2/8/ x 6/0 ESP 2031 Series Window 4/1 Tempered	$416.13	$27,464.58
208	Window B2	(2) Twin 2/8 x 6/0 ESP 2031 Series Window 4/1-Factory Mulled	$758.60	$157,788.80
5	Window C2	2/0 x 4/0 ESP 2031 Series Window 4/1	$210.36	$1,051.80
		Sub Total:		**$202,094.33**
		Tax Total @ 6.5%		**$13,136.13**
		TOTAL		**$215,230.46**
		Windows to be delivered in truck loads quantities		
		ordered by the project superintendent. Windows		
		will be counted and inspected after and while		
		unloading. Supplier shall replace any damaged		
		windows from shipment.		

Please Mail Invoices To:

TCR NC Construction I
Limited Partnership
230 Seven Farms Drive, Suite 104
Charleston, SC 29492
T: 843-278-2892 F: 843-278-2894

Acceptance of Offer: The Vendor does hereby accept the above offer subject to the terms on all pages hereof, said acceptance being made this

14 Day of April, 2006

AGREED TO:

Dave Clements- Vice President

SIGNED BY:

TITLE: AVP

SUBJECT TO ATTACHED CONTRACT ADDENDUMS

FILE COPY

MAILED 5-18-06

ENTERED Atfield Subdiv Prolog

PLAINTIFF'S EXHIBIT 44A

TCR 0005016

BFSSE069-0306
Project: Belle Hall Condominiums
Purchase Order: 0410230-34 Cost Code: 10-08-510

CONTRACT ADDENDUM

This CONTRACT ADDENDUM (the "Addendum") amends and supplements the Purchase Order between Builders FirstSource – Southeast Group, LLC ("Vendor") and TCR NC Construction 1, Limited Partnership ("Vendee"). To the extent the terms of the Purchase Order conflict with or are dealt with by this Addendum, the terms of this Addendum shall prevail. Capitalized terms used herein shall have the same meaning given to them in the Purchase Order.

1. Vendor agrees to provide insurance coverage at the limits stated in the Purchase Order. Vendor's Commercial General Liability and Business Auto insurance policies will list Vendee or other parties reasonably requested as an additional insured for claims against Vendee to the extent of liability resulting from Vendor's negligence or willful misconduct. The additional insured coverage herein shall end when Vendor's ongoing operations for Vendee on each applicable project are concluded.

2. Vendor shall indemnify, defend, and hold harmless Vendee from claims to the extent of liability resulting from Vendor's negligence or willful misconduct. This indemnification obligation shall last for one (1) year following the completion of Vendor's portion of the Work. Vendor shall have no obligation to indemnify, hold harmless or defend Vendee or any other person unless set forth above.

3. Vendor shall provide lien releases conditioned on payment. Vendor shall promptly cause to be released or bonded, and shall indemnify Vendee against, any lien placed on the property by Vendor's subcontractors or material suppliers relating to Work that has been paid for. Vendee shall have the right to pay any lien placed on the property after fifteen (15) days following Vendor's receipt of notice of the lien. Affidavits and/or evidence regarding payment to and/or lien releases from subcontractors and material suppliers will not be required. Failure of Vendor to promptly pay subcontractors and/or material suppliers shall not be a breach of the Purchase Order. Vendee shall not issue joint checks for any payment under the Purchase Order or pay Vendor's subcontractors or material suppliers directly. Vendee shall place no requirements on the Vendor's contracts with subcontractors and/or material suppliers. Vendor does not waive or forfeit any cause of action, the right to file any lien, or entitlement to any portion of the Purchase Order or amount of the Purchase Order. Vendor does not waive the right to a trial by jury.

Agreed to as of this 2 day of MAY, 2006.

"Vendor"

Builders FirstSource – Southeast Group, LLC

By: _____
Name:
Title: AVP

"Vendee"

TCR NC Construction 1, Limited Partnership

By: _____
Name:
Title:

GENERAL CONDITIONS

1. ACKNOWLEDGMENT:
(a) Immediately sign and return the confirmation copy of this order. Until this executed copy is received by the Vendee, the right to cancel by oral or written notice is reserved.
(b) The entire contract between the parties consists of this purchase order and any documents incorporated by reference as stated herein and no other acceptance or acknowledgment or other conditions will apply. Amendments, if any, will be made in writing by mutual agreement only and must be signed by both parties.

2. INVOICING:
(a) Invoices shall be rendered ~~in quadruplicate~~ for each and every shipment.
(b) Original ~~and two copies of~~ express or freight bill, with transportation charges shown thereon, and stamped by the carrier, shall ~~accompany all invoices~~ be left at time of delivery.
(c) this purchase order number must appear on all copies of the invoice. The articles or services must be described in terms used in this order, must itemize all components and be complete as to quantity, grade, type, size, weight, etc.

3. SHIPPING:
(a) At the time of delivery to the carrier at point or origin, written notice of shipment is to be furnished the Vendee.
(b) All shipments must be packed, crated, bundled, etc., in accordance with the special conditions shown herein. No extra charge will be allowed for packing, crating, bundling, etc., unless agreed to and specified in this purchase order.
(c) Weights, measurements, and other identification shall be clearly marked on each box, crate, bundle, package, piece, etc. by the Vendor prior to shipment. No extra charge will be allowed for this marking unless agreed to and specified in this order.

4. QUALITY AND DESIGN OF PRODUCT OR SERVICES:
(a) Articles furnished hereunder shall be of new material of the most suitable grade of their respective kind for the purposes intended and Vendor warrants all to be free from defect in materials, design and workmanship. No used or second hand material and/or equipment shall be furnished or incorporated in any articles furnished hereunder, unless specified as such and recited in this order.
(b) All services furnished hereunder by Vendor are to be performed by qualified, careful and efficient mechanics in the best and most workmanlike manner and in exact accordance with the provisions hereof.
(c) Vendor shall verify and be responsible for all measurements, dimensions, layouts, colors, qualities, quantities, etc. insofar as same are pertinent to the articles or services furnished hereunder. Vendor shall replace at its own cost and expense defective items, articles, services, etc. furnished hereunder and shall indemnify Vendee for any costs or expenses attributable to errors in Vendor's performance.
(d) Vendor shall furnish samples, shop drawings, certificates, affidavits, reports, or any other written or physical data that may be required by the Vendee for the proper performance hereunder.

5. WORKER'S COMPENSATION AND INSURANCE
(a) Vendor shall provide and keep in force Worker's Compensation Insurance and Public Liability and Property Damage Insurance to protect the Vendee against claims arising out of the Vendor's operations. Vendor shall save and hold the Vendee harmless from any and all such claims.
(b) The Vendor shall hold and save Vendee harmless from liability of any nature or kind, for or on account of the use of any patented article, device or appliance furnished or used in performance hereof.

6. CHANGES AND/OR EXTRAS:
(a) No changes as to quantities, qualities, descriptions, prices extent of services, etc. shall be made, nor will any charge for extras be allowed unless same has been authorized in writing by the Vendee. No charge will be allowed for freight, express, cartage, demurrage or other transportation or storage unless agreed to and specified in this order.

7. PERFORMANCE AND DEFAULT:
(a) Time is of the essence of this transaction and therefore it is agreed that for failure to comply with the terms and conditions hereof, or failure to prosecute the work with promptness and diligence, or for failure to make shipment within the time specified or any extension thereof, the Vendor shall be declared in default; except that the Vendor shall not be responsible or considered in default for delay in shipment due to Acts of God, Acts of the Vendee, War, Floods, Freight Embargoes, or unusually severe weather, and in the event of delay from such cause the promised delivery date shall be extended for a period of such delay.

8. REMEDY FOR DELAYS AND DEFAULT:
(a) If the Vendor fails or is unable to proceed with all or any of his obligations hereunder, makes and assignment for the benefit of his creditors, is bankrupt or insolvent, or declared in default, the Vendee at his option may procure the articles or services from other sources, by purchase in the open market, or by negotiated contract, or otherwise, and the Vendor shall be liable to the Vendee for any excess costs and damages occasioned by said default or the Vendee may elect to complete performance of the obligations of the Vendor hereunder, in which event the Vendor shall also be liable to the Vendee for any excess costs and damages occasioned by said default.

9. COMPLIANCE WITH THE LAW:
(a) Vendor shall comply with all applicable Federal, State and local laws and regulations.
(b) The purchase price hereunder shall not increase on account of any existing taxes or any taxes which may hereafter be imposed by Federal, State and Local governments, including, without limitation, any Sales, Use and Personal Property Taxes.

10. PRICE ADJUSTMENT:
(a) The purchase price hereunder shall not be increased on account of any changes in the cost of any materials, labor, freight, storage or other charges.

11. ARBITRATION:
(a) Any controversy or claim arising out of or relating to this purchase order or the breach thereof, provision for the determination of which is not made elsewhere, shall be settled by arbitration in Raleigh, North Carolina, in accordance with the rules then obtaining of The American Arbitration Association. The Vendor and Vendee hereby submit to such Raleigh, North Carolina, jurisdiction and to arbitration as herein provided. Service of an application for arbitration or of a notice of submission to arbitration hereunder shall be sufficient if made by registered mail-directed to the party at its respective address given above.
(b) Work shall not be interrupted or delayed during any arbitration proceedings, except on written agreement by both parties.

12. ASSIGNMENT BY VENDER:
(a) The Vendor shall not assign this order, nor any moneys due or to become due hereunder, without the Vendee's prior written consent, and any attempted assignment without the Vendee's consent shall be null and void.

13. CANCELLATION OF MECHANICS LIENS, ETC.:
(a) After payment by General Contractor of undisputed amounts, vendor does hereby waive all right of liens or conditional bills of sale and does waive all right to file any notices in relation thereto, and does agree to remove, at his own cost and expense, all such notices or liens or conditional bills of sale or encumbrances which may be placed against said premises or any part thereof as a result of the work contracted to be done and materials agreed to be furnished by the Vendor, whether such notice or notices be placed thereon by the Vendor or any other person employed or otherwise engaged by the Vendor in relation to said work or any material man furnishing any material to such job, and the Vendor does hereby agree to hold the owner harmless on account thereof. This agreement of waiver and indemnity shall remain in full force and effect even should any dispute arise respecting payment and/or should there by any delay on account thereof and/or should there be any default by the Vendee in relation to any of the agreements herein contained on the Vendee's part to be performed and/or in relation to payments required to be made by the Vendee as set forth in this contract.
(b) Vendor agrees within five (5) days after payment of undisputed amounts, notice and demand by the Vendee to cancel and discharge any notices of liens filed for work or labor performed for, materials furnished to, the Vendee, and the Vendor agrees further to reimburse the Vendee for any damage the Vendee may suffer by reason of the filing of such notices or liens or the failure to obtain cancellation and discharge thereof as herein provided, including all costs and a reasonable attorney's fee

14. FAILURE TO EXECUTE:
(a) In event the Vendor fails to acknowledge this order in accordance with the provisions hereof within ten (10) days from its date, then it shall be deemed canceled, null and void and inoperative at the option of the Vendee.

15. In the event that parties herein have heretofore entered into a separate agreement with respect to the same subject matter, then the provisions of contract shall prevail in the event of a conflict, except to the extent that no conflict exists with respect to price or delivery, wherein the provisions of the within agreement shall prevail.

16. The vendor is required to pay all sales taxes if required. Vendor is to provide proof of payment to the General Contractor.

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Your Shipment Details

Ship to:	Larry Bratton Builders First Source 430 Leisure Lane Catawba, SC 29704 US 803-328-3585	**Package Type:**	FedEx Envelope
		Pickup/Drop Off:	give to scheduled courier at my location
		Weight:	1 LBS
		Dimensions:	0 x 0 x 0 in
		Declared Value:	0 USD
From:	Kyle Crout Trammell Crow Residential 230 Seven Farms Drive Suite 104 Charleston, SC 29492 US 8432782881	**Shipper Account Number:**	325866489
		Bill transportation to:	325866489
		Courtesy Rate Quote	*7.17
		Discounted variable %	0.00
		Special Services:	
		Purpose:	
Tracking no:	790434818654	**Shipment Type:**	Express
Your reference:	Belle Hall		
Ship date:	May 18 2006		
Service Type:	FedEx Express Saver		

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Please Note

*The courtesy rate shown here may be different than the actual charges for your shipment. Differences may occur based on actual weight, dimensions, and other factors. C applicable FedEx Service Guide or the FedEx Rate Sheets for details on how shipping charges are calculated.

FedEx will not be responsible for any claim in excess of $100 per package, whether the result of loss, damage, delay, non-delivery, misdelivery, or misinformation, unless yo value, pay an additional charge, document your actual loss and file a timely claim.

Limitations found in the current FedEx Service Guide apply. Your right to recover from FedEx for any loss, including intrinsic value of the package, loss of sales, income inter attorney's fees, costs, and other forms of damage whether direct, incidental, consequential, or special is limited to the greater of $100 or the authorized declared value. Reco exceed actual documented loss. Maximum for items of extraordinary value is $500, e.g., jewelry, precious metals, negotiable instruments and other items listed in our Servic claims must be filed within strict time limits. Consult the applicable FedEx Service Guide for details.

Our Answers Fit All

Energy Saving Products of Florida, Inc.

P. O. Box 1119 • Jasper, Florida 32052

SINGLE HUNG INSTALLATION

ROUGH OPENING

1. Check to be sure the opening is proper size.

2. Sill plate must be level.

3. Provide ¼ to ½ inch of clearance on both height and width.

4. In wood frame installations. Cover the outside face of the opening with strips of asphalted building paper or other material as specified by local building code.. Overlap sides over bottom strip. Top strip is applied over nailing fin after window is installed.

UNIT

1. Open and operate sash and check that the unit operates properly before installing.

2. Close and lock sash.

INSTALLATION PROCEDURE

1a. In wood frame construction, apply a continuous bead of sealant (bedding joint) around the full perimeter of the backside of the mounting fin. Apply the sealant in line with any pre-punched holes on the mounting fin.

1b. In masonry construction, sealant may be applied around the entire buck at the point where the backside (interior surface) of the mounting flange will make contact with the seal.

2. Center unit in opening.

3. Select and apply shims

4. Adjust the shims and check the window for level, plumb, and true. Make sure the window is not bowed in or out. Distance between jambs at Meeting Rail should measure the same as Head and Sill.

5a. For wood frame installations fasten the upper corner in place through the nail fin. Do not drive the fastener all the way in.

5b. For concrete/masonry wall installations fasten the upper corner in place through the balance channel. Do not drive the fastener all the way in.

6. Make sure the window is square, operates smoothly, and operable sash are sitting square in their openings.

7. Fasten the corner diagonally opposite the upper corner that was fastened first.

8. Continue to fasten sides, top, and bottom through the mounting fin; rechecking the unit to ensure it is set plumb, level, square, and true. Fastener heads should not compress the nail fin when put in place.

9. If applying additional insulation behind jambs and under sill be careful not to bow frame in.

10. In wood frame installations the top flashing strip is applied over nailing fin after window is installed at this time.

6/17/02

PLAINTIFF'S EXHIBIT tabbies 82

OBH - O&M 108

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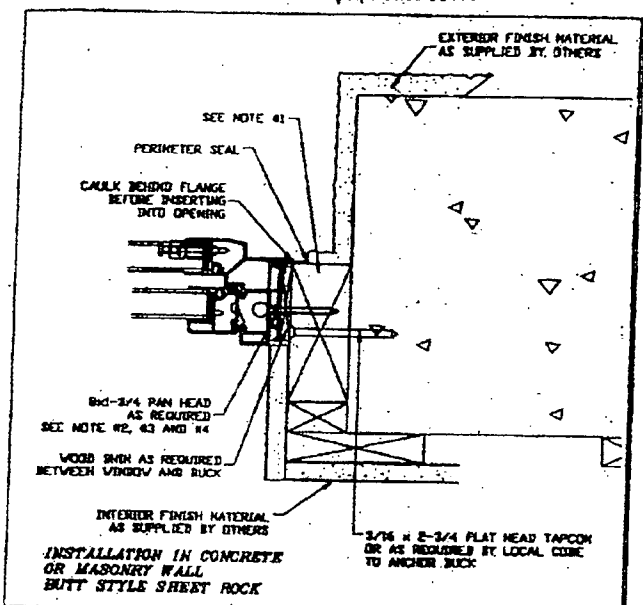


INSTALLATION IN CONCRETE OR MASONRY WALL BUTT STYLE SHEET ROCK

NOTE:

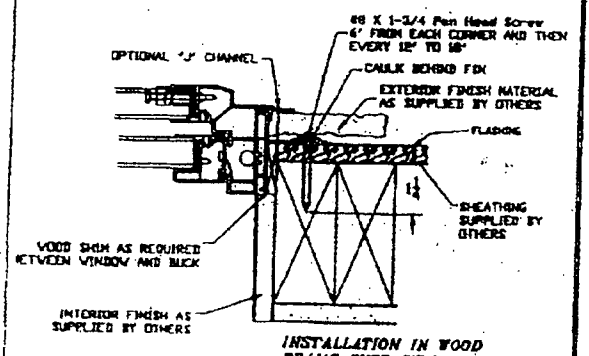
1.) IT IS RECOMMENDED THAT A BUCK 1-1/2" THICK OR GREATER BE SECURED TO THE OPENING WITH 3/16" TAPCONS OF A LENGTH TO HAVE 1 1/4" PENETRATION INTO MASONRY OR CONCRETE. THE SCREWS SHOULD BE PLACED 6" FROM EACH CORNER AND 24" ON CENTER.

2.) ANCHOR/MOUNTING SCREWS PLACED IN THE BALANCE CHANNELS NEED TO HAVE A 5/8" DIAMETER HOLES PRE DRILLED SO THAT THE SCREW HEADS DO NOT INTERFERE WITH BALANCE SHOE OPERATION. THE 3/8" HOLES IN THE INNER BALANCE CHANNEL GO THROUGH ONE WALL ONLY. CAUTION: DO NOT DRILL THROUGH THE OUTER WALL OF THE WINDOW FRAME.

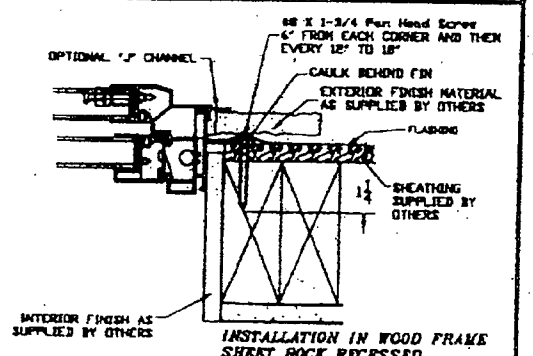
3.) ANCHOR/MOUNTING SCREWS ARE APPLIED THROUGH THE BALANCE CHANNEL IN THE JAMBS. SCREWS ARE LOCATED AT THE HEAD (ABOVE THE BALANCE) AND AT THE MEETING RAIL. JUST BELOW THE BALANCE AND ABOVE THE BALANCE SHOE AT ITS UPPER MOST POSITION. THE SCREW AT THE SILL END OF THE JAMB SHOULD BE LOCATED AT THE BOTTOM OF THE BALANCE CHANNEL. WHEN THE BUCK IS LESS THAN 1-1/2" THICK USE A 3/16" TAPCON WITH A LENGTH TO HAVE 1-1/4" PENETRATION INTO THE CONCRETE/MASONRY

FOR WINDOWS REQUIRED TO MEET IMPACT

4.) THE WINDOW IS SECURED TO THE BUCK WITH #8 SCREWS OF A LENGTH TO HAVE 1-1/4 PENETRATION INTO THE BUCK. THESE SCREWS SHOULD BE PLACED 3" TO 6" FROM EACH CORNER AND 12" TO 18" ON CENTER IN THE JAMB. THE SCREW SPACING IN THE HEAD AND SILL WOULD BE 3" TO 6" FROM THE CORNER AND 16" TO 24" ON CENTER.



INSTALLATION IN WOOD FRAME BUTT STYLE SHEET ROCK



INSTALLATION IN WOOD FRAME SHEET ROCK RECESSED BEHIND WINDOW FRAME

6/17/02

Energy Saving Products of Florida, Inc.

Our Name Says It All!

P. O. Box 1119 • Jasper, Florida 32052

SINGLE HUNG INSTALLATION

ROUGH OPENING

1. Check to be sure the opening is proper size.

2. Sill plate must be level.

3. Provide ¼ to ½ inch of clearance on both height and width.

4. In wood frame installations. Cover the outside face of the opening with strips of asphalted building paper or other material as specified by local building code. Overlap sides over bottom strip. **Top strip is applied over nailing fin after window is installed**.

UNIT

1. Open and operate sash and check that the unit operates properly before installing.

2. Close and lock sash.

INSTALLATION PROCEDURE

1a. In wood frame construction, apply a continuous bead of sealant (bedding joint) around the full perimeter of the backside of the mounting fin. Apply the sealant in line with any pre-punched holes on the mounting fin.

1b. In masonry construction, sealant may be applied around the entire buck at the point where the backside (interior surface) of the mounting flange will make contact with the seal.

2. Center unit in opening.

3. Select and apply shims

4. Adjust the shims and check the window for level, plumb, and true. Make sure the window is not bowed in or out. Distance between jambs at Meeting Rail should measure the same as Head and Sill.

5a. For wood frame installations fasten the upper corner in place through the nail fin. Do not drive the fastener all the way in.

5b. For concrete/masonry wall installations fasten the upper corner in place through the balance channel. Do not drive the fastener all the way in.

6. Make sure the window is square, operates smoothly, and operable sash are sitting square in their openings.

7. Fasten the corner diagonally opposite the upper corner that was fastened first.

8. Continue to fasten sides, top, and bottom through the mounting fin; rechecking the unit to ensure it is set plumb, level, square, and true. Fastener heads should not compress the nail fin when put in place.

9. If applying additional insulation behind jambs and under sill be careful not to bow frame in.

10. In wood frame installations the top flashing strip is applied over nailing fin after window is installed at this time.

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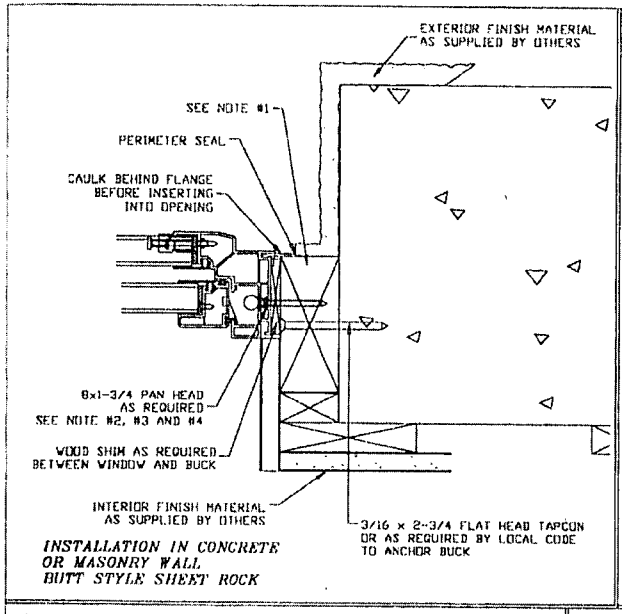


INSTALLATION IN CONCRETE OR MASONRY WALL BUTT STYLE SHEET ROCK

NOTE:

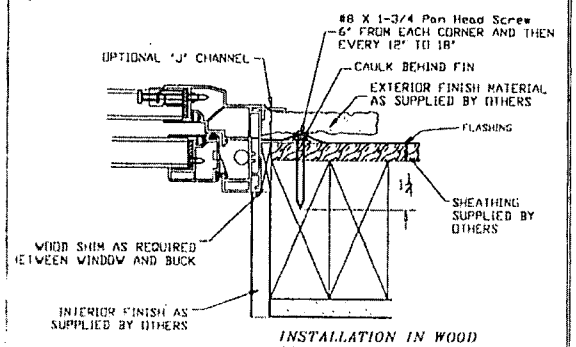
1.) IT IS RECOMMENDED THAT A BUCK 1-1/2" THICK OR GREATER BE SECURED TO THE OPENING WITH 3/16" TAPCONS OF A LENGTH TO HAVE 1 1/4" PENETRATION INTO MASONRY OR CONCRETE. THE SCREWS SHOULD BE PLACED 6" FROM EACH CORNER AND 24" ON CENTER.

2.) ANCHOR/MOUNTING SCREWS PLACED IN THE BALANCE CHANNELS NEED TO HAVE 3/8" DIAMETER HOLES PRE DRILLED SO THAT THE SCREW HEADS DO NOT INTERFERE WITH BALANCE SHOE OPERATION. THE 3/8" HOLES IN THE INNER BALANCE CHANNEL GO THROUGH ONE WALL ONLY. CAUTION DO NOT DRILL THROUGH THE OUTER WALL OF THE WINDOW FRAME.

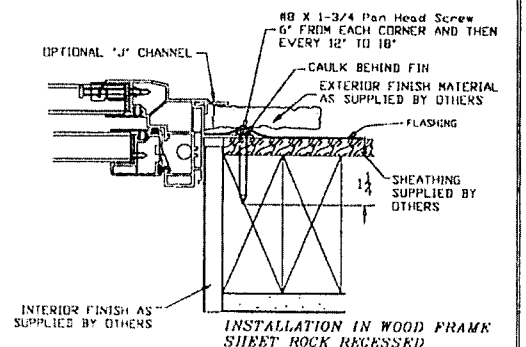
3.) ANCHOR/MOUNTING SCREWS ARE APPLIED THROUGH THE BALANCE CHANNEL IN THE JAMBS. SCREWS ARE LOCATED AT THE HEAD (ABOVE THE BALANCE) AND AT THE MEETING RAIL JUST BELOW THE BALANCE AND ABOVE THE BALANCE SHOE AT ITS UPPER MOST POSITION. THE SCREW AT THE SILL END OF THE JAMB SHOULD BE LOCATED AT THE BOTTOM OF THE BALANCE CHANNEL. WHEN THE BUCK IS LESS THAN 1-1/2" THICK USE A 3/16" TAPCON WITH A LENGTH TO HAVE 1-1/4" PENETRATION INTO THE CONCRETE/MASONRY

FOR WINDOWS REQUIRED TO MEET IMPACT

4.) THE WINDOW IS SECURED TO THE BUCK WITH #8 SCREWS OF A LENGTH TO HAVE 1-1/4 PENETRATION INTO THE BUCK. THESE SCREWS SHOULD BE PLACED 3" TO 6" FROM EACH CORNER AND 12" TO 18" ON CENTER IN THE JAMB. THE SCREW SPACING IN THE HEAD AND SILL WOULD BE 3" TO 6" FROM THE CORNER AND 18" TO 24" ON CENTER.



INSTALLATION IN WOOD FRAME BUTT STYLE SHEET ROCK



INSTALLATION IN WOOD FRAME SHEET ROCK RECESSED BEHIND WINDOW FRAME

ROA_01113

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SINGLE HUNG INSTALLATION

ROUGH OPENING

1. Check to be sure the opening is proper size.

2. Sill plate must be level.

3. Provide ¼ to ½ inch of clearance on both height and width.

4. In wood frame installations. Cover the outside face of the opening with strips of asphalted building paper or other material as specified by local building code. Overlap sides over bottom strip. **Top strip is applied over nailing fin after window is installed**.

UNIT

1. Open and operate sash and check that the unit operates properly before installing.

2. Close and lock sash.

INSTALLATION PROCEDURE

1a. In wood frame construction, apply a continuous bead of sealant (bedding joint) around the full perimeter of the backside of the mounting fin. Apply the sealant in line with any pre-punched holes on the mounting fin.

1b. In masonry construction, sealant may be applied around the entire buck at the point where the backside (interior surface) of the mounting flange will make contact with the seal.

2. Center unit in opening.

3. Select and apply shims

4. Adjust the shims and check the window for level, plumb, and true. Make sure the window is not bowed in or out. Distance between jambs at Meeting Rail should measure the same as Head and Sill.

5a. For wood frame installations fasten the upper corner in place through the nail fin. Do not drive the fastener all the way in.

5b. For concrete/masonry wall installations fasten the upper corner in place through the balance channel. Do not drive the fastener all the way in.

6. Make sure the window is square, operates smoothly, and operable sash are sitting square in their openings.

7. Fasten the corner diagonally opposite the upper corner that was fastened first.

8. Continue to fasten sides, top, and bottom through the mounting fin; rechecking the unit to ensure it is set plumb, level, square, and true. Fastener heads should not compress the nail fin when put in place.

9. If applying additional insulation behind jambs and under sill be careful not to bow frame in.

10. In wood frame installations the top flashing strip is applied over nailing fin after window is installed at this time.

ROA_01115

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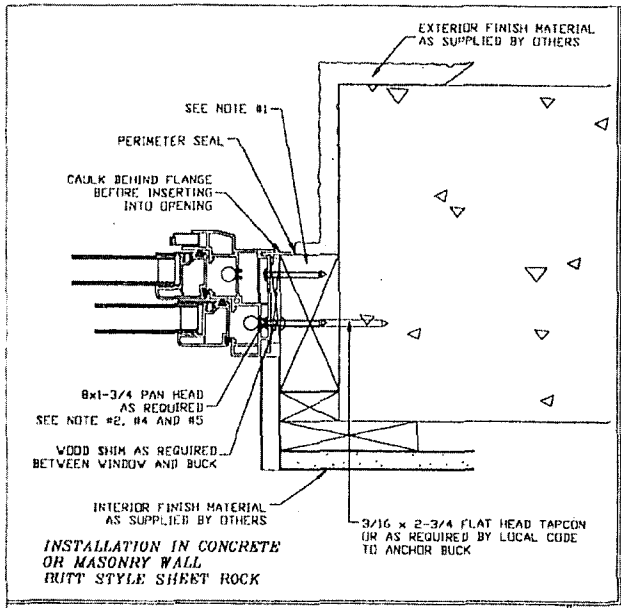


INSTALLATION IN CONCRETE OR MASONRY WALL BUTT STYLE SHEET ROCK

NOTE:

1.) IT IS RECOMMENDED THAT A BUCK 1-1/2" THICK OR GREATER BE SECURED TO THE OPENING WITH 3/16" TAPCONS OF A LENGTH TO HAVE 1 1/4" PENETRATION INTO MASONRY OR CONCRETE. THE SCREWS SHOULD BE PLACED 6" FROM EACH CORNER AND 24" ON CENTER.

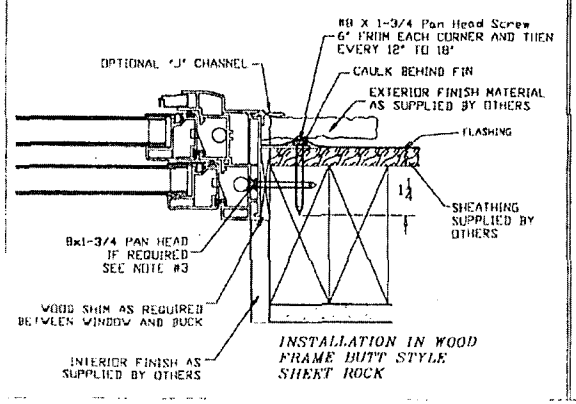
2.) WHEN ANCHOR/MOUNTING SCREWS ARE APPLIED THROUGH THE BALANCE CHANNEL IN THE JAMBS, SCREWS IN THE INNER BALANCE CHANNEL ARE LOCATED AT THE HEAD (ABOVE THE BALANCE) AND AT THE MEETING RAIL JUST BELOW THE BALANCE AND ABOVE THE BALANCE SHOE AT ITS UPPER MOST POSITION. THE SCREW AT THE SILL END OF THE JAMB SHOULD BE LOCATED AT THE BOTTOM OF THE OUTER BALANCE CHANNEL. THIS SCREW CAN BE LOCATED BY MOVING THE SASH STOP UP. WHEN THE BUCK IS LESS THAN 1-1/2" THICK USE A 3/16" TAPCON WITH A LENGTH TO HAVE 1-1/4" PENETRATION INTO THE CONCRETE/MASONRY

FOR WINDOWS REQUIRED TO MEET IMPACT

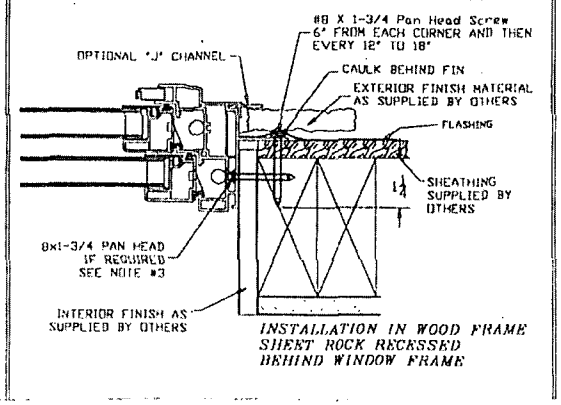
3.) IN WOOD FRAME CONSTRUCTION WINDOWS THAT ARE REQUIRED TO MEET DESIGN PRESSURES GREATER THAN DP40 NEED TO HAVE A #8 SCREW LOCATED AT THE MEETING RAIL. A 3/8" DIAMETER HOLE IS PRE DRILLED IN THE INSIDE BALANCE CHANNEL AND IS LOCATED BELOW THE BALANCE AND ABOVE THE BALANCE SHOE AT ITS UPPER MOST POSITION. THIS SCREW MUST HAVE A PENETRATION OF 1-1/4" INTO THE WOOD BUCK.

4.) ANCHOR/MOUNTING SCREWS PLACED IN THE BALANCE CHANNELS NEED TO HAVE 3/8" DIAMETER HOLES PRE DRILLED SO THAT THE SCREW HEADS DO NOT INTERFERE WITH BALANCE SHOE OPERATION. THE 3/8" HOLES IN THE INNER BALANCE CHANNEL GO THROUGH ONE WALL ONLY. THE HOLES IN THE OUTER BALANCE CHANNEL GO THROUGH TWO WALLS. CAUTION DO NOT DRILL THROUGH THE OUTER WALL OF THE WINDOW FRAME.

5.) THE WINDOW IS SECURED TO THE BUCK WITH #8 SCREWS OF A LENGTH TO HAVE 1-1/4 PENETRATION INTO THE BUCK. THESE SCREWS SHOULD BE PLACED 3" TO 8" FROM EACH CORNER AND 12" TO 18" ON CENTER IN THE JAMB. THE SCREW SPACING IN THE HEAD AND SILL WOULD BE 3" TO 8" FROM THE CORNER AND 18" TO 24" ON CENTER.



INSTALLATION IN WOOD FRAME BUTT STYLE SHEET ROCK



INSTALLATION IN WOOD FRAME SHEET ROCK RECESSED BEHIND WINDOW FRAME

NATIONAL CERTIFIED TESTING LABORATORIES

8350 PARKLINE BLVD SUITE 320 • ORLANDO, FLORIDA 32809 • TELEPHONE (407) 240-1356
FAX (407) 240-8882
www.nctlinc.com

STRUCTURAL/IMPACT PERFORMANCE TEST REPORT

Report No: NCTL-210-2947-2
Test Date: 09/25/03
Report Date: 10/28/03
Expiration Date: 09/30/07
Revised Date: 12/31/07

Client: *Energy Saving Products*
P.O. Box 1119
Jasper, FL 32052-1119

Test Specimen: *Energy Saving Products' Series "2031/2041" Single Hung Vinyl Prime Window (H-C50 54x78).*

Test Method: *AAMA/NWWDA 101/I.S.2-97, "Voluntary Specifications for Aluminum, Vinyl (PVC), and Wood Windows and Glass Doors"; ASTM E1996-99, "Performance of Exterior Windows, Glazed Curtain Walls, Doors and Storm Shutters Impacted by Windborne Debris in Hurricanes"; ASTM E1886-97, "Performance of Exterior Windows, Curtain Walls, Doors and Storm Shutters Impacted by Missiles (5) and Exposed to Cyclic Pressure Differentials."*

LARGE MISSILE DATA: *2 x 4 Southern Yellow Pine (S4S)*
Length: *7'0"*
Weight: *9 lbs.*
Velocity: *34 mph - 50 ft. per second*

TEST SPECIMEN DESCRIPTION

General: *The test specimen was a single hung vinyl prime window measuring 54" wide by 78" high overall. The top lite measured 44-1/2" wide by 40-1/2" high, providing a viewing area of 42-1/2" wide by 38" high. The active bottom sash measured 45-1/2" wide by 28-1/2" high, providing a viewing area of 43-1/2" wide by 27" high. The frame was of welded mitered corner construction. The active and fixed sash were of mitered type corner construction. The frame was fastened to the buck using twenty (20) (#8x2") phcs screws; four (4) on the top and bottom, six (6) on each side located 3" from each end then at 14" intervals.*

Glazing: *All sash were interior glazed using sealed insulating glass with a structural laminated silicone back-bedding and a rigid vinyl glazing bead. The overall insulating glass thickness was 0.750" consisting of two (2) lites of 3/16" thick annealed glass and one (1) space created by a "Swiggle Strip" spacer system. A 15 mm thick polyester film (Film Technology, Inc. Part No. T3960920) was adhered to glazing surfaces no. 2 and 3. Each impacted specimen used Sika 552 adhesive back-bedding. the structural specimen used GE2800 structural silicone with a snap-in rigid glazing bead.*

Reinforcement: *One (1) U-shaped reinforcement channel (0.105" thick) measuring 0.760" wide was housed by the top and bottom rail hollows and both active sash stiles.*

Locks & Keepers: *One (1) metal cam-type sweep lock was located at 7-1/2" from each end of the active sash top rail. One (1) metal keeper was located on the fixed meeting rail at the lock position. One (1) metal tilt latch with thumb actuator was located at each end of the active interior sash top rail.*

Weatherseals: *One (1) strip of center fin weatherstrip (0.250" high) was located at both sides and the bottom of the exterior active sash face. One (1) strip of center fin weatherstrip (0.250" high) was located at the bottom at both sides of the active sash. One (1) strip of center fin weatherstrip (0.250" high) was located at the interior sill riser.*

Weeps: *One (1) weep hole measuring 1/2" x 1/4" was located at 1-1/2" from each end of the screen retainer track. One (1) weep hole employing a plastic weep cover measuring 1-1/2" x 1/4" was located at 4-1/2" from each end of the exterior vertical sill wall.*

Interior & Exterior Surface Finish: *White vinyl (PVC).*

Sealant: *No apparent sealant applied.*

Screen: *An insect screen measuring 52" wide by 29" high was of butt-type corner construction with nylon corner keys. The screen employed fiberglass mesh cloth with a solid vinyl spline and two (2) pull tabs.*

TEST RESULTS

Par. No.	*Title of Test & Method*	*Measured*	*Allowed*
Specimen 2A:			
2.2.1.6.1	*Operating Force- ASTM E2068*		
	Active Sash	*27 lbf*	*30 lbf*
2.2.1.6.2	*Deglazing Test- ASTM E987*		
	Active Sash		
	Meeting Rail (70 lbf)	*4.2 % (0.021")*	*<100%*
	Bottom Rail (70 lbf)	*8.8 % (0.044")*	*<100%*
	Left Stile (50 lbf)	*1.6 % (0.008")*	*<100%*
	Right Stile (50 lbf)	*8.0 % (0.040")*	*<100%*
2.1.2	*Air Infiltration - ASTM E283*		
	1.57 psf (25 mph)	*0.3 cfm/ft² (0.29 cfm/ft²)*	*0.3 cfm/ft²*
*2.1.3 **	*Water Resistance - ASTM E547 & E331*		
	5.0 gph/ft²		
	WTP = 4.5 psf	*No Leakage*	*No Leakage*
*2.1.4.2 ***	*Uniform Load Structural - ASTM E330*		
	50.0 psf Exterior	*0.001"*	*0.178"*
	50.0 psf Interior	*0.004"*	*0.178"*

TEST RESULTS (Cont.)

Par. No.		Title of Test & Method	Measured	Allowed
2.1.7		Welded Corner Test	Meets As Stated	
2.1.8		Forced Entry Resistance - ASTM F588 Level 10 (See Appendix A for test results)	Meets as Stated	
		OPTIONAL PERFORMANCE		
4.3	*	Water Resistance - ASTM E547 5.0 gph/ft² WTP= 7.5 psf	No Leakage	No Leakage
4.4.2	**	Uniform Load Structural - ASTM E330 75.0 psf Exterior 75.0 psf Interior	0.015" 0.001"	0.178" 0.178"

* Tested with and without screen.
** No glass breakage or permanent damage causing the unit to be inoperable.

Large Missile Impact – ASTM E1996

Impact No.	Location	Speed	Comments
Specimen 2B			
1	Lower left corner of active sash	50 ft/sec (34 mph)	No penetration/ Passed
Specimen 2C			
1	Middle of active sash	50 ft/sec (34 mph)	No penetration/ Passed
Specimen 2D			
1	Top right corner of active sash	50 ft/sec (34 mph)	No penetration/ Passed

NOTE: All impacts rejected without penetration.

Cycle Test – ASTM E1886

Specimen 2B

Positive Loads

Range of Test			Actual			# of Cycles	Maximum Deflection
+0.2	to	+0.5	10	psf to	25 psf	3,500	No opening/ Passed
+0.0	to	+0.6	0	psf to	30 psf	300	No opening/ Passed
+0.5	to	+0.8	25	psf to	40 psf	600	No opening/ Passed
+0.3	to	+1.0	15	psf to	50 psf	100	No opening/ Passed

Negative Loads

-0.3	to	-1.0	15	psf to	50 psf	50	No opening/ Passed
-0.5	to	-0.8	25	psf to	40 psf	1,050	No opening/ Passed
-0.0	to	-0.6	0	psf to	30 psf	50	No opening/ Passed
-0.2	to	-0.5	10	psf to	25 psf	3,350	No opening/ Passed

3/25/10

Specimen 2C

Positive Loads

Range of Test			Actual			# of Cycles	Maximum Deflection
+0.2	to	+0.5	10	psf to	25 psf	3,500	No opening / Passed
+0.0	to	+0.6	0	psf to	30 psf	300	No opening / Passed
+0.5	to	+0.8	25	psf to	40 psf	600	No opening / Passed
+0.3	to	+1.0	15	psf to	50 psf	100	No opening / Passed

Negative Loads

-0.3	to	-1.0	15	psf to	50 psf	50	No opening / Passed
-0.5	to	-0.8	25	psf to	40 psf	1,050	No opening / Passed
-0.0	to	-0.6	0	psf to	30 psf	50	No opening / Passed
-0.2	to	-0.5	10	psf to	25 psf	3,350	No opening / Passed

Specimen 2D

Positive Loads

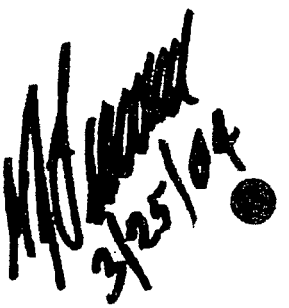
Range of Test			Actual			# of Cycles	Maximum Deflection
+0.2	to	+0.5	10	psf to	25 psf	3,500	No opening / Passed
+0.0	to	+0.6	0	psf to	30 psf	300	No opening / Passed
+0.5	to	+0.8	25	psf to	40 psf	600	No opening / Passed
+0.3	to	+1.0	15	psf to	50 psf	100	No opening / Passed

Negative Loads

-0.3	to	-1.0	15	psf to	50 psf	50	No opening / Passed
-0.5	to	-0.8	25	psf to	40 psf	1,050	No opening / Passed
-0.0	to	-0.6	0	psf to	30 psf	50	No opening / Passed
-0.2	to	-0.5	10	psf to	25 psf	3,350	No opening / Passed

TEST COMPLETED 09/25/03

The tested specimen meets (or exceeds) the performance levels specified in Table 2.1 of AAMA/NWWDA 101/I.S.2-97 for air infiltration. The listed results were secured by using the designated test methods and indicate compliance with the performance requirements of the referenced specification paragraphs for the H-C50 54x78 product designation.



This test does not constitute certification of this product, but only that the above test results were obtained using the designated test methods and indicate compliance with the performance requirements of the above referenced specifications. A copy of this report along with representative sections of the test specimen will be retained by NCTL for a period of four (4) years. The results obtained apply only to the specimen tested. NCTL assumes that all information provided by the client is accurate and that the physical and chemical properties of the components are as stated by the manufacturer.

NATIONAL CERTIFIED TESTING LABORATORIES

Michael E. Lane

MICHAEL E. LANE
Division Manager

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER No. 16758-E

MEL/amb

3/25/14

APPENDIX A

Forced Entry Resistance Test Results

***Test Method**: ASTM F588, "Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact".*

TEST RESULTS

Paragraph No.	*Loads*	*Duration*	*Measured*	*Allowed*
10.1-Lock Manipulation		*5 Minutes*	*No Entry*	*No Entry*
10.2.1.1-Test A1	*L1=150 lbf*	*1 Minute*	*No Entry*	*No Entry*
10.2.1.2-Test A2	*L1=150 lbf* *L2=75 lbf interior*	*1 Minute*	*No Entry*	*No Entry*
10.2.1.3-Test A3	*L1=75 lbf* *L2=75 lbf exterior*	*1 Minute*	*No Entry*	*No Entry*
10.2.1.4-Test A4	*L1=300 lbf* *L2=75 lbf interior*	*1 Minute*	*No Entry*	*No Entry*
10.2.1.5-Test A5	*L1=300 lbf* *L2=175 lbf exterior*	*1 Minute*	*No Entry*	*No Entry*
10.2.1.6-Test A6	*L1=300 lbf* *L3= 30 lbf interior*	*1 Minute*	*No Entry*	*No Entry*

3/25/14

KEYSTONE

Document Title: CERTIFICATION AUTHORIZATION REPORT	Document No: FRM BT-02	
	Revision No: 3	Page: 1 Of 1
Reference No: PRO BT-03		

FMA Keystone Certification Program

Certification Authorization Report

CAR & Product ID Number: 146 - 190
CAR Issue Date: 4/11/2005
CAR Expiration Date: 10/28/2007
Company Code: 146

This Certification Authorization Report (CAR) is issued by Keystone Certifications, Inc. (KCI) after full validation review of the product qualification documents for the product named below. This report is only valid when signed by the President of KCI, and indicates the product as manufactured by the company named below has been tested and meets the requirements of the referenced standard and is eligible for the application of FMA Keystone Certification Program certification labels. Licensee stipulates in affixing certification labels to products, that those products are representative of the specimen evaluated and documented for certification authorization. Only products bearing such a certification label shall be considered certified. The information in this report can be verified at www.keystonecerts.com

Company Information:	**Product Information:**
Energy Saving Products of Florida	Model: 2031/2041 Impact Single Hung
4000 NW 110th Drive PO Box 1119	Operator Type: H
Jasper FL 32052	Configuration: AV/AH/Lami IG
	Max Width: 54
	Max Height: 78

Referenced Standard:	**Product Rating:**
ANSI/AAMA/WDMA 101/IS2-97	H-LC50, 54x78

Qualifying Test Information:	
Test Report No:	NCTL-210-2947-2
Test Report Expiration:	10/28/2007

Authorized Signature:

Marcia Falke, President

Keystone Certifications, Inc.
1790 Old Trail Road, Suite D
Etters, Pennsylvania 17319
Phone: 717-932-8500
Fax: 717-932-8501

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KEYSTONE

CERTIFICATION AUTHORIZATION REPORT	FRM BI-43	
	New	
PRODUCTS		

FMA Keystone Impact Certification Program

Certification Authorization Report

CAR & Product ID Number 146 - 234
CAR Issue Date 4/11/2005
CAR Expiration Date 10/28/2007
Company Code 146

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Company Information:	**Product Information:**
Energy Saving Products of Florida 4000 NW 110th Drive PO Box 1119 Jasper FL 32052	Model: 2031/2041 Impact Single Hung Operator Type: H Configuration: AV/AH/Lami IG Max Width: 54 Max Height: 78 Corresponding Structural CARs: 146-190

Referenced Standard:	**Product Rating:**
ASTM E1886-97/1996-99	Missile Level D, Wind Zone 3, DP +/-50, 54x78

Qualifying Test Information:	
Test Report No.	NCTL-210-2947-2
Test Report Expiration	10/28/2007

Authorized Signature:

Marcus P. Hall

Marcus Hall, President

Keystone Certifications, Inc.
1790 Old Trail Road, Suite D
Etters, Pennsylvania 17319
Phone: 717-932 8500
Fax: 717-932-8501

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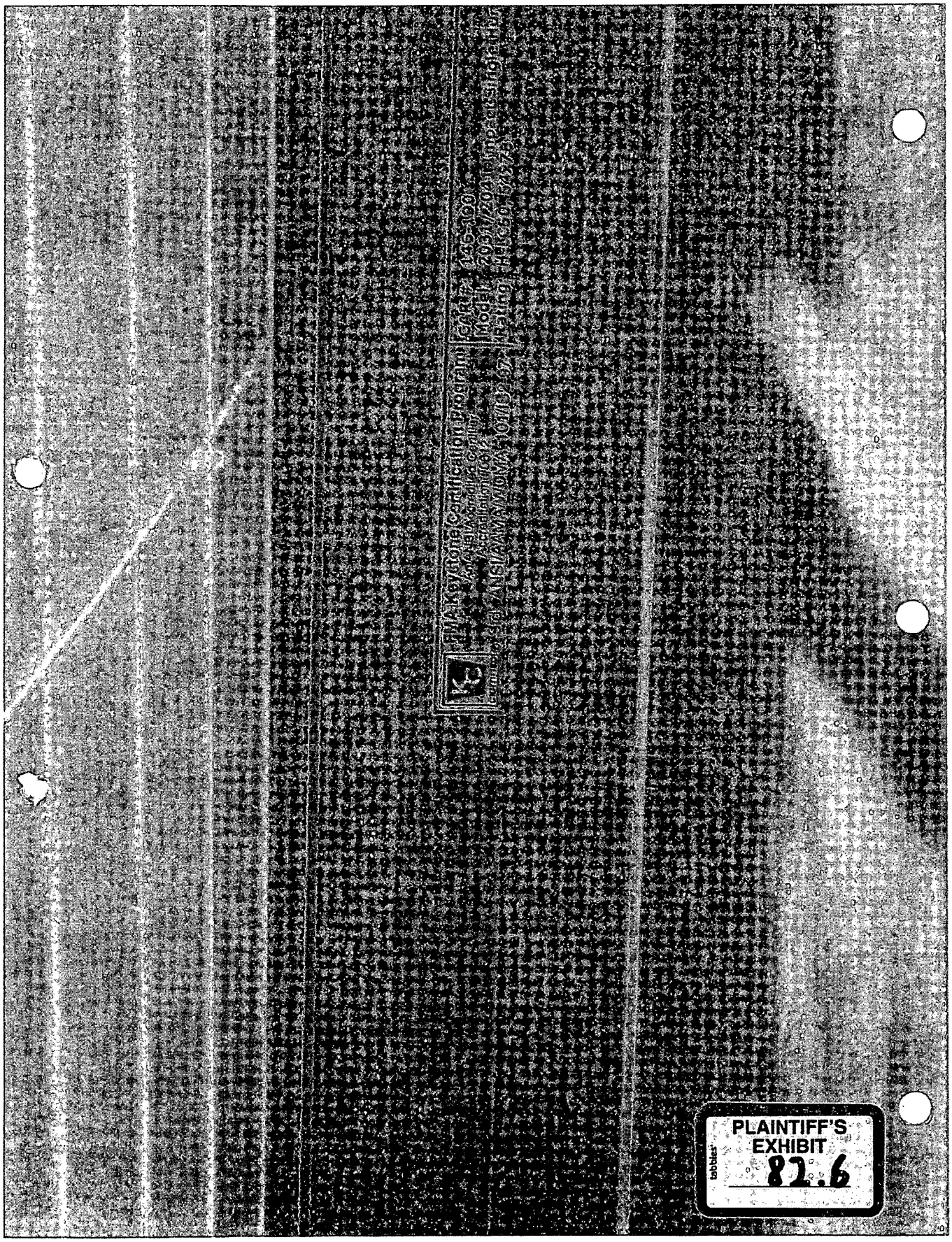
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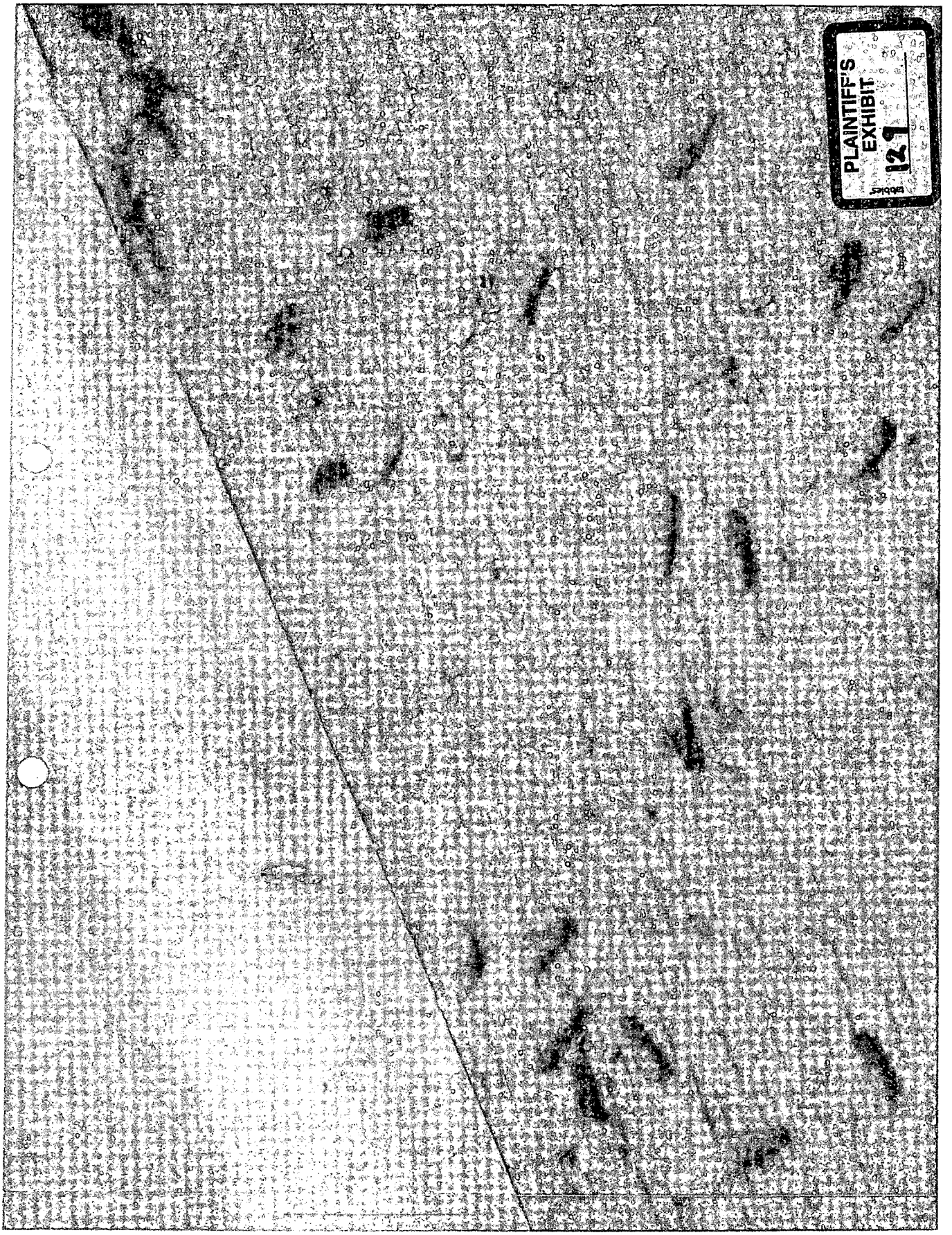
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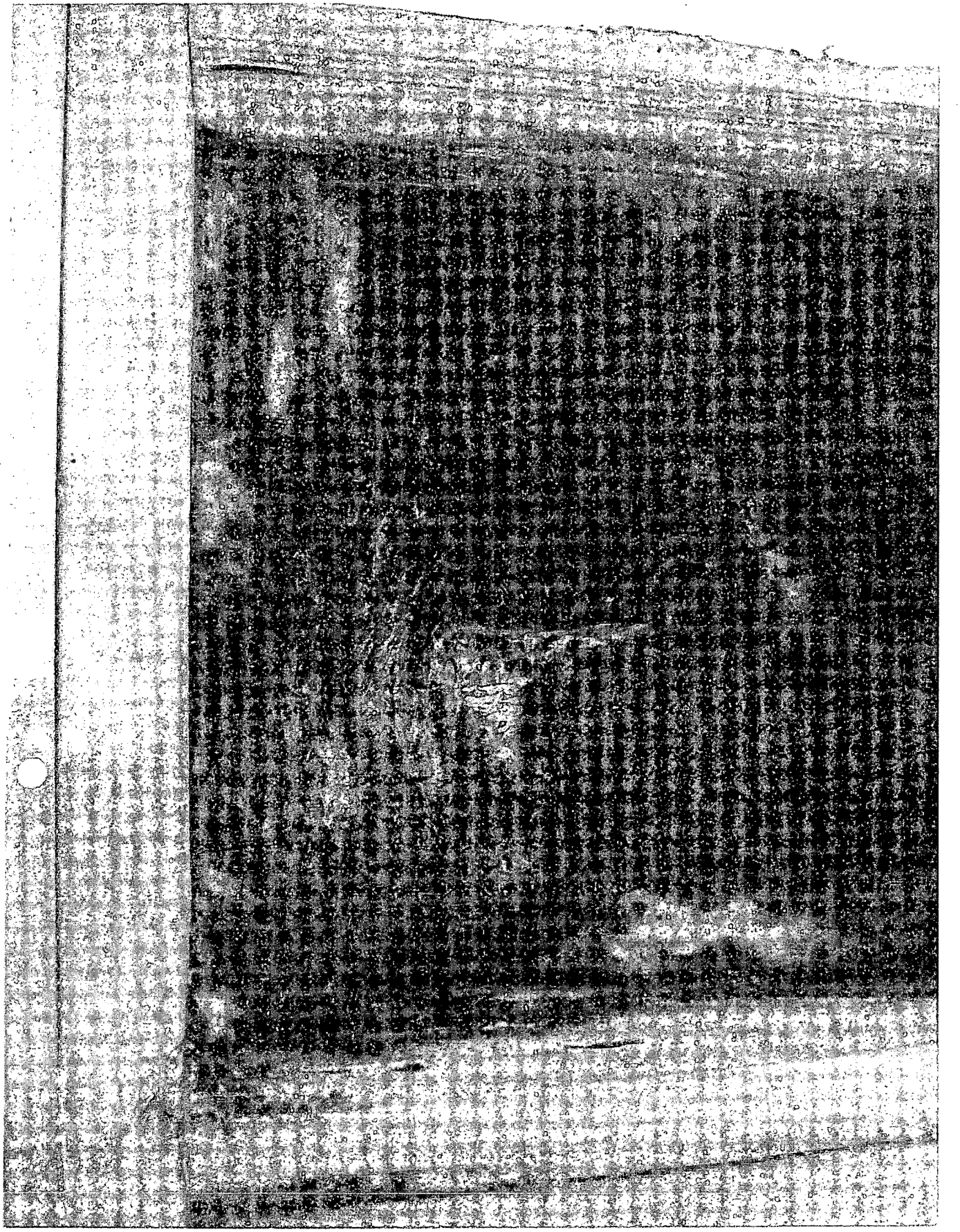

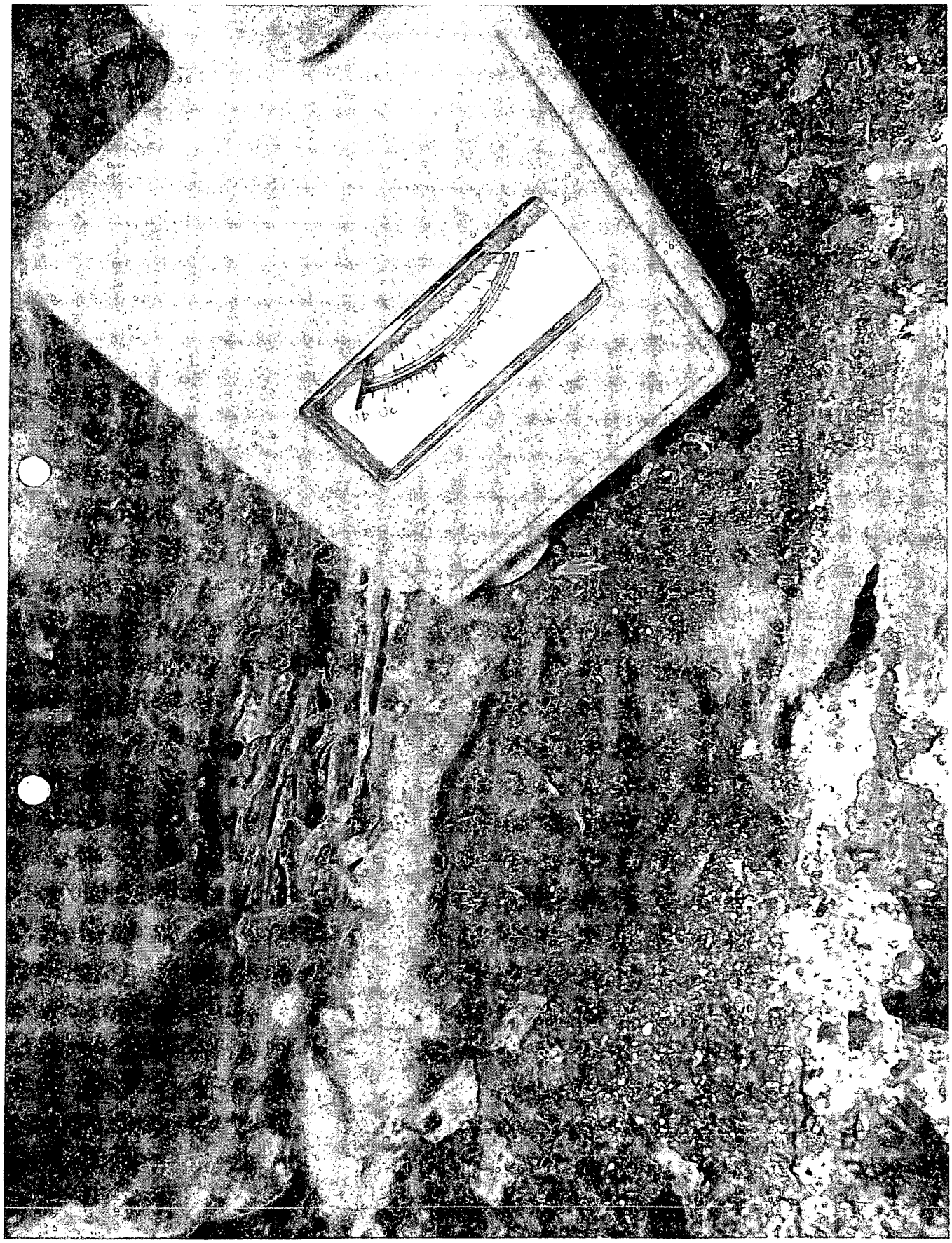

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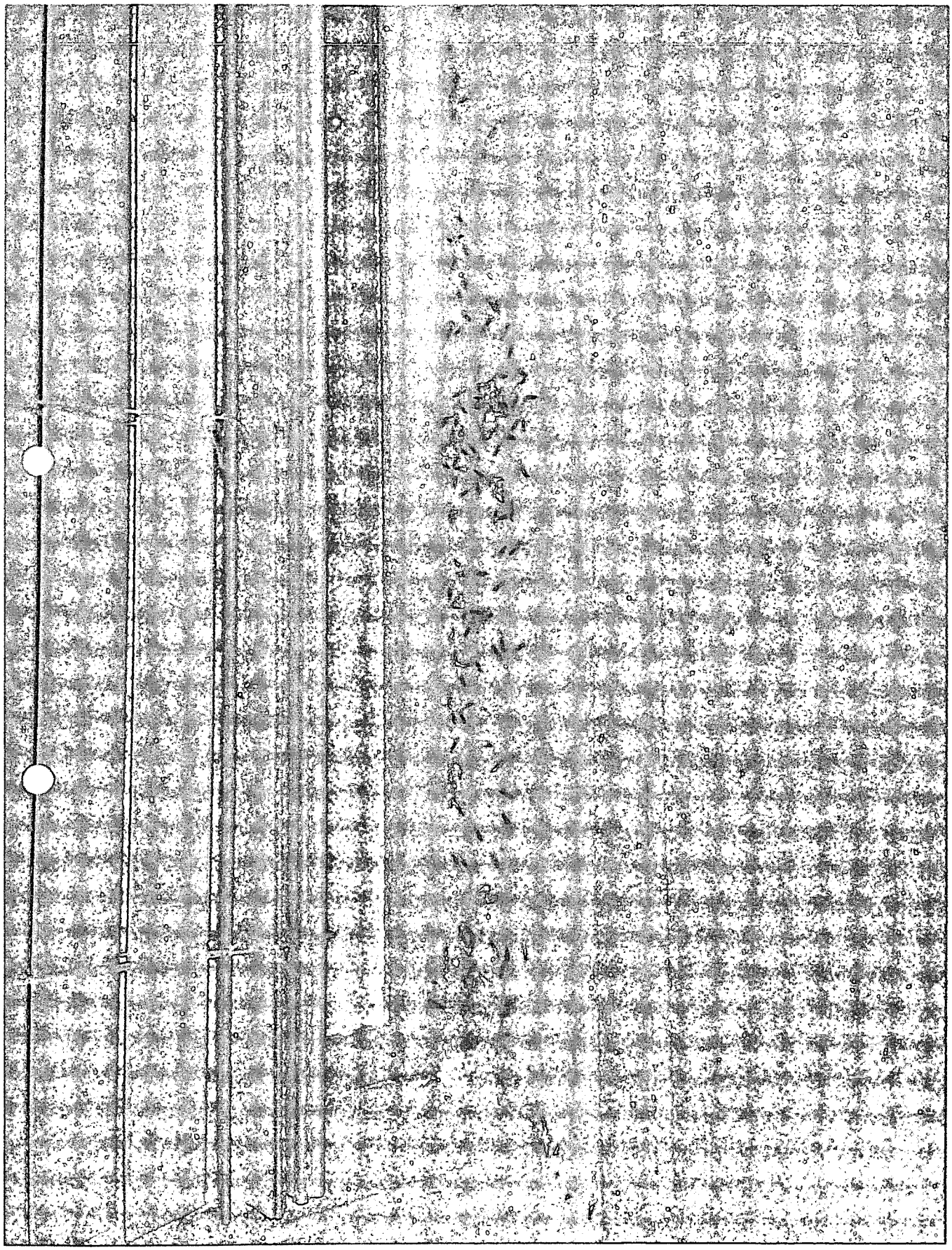

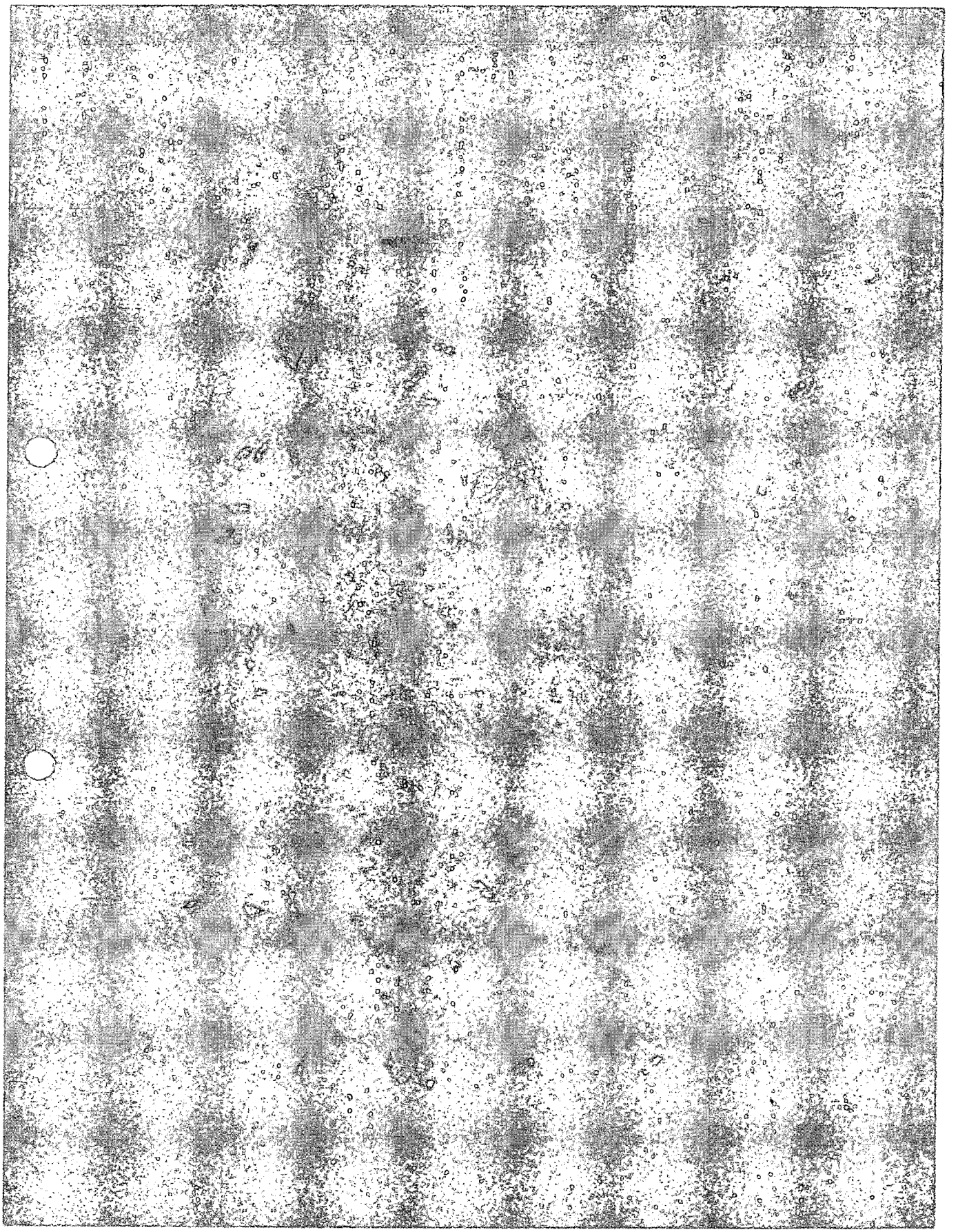

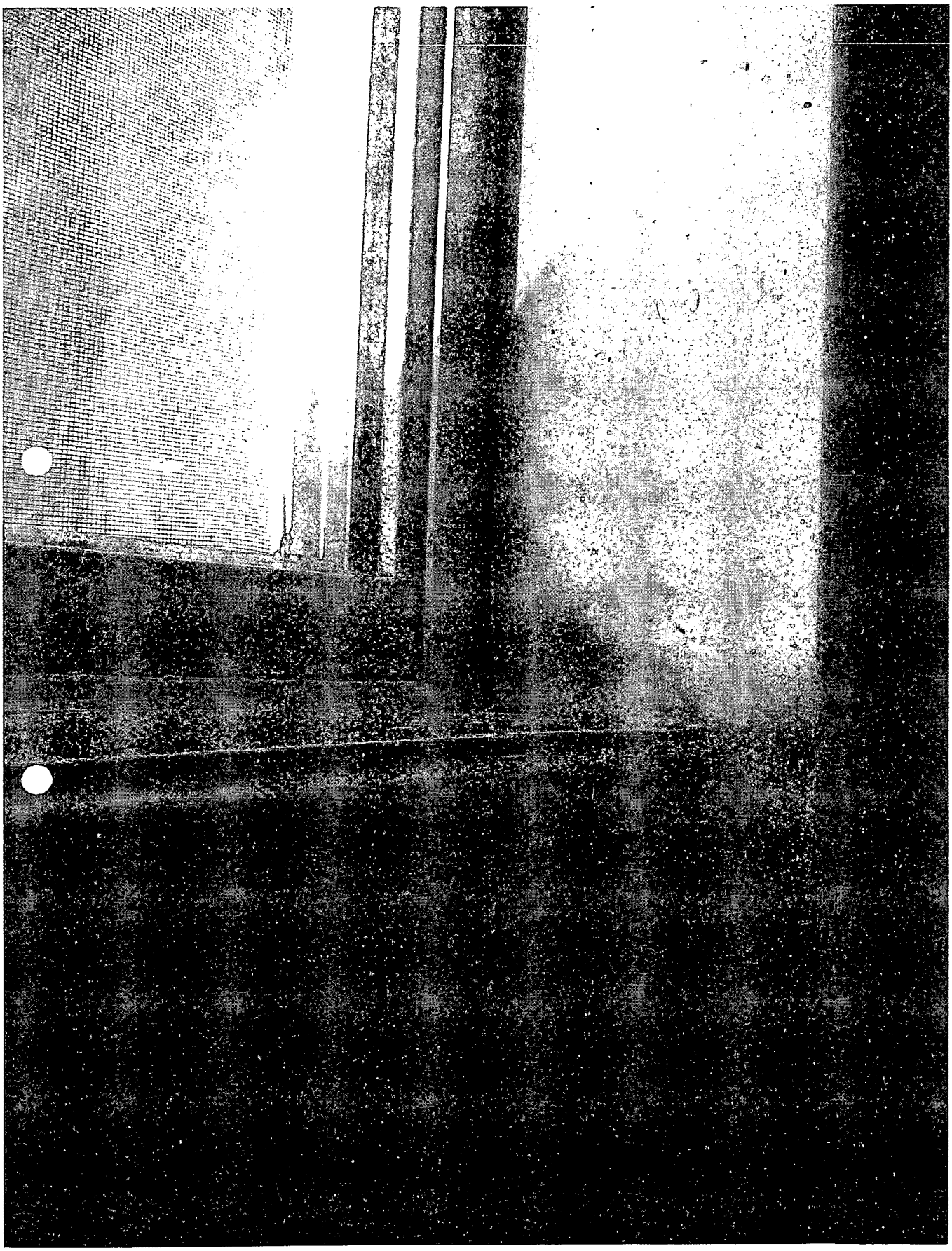

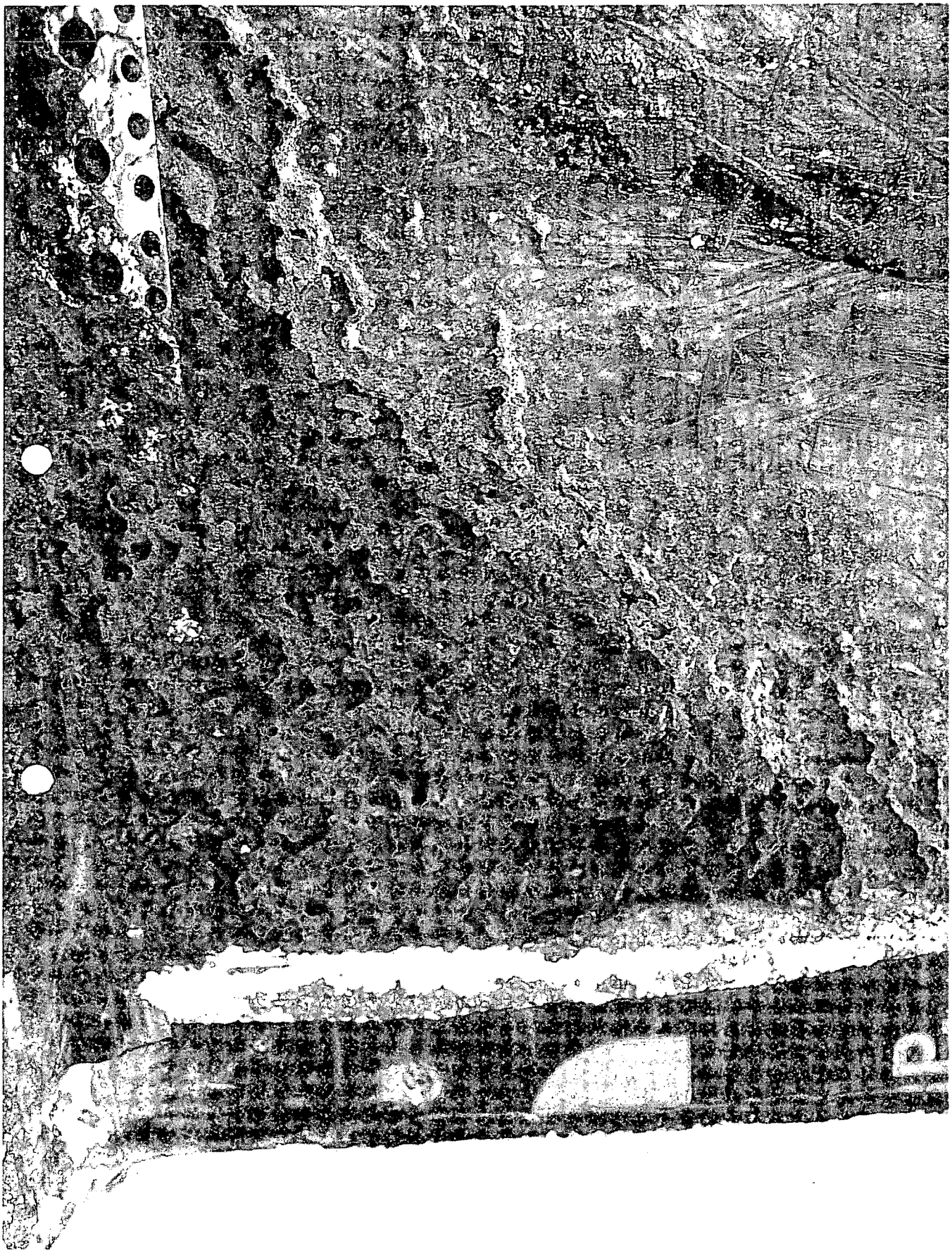

ONE BELLE HALL

OPERATION AND MAINTENANCE DOCUMENTS

VOLUME 1 OF 2

PLAINTIFF'S EXHIBIT 179

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Suite 104
Charleston, SC 29492

ONE BELLE HALL CONDOMINIUMS

OPERATION AND MAINTENANCE DOCUMENTS

PRODUCT DATA

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- LANDSCAPE IRRIGATION/ PLEASANT PLACES

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- CONCRETE/ JC CONCRETE
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- MASONRY/ SUPERIOR CONSTRUCTION SERVICES

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ONE BELLE HALL CONDOMINIUMS

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MT. PLEASANT, SC 29464
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FAX: 336-886-6619

9. COASTAL LUMBER & FRAMING
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FAX: 352-735-6006

10. WHOLESALE BUILDING SUPPLY
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FAX: 912-537-3093

11. SOUTHERN SPECIALTIES
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FAX: 803-328-3839

15. GALE CONTRACTOR SERVICES
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FAX: 843-871-8358

16. FIRST EXTERIORS
3285 ASSOCIATE DRIVE
N. CHARLESTON, SC 29418
PHONE: 843-207-1244
FAX: 843-207-1242

17. DRY-TECH
7282 TANGLEWOOD DR
CHARLESTON, SC 29418
PHONE: 843-552-3702

18. FLOORING SERVICES
2220 TECHNICAL PARKWAY
N. CHARLESTON, SC 29406
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19. J & D PAINTING
4916 LUMLEY ROAD
DURHAM, NC 27703
PHONE: 336-382-0231

20. GENERAL ELECTRIC
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FAX: 919-859-0378

22. SOLID SOLUTIONS
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CLAYTON, NC 27520
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FAX: 919-550-7037

23. CENTURY FIRE PROTECTION
2625 PINEMEADOW COURT STE. F
DULUTH, GA 30096
PHONE: 770-945-2330
FAX: 770-945-2651

24. BUDGET MECHANICAL PLUMBING
733 TALLWOOD ROAD
CHARLESTON, SC 29412
PHONE: 843-406-2800
FAX: 843-406-1050

25. GENERAL HEATING & AIR
224 HICKS ROAD
GREENVILLE, SC 29605
PHONE: 864-277-4554
FAX: 864-299-0246

26. HOUSTON-STAFFORD
3670 BURNETTE PARK DRIVE STE. A
SUWANEE, GA 30024
PHONE: 770-945-4244
FAX: 770-945-1929

DIVISION 2- SITEWORK

SITEWORK- O.L. THOMPSON

ROA_01146

WARRANTY AGREEMENT

Project: Belle Hall Condominiums

Owner: Belle Hall Direct 101, LP
Contractor: TCR NC Construction I Limited Partnership

Subcontractor: D.L. Thompson

Subcontractor hereby expressly warrants and guarantees that all labor, materials, and equipment furnished and work performed in conjunction with the above referenced project are in accordance with the plans, specifications, the Subcontract Agreement and authorized modifications thereto. All labor, materials and equipment shall be free from defects, due to defective materials and/or workmanship, for a period of one (1) year from the date of Certificate of Occupancy for each building/structure, unless otherwise stated in the Subcontract Agreement.

Should any defects develop during the warranty period due to improper workmanship and/or arrangement, the same shall, upon notice, be made good by this Subcontractor at no expense to the Contractor, Owner, or Owner's Representative. Nothing in the above shall be deemed to apply to work or equipment which has been abused, neglected or altered by the Contractor, Owner, or Owner's Representative.

Unless otherwise stated in the Subcontract Agreement, warranty work shall be responded to within twenty-four (24) hours of notification by the Contractor, Owner, or Owner's Representative, including weekends and holidays. Warranty notices received before 10:00 am shall be responded to on the same day. Should Subcontractor fail to respond within twenty-four (24) hours of notification or correct the defective work or equipment within seventy-two (72) hours, the Contractor, Owner, or Owner's Representative shall proceed with the correction of the defective work. All costs associated with this corrective action shall be reimbursed by this Subcontractor or charged against its account. Subcontractor shall remit payment for such charges within five (5) calendar days of notification by the Contractor, Owner, or Owner's Representative.

Signature: D-2

Printed Name: Don Thompson

Position/Title: VP

Date: 12-7-06

DIVISION 2- SITEWORK

TERMITE TREATMENT-DODSON PEST CONTROL

$100,000 INSURED TERMITE WARRANTY

SOIL TREATMENTS

WARRANTY

№ 85566

For the sum of $ 6,086.00 Dodson Bros. Exterminating Co., Inc. has agreed with the owner named herewith to service the following described real property against attack by subterranean termites:

OWNER: TCR NC Construction Limited Partner

ADDRESS: 230 Seven Farms Dr. #104, Daniel Island, SC 29492

DESCRIPTION OF REAL PROPERTY: Belle Hall Condominiums

CHECK ONE: COMMERCIAL PROPERTY ☒
PRIVATE RESIDENCE ☐ AREA ENCLOSED WITHIN OUTSIDE WALLS: 35,372 SQ. FT.

LOCATION OF REAL PROPERTY: 1000 S. Egypt Rd., Mt. Pleasant, SC 29464

In accordance with our Service Agreement No. 13768 we guarantee that:

1. Any additional subterranean termite control service deemed necessary within five (5) years after the date of this Warranty will be performed without charge to the owner, and;

2. If an occurance of active subterranean termite damage is reported within the period of the five (5) year warranty for the above property; Dodson Bros. will perform a detailed inspection to determine the cause and extent of damages. Dodson Bros. will agree to supervise and/or perform the repairs not to exceed $100,000.

This Warranty shall remain in force for five years from the contract date noted herein. If additions or alterations have been made to the described real property which in the opinion of Dodson Bros. constitutes a subterranean termite hazard, such additions or alterations must be serviced by Dodson Bros. as soon as practicable at the expense of the owner or this Warranty shall immediately become null and void.

This repair guarantee applies to all areas of the building except those areas where:

1. Wood members of the building are in direct contact with the ground.

2. Wood material in the building is below outside finished ground level.

3. A moisture problem exists caused by faulty plumbing, gutter, down spouts or grading.

NOTE: THIS WARRANTY DOES NOT COVER ANY HIDDEN DAMAGE DISCOVERED AFTER CONTRACT DATE UNLESS LIVE ACTIVE INFESTATION IS FOUND.

COMPLETION DATE: December 6, 2006

BY: Bert Dodson Jr.

DODSON BROS. EXTERMINATING CO., INC.
Home Office, Lynchburg, Virginia

ROA_01149

OBH - O&M 11

DIVISION 2- SITEWORK

LANDSCAPE IRRIGATION-PLEASANT PLACES

WARRANTY AGREEMENT

Project: Belle Hall Condominiums

Owner: Belle Hall Direct 101, LP
Contractor: TCR NC Construction I Limited Partnership

Subcontractor: Pleasant Places

Subcontractor hereby expressly warrants and guarantees that all labor, materials, and equipment furnished and work performed in conjunction with the above referenced project are in accordance with the plans, specifications, the Subcontract Agreement and authorized modifications thereto. All labor, materials and equipment shall be free from defects, due to defective materials and/or workmanship, for a period of one (1) year from the date of Certificate of Occupancy for each building/structure, unless otherwise stated in the Subcontract Agreement.

Should any defects develop during the warranty period due to improper workmanship and/or arrangement, the same shall, upon notice, be made good by this Subcontractor at no expense to the Contractor, Owner, or Owner's Representative. Nothing in the above shall be deemed to apply to work or equipment which has been abused, neglected or altered by the Contractor, Owner, or Owner's Representative.

Unless otherwise stated in the Subcontract Agreement, warranty work shall be responded to within twenty-four (24) hours of notification by the Contractor, Owner, or Owner's Representative, including weekends and holidays. Warranty notices received before 10:00 am shall be responded to on the same day. Should Subcontractor fail to respond within twenty-four (24) hours of notification or correct the defective work or equipment within seventy-two (72) hours, the Contractor, Owner, or Owner's Representative shall proceed with the correction of the defective work. All costs associated with this corrective action shall be reimbursed by this Subcontractor or charged against its account. Subcontractor shall remit payment for such charges within five (5) calendar days of notification by the Contractor, Owner, or Owner's Representative.

Signature: _____

Printed Name: Garner Regenovich

Position/Title: Director of Sales

Date: 12-7-06

BELLE HALL CONDOS MAINTENANCE SCHEDULE

	DESCRIPTION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LAWN AREAS	MOWING			X	X	X	X	X	X	X	X		
	WEEDEATING			X	X	X	X	X	X	X	X		
	EDGING	X	X	X	X	X	X	X	X	X	X	X	X
	INSECT & DISEASE CONTROL			X	X	X	X	X	X				
	WEED CONTROL			X	X	X	X	X	X	X	X		
	FERTILIZATION			X	X	X							
	OVERSEED									X			
	PRE EMERGENT WEED CONTROL									X			
	POST EMERGENT WEED CONTROL			X	X	X	X	X	X	X			
TREE & SHRUB AREAS	TREES												
	PRUNING	X	X	X	X	X	X	X	X	X	X	X	X
	INSECT & DISEASE CONTROL			X	X	X	X	X	X	X	X	X	
	WEED CONTROL			X	X	X	X	X	X	X	X	X	
	FERTILIZATION			X	X	X				X			
	PRE EMERGENT WEED CONTROL										X		
	POST EMERGENT WEED CONTROL			X	X	X	X	X	X	X	X		
	MULCH				X						X		
	SHRUBS												
	PRUNING	X	X	X	X	X	X	X	X	X	X	X	X
	INSECT & DISEASE CONTROL			X	X	X	X	X	X	X			
	WEED CONTROL			X	X	X	X	X	X	X	X	X	
	FERTILIZATION			X	X	X				X			
	PRE EMERGENT WEED CONTROL										X		
	POST EMERGENT WEED CONTROL			X	X	X	X	X	X	X	X		
	MULCH												
MISC.	LITTER	X	X	X	X	X	X	X	X	X	X	X	X
	BLOW/VACUUM	X	X	X	X	X	X	X	X	X	X	X	X
	IRRIGATION MAINT.	X	X	X	X	X	X	X	X	X	X	X	X
	ANNUALS				X						X		

RAIN BIRD®

TECH SPECS

PEB and PESB Series Valves

Valves That Are Built Tough!

Pressure surges? Effluent water? Clogging debris? No problem. PEB and PESB Series valves offer long life and efficient, trouble-free performance—even under harsh conditions. Constructed of heavy-duty, glass-filled nylon, these valves resist clogging. And the PESB model features a patented scrubber to actively fight dirt, debris and particles.

Features

- Durable glass-filled nylon construction for long life and heavy-duty performance at 200 psi pressure.
- Stainless steel studs molded into the bonnet. Bonnet can be attached and removed more easily and more often without damaging threads.
- One-piece solenoid design with captured plunger and spring for easy servicing. Prevents loss of parts during field service.
- Manual internal and external bleed. External bleed does not allow debris to go through the solenoid ports when system is flushed. Internal bleed operates the valve without allowing water into the valve box; allows pressure regulator to be adjusted without turning the valve on at the controller first.
- Low flow operating capability (0.25 GPM) for a wide range of applications. For flows below 3 GPM (0,75 m³/h; 0,21 l/s) or any Xerigation® application, install Rain Bird Y filter upstream.
- Slow closing to prevent water hammer and subsequent system damage.
- **PESB only:** Nylon scrubber scrapes its stainless steel screen clean to break down grit and plant material. Prevents debris build-up and clogging.

Options

- Accommodate optional, field installed PRS-B pressure regulating module to ensure optimum sprinkler performance.
- Accept latching solenoid for use with Rain Bird battery-operated controllers.
- Optional purple flow control handles for non-potable water applications (PEB-NP-HAN).

Operating Range

- Pressure: 20 to 200 psi (1,4 to 13,8 Bars)
- Flow without PRS-B option: 0.25 to 200 GPM (0,06 to 45 m³/h; 0,02 to 12,60 l/s)
- Flow with PRS-B option: 20 to 200 GPM (5 to 45 m³/h; 1,39 to 12,60 l/s)
- Temperature: Up to 150° F (66° C)

Electrical Specifications

- 24 VAC 50/60 cycle solenoid power requirement: 0.41 A (9.9 VA) inrush current; 0.23 A (5.5 VA) holding current

Models*

- 100-PEB and 100-PESB: 1" (26/34)
- 150-PEB and 150-PESB: 1½" (40/49)
- 200-PEB and 200-PESB: 2" (50/60)

** Available in BSP model. Specify NPT or BSP threads when ordering.*

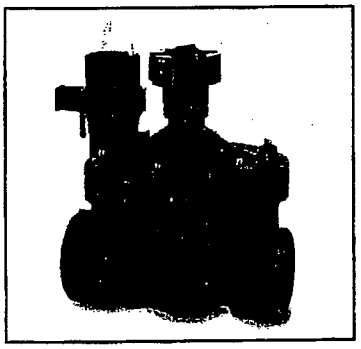
PEB & PESB Valves Pressure Loss (psi)

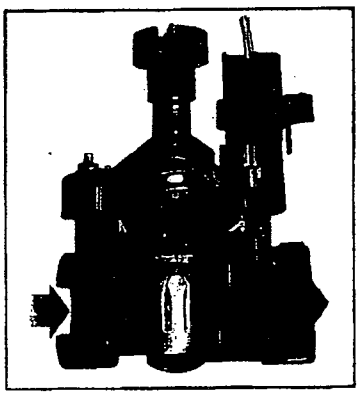
Flow (GPM)	1"	1½"	2"
0.25	3.0	-	-
0.5	3.0	-	-
1	3.0	-	-
5	2.0	-	-
10	1.5	-	-
20	2.5	1.5	-
30	5.0	1.5	-
40	9.3	1.8	-
50	15.5	2.2	1.2
75	-	3.9	2.4
100	-	7.0	4.2
125	-	11.3	6.8
150	-	16.2	9.8
175	-	-	13.3
200	-	-	17.7

Pressure Loss (Bars)

Flow (m³/h)	Flow (l/s)	1"	1½"	2"
0,06	0,02	0,21	-	-
1	0,20	0,15	-	-
2	0,56	0,10	-	-
3	0,83	0,12	-	-
4	1,11	0,16	-	-
5	1,39	0,21	0,10	-
6	1,67	0,27	0,12	-
7	1,94	0,35	0,14	-
8	2,22	0,45	0,15	-
9	2,50	0,59	0,16	-
10	2,78	0,77	0,17	-
12	3,33	-	0,18	0,09
14	3,89	-	0,19	0,12
16	4,44	-	0,23	0,15
22	6,11	-	0,46	0,26
28	7,78	-	0,75	0,44
34	9,44	-	1,12	0,66
40	11,11	-	-	0,93
45	12,60	-	-	1,27

** Loss values are with flow control fully open.*
1) Rain Bird recommends flow rates in the supply line not to exceed 7.5 ft./sec. (2.3 m/s) in order to reduce the effects of water hammer.
2) For flows below 5 GPM (1 m³/h; 32 l/s), Rain Bird recommends use of upstream filtration to prevent debris from collecting below the diaphragm.
3) For flows below 10 GPM (2 m³/h; 63 l/s) Rain Bird recommends the flow control stem be turned down two full turns from the fully open position.
Note: PRS-B module is recommended for use only at flow rates in areas below solid line.





Dimensions

Size	Height	Length	Width
100	6½" (16,5 cm)	4" (10,2 cm)	4" (10,2 cm)
150	8" (20,3 cm)	6" (15,2 cm)	6" (15,2 cm)
200	8" (20,3 cm)	6" (15,2 cm)	6" (15,2 cm)

Note: The PRS-B option adds 2" (5 cm) to valve height.

How to Specify

100-PEB-PRS-B

Size	Model	Optional Feature
100: 1"	PEB	PRS-B: pressure
150: 1½"	PESB: scrubber	regulating
200: 2"	model	module

Note: Valve and PRS-B module must be ordered separately.

RAIN BIRD.

Specifications

The remote control valve shall be a normally closed 24 VAC 50/60 cycle solenoid actuated globe pattern capable of having a flow rate of _____ gallons per minute (GPM) with a pressure loss not to exceed _____ pounds per square inch (psi). The valve pressure rating shall not be less than 200 psi.

The valve body and bonnet shall be constructed of heavy-duty glass-filled UV-resistant nylon and have stainless steel studs and flange nuts; diaphragm shall be of nylon reinforced nitrile rubber.

The valve shall have both internal and external manual open/close control (internal and external bleed) to manually open and close the valve without electrically energizing the solenoid. The valve's internal bleed shall prevent flooding of the valve box.

The valve shall house a fully-encapsulated, one-piece solenoid. The solenoid shall have a captured plunger with a removable retainer for easy servicing, and a leverage handle for easy turning. This 24 VAC 50/60 Hz solenoid shall open with 19.6 volt minimum at 200 psi. At 24 VAC average inrush current shall not exceed .23 amps.

The valve shall have a brass flow control stem for accurate manual regulation and/or shut-off of outlet flow. The valve must open or close in less than I minute at 200 psi, and less than 30 seconds at 20 psi.

The PESB valve shall have a self-cleaning stainless steel screen designed for use in dirty water applications.

The valve construction shall be such as to provide for all internal parts to be removable from the top of the valve without disturbing the valve installation.

Optional Feature Specification

PRS-B Pressure Regulating Module:
100-PEB-PRS-B 100-PESB-PRS-B
150-PEB-PRS-B 150-PESB-PRS-B
200-PEB-PRS-B 200-PESB-PRS-B

When so indicated on the design, the 1", 1½" and 2" electric remote control plastic valves shall have a pressure regulating module (PRS-B) capable of regulating outlet pressure between 15 and 100 psi (±5 psi).

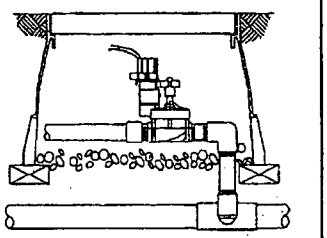
The PRS-B module shall have an adjusting screw for setting pressure and Schrader valve connection for monitoring pressure. The pressure shall be adjustable from the PRS-B when the valve is internally manually bled or electrically activated.

Non-Potable Flow Control Handle:
PEB-NP-HAN

When so indicated on the design, the valve shall have a purple flow control handle to indicate to the user that non-potable water is being used. There shall be no difference between the black and purple handles except for the color.

The valve shall be as manufactured by Rain Bird Sprinkler Mfg. Corp., Glendora, California.

Plastic Electric Remote Control PEB or PESB Valve (with PRS-B)



Rain Bird Sales, Inc.
970 W. Sierra Madre, Azusa, CA 91702
Tel: 626-963-9311 Fax: 626-812-3411

Rain Bird Sales, Inc.
6640 South Bonney Avenue, Tucson, AZ 85706
Phone: (520) 434-6200 Fax: (520) 434-6246

Rain Bird International, Inc.
145 North Grand Avenue, Glendora, CA 91741
Tel.: 626-963-9311 Fax: 626-963-4287

Rain Bird Technical Service
800 247-3782 (U.S. only)

http://www.rainbird.com

Rain Bird. Conserving More Than Water.

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RAIN BIRD®

TECH SPECS

1800 Series Spray Heads

Industry's Leading Spray Heads

1800 Series Spray Heads have first-rate quality built in for reliable operation and long life. Their superior components and features make them the spray heads of choice for a wide variety of applications.

Features

- Exclusive co-molded, pressure-activated, multi-functional wiper seal assures positive seal without excess "flow-by" which enables more heads to be installed on the same valve.
- Precision controlled flush at pop-down clears debris from unit, assuring positive stem retraction in all soil types.
- Strong stainless steel spring provides reliable stem retraction.
- Ratchet mechanism on all models allows easy nozzle pattern alignment without tools.
- Pre-installed 1800 Pop-Top™ flush plug blocks debris from entering after flushing. Allows for easy nozzle installation.
- Constructed of time-proven UV-resistant plastic and corrosion resistant stainless steel parts, assuring long product life.
- All sprinkler components are removable from the top without special tools, providing for quick and easy flushing and maintenance of the sprinkler.
- Side and bottom inlets featured on 1806 and 1812 models.
- Five-year trade warranty.

Operating Range

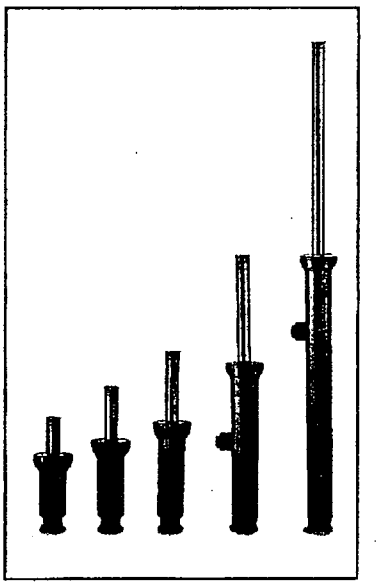
- Spacing: 3 to 20 feet (0,9 to 6,1 m)
- Pressure: 15 to 70 psi (1,0 to 4,8 Bars)

Specifications

- Flow-by: 0 at 8 psi (0,6 Bars) or greater; 0.50 GPM (0,11 m^3/h; 0,03 l/s) otherwise

Dimensions/Models

- ½" (15/21) NPT female threaded inlet
- Models and height:
  1802: 4" (10 cm) body height;
  2" pop-up height (5 cm)
  1803: 4⅞" (12 cm) body height;
  3" pop-up height (7,6 cm)
  1804: 6" (15 cm) body height;
  4" pop-up height (10 cm)
  1806: 9⅜" (24 cm) body height;
  6" pop-up height (15 cm)
  1812: 16" (40 cm) body height;
  12" pop-up height (30 cm)
- Exposed surface diameter: 2¼" (5.7 cm)



How to Specify

1804-SAM-PRS

Model	Optional Feature	Optional Feature
1804	SAM: Seal-A-Matic™ check valve	PRS: In-stem pressure regulator

RAIN BIRD

1800 SAM Series

Ideal for use in areas with changing elevations, the 1800 SAM Series offers all 1800 Series features plus:

- Built-in Seal-A-Matic™ (SAM) check valve. Eliminates the need for under-the-head check valves. No parts to be installed at the site.
- Traps water in lateral pipes in elevation changes of up to 8' (2,4 m). Reduces wear on system components by minimizing water hammer during start-up.
- Prevents drainage from spray heads at lower elevations. Stops water waste. Ends landscape damage due to flooding and/or erosion.
- Even stronger retract spring to accommodate elevation changes up to 8' (2,4 m). One of the strongest springs in the industry.
- Designed for use with all Rain Bird plastic and brass spray head nozzles.
- "SAM" stamped on cap for easy identification and maintenance.
- Five-year trade warranty.

Operating Range

- Spacing: 3 to 20 feet (0,9 to 6,1 m)
- Pressure: 25 to 70 psi (1,7 to 4,8 Bars)

Specifications

- SAM capability: holds up to 8 feet (2,4 m) of head; 3.5 psi (0,2 Bars)
- Flow-by: 0 at 8 psi (0,6 Bars) or greater; 0.50 GPM (0,11 m³/h; 0,03 l/s) otherwise
- SAM operable only when installed by bottom inlet

Dimensions

- ½" (15/21) NPT female threaded inlets
- Body height: 1804 SAM - 6" (15 cm), 1806 SAM - 9⅜" (24 cm), 1812 SAM-16" (40 cm)
- Exposed surface diameter: 2¼" (5,7 cm)

Models

- 1804 SAM: 4" pop-up height (10 cm)
- 1806 SAM: 6" pop-up height (15 cm)
- 1812 SAM: 12" pop-up height (30 cm)

1800 PRS Series

Designed for areas with high and/or widely fluctuating water pressures, the 1800 PRS Series has all 1800 Series features plus:

- **PATENTED** PRS pressure regulator built into the stem. No parts to be installed at the site. Saves time and money.
- Maintains constant outlet pressure at 30 psi (2,1 Bars). Spray heads and nozzles perform best at 30 psi. Ensures maximum spray head and nozzle performance, even with varying inlet pressures. Maintains constant pressure regardless of nozzle used.
- Restricts water loss by up to 70% if nozzle is removed or damaged. Saves water and money. Reduces possibility of accidents and property damage. Recommended for vandal-prone areas.
- Ends misting and fogging caused by high pressure. Stops water waste. Ensures necessary watering occurs in high pressure or wind conditions.
- Designed for use with all Rain Bird plastic and brass spray head nozzles.
- "PRS" stamped on cap for easy identification and maintenance.
- Five-year trade warranty.

Operating Range

- Spacing: 3 to 20 feet (0,9 to 6,1 m)
- Pressure: 15 to 70 psi (1 to 5 Bars)

Specifications

- Regulates nozzle pressure to an average 30 psi (2,1 Bars) with inlet pressures of up to 70 psi (4,8 Bars).
- Flow-by: 0 at 8 psi (0,6 Bars) or greater; 0.50 GPM (0,11 m³/h; 0,03 l/s) otherwise
- Installation: side or bottom inlet
- Side inlet installation not recommended in freezing climates

Dimensions

- ½" (15/21) NPT female threaded inlets
- Body height: 1804 PRS - 6" (15 cm), 1806 PRS - 9⅜" (24 cm), 1812 PRS - 16" (40 cm)
- Exposed surface diameter: 2¼" (5,7 cm)

Models

- 1804 PRS: 4" pop-up height (10 cm)
- 1806 PRS: 6" pop-up height (15 cm)
- 1812 PRS: 12" pop-up height (30 cm)

1800 SAM-PRS Series

Meets the needs of all spray areas, regardless of changing elevation or water pressures. Incorporates all 1800 Series SAM and PRS features. "SAM-PRS" stamped on the cap for easy identification and maintenance.

Operating Range

- Spacing: 3 to 20 feet (0,9 to 6,1 m)
- Pressure: 25 to 70 psi (1,7 to 4,8 Bars)

Specifications

- SAM capability: holds up to 8 feet (2,4 m) of head; 3.5 psi (0,2 Bars)
- Flow-by: 0 at 8 psi (0,6 Bars) or greater; 0.50 GPM (0,11 m³/h; 0,03 l/s) otherwise
- SAM operable only when installed by bottom inlet

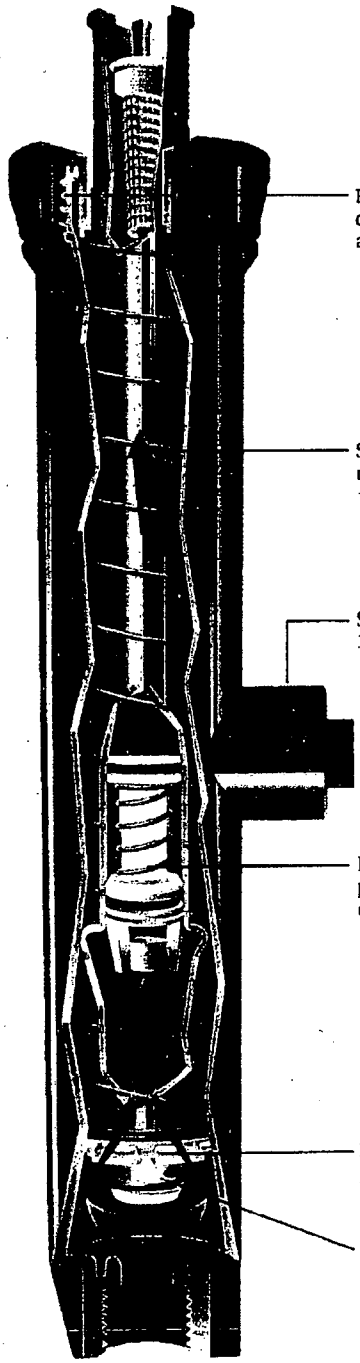
Dimensions

- ½" (15/21) NPT female threaded inlets
- Body height: 1804 SAM-PRS - 6" (15 cm), 1806 SAM-PRS - 9⅜" (24 cm), 1812 SAM-PRS - 16" (40 cm)
- Exposed diameter: 2¼" (5,7 cm)

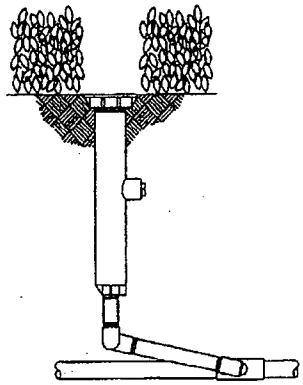
Models

- 1804 SAM-PRS: 4" pop-up height (10 cm)
- 1806 SAM-PRS: 6" pop-up height (15 cm)
- 1812 SAM-PRS: 12" pop-up height (30 cm)

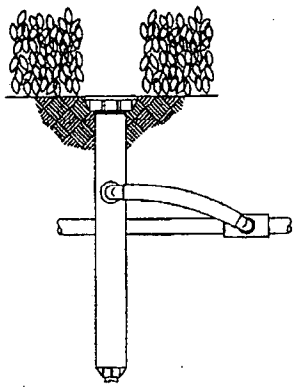
RAIN BIRD



1806 with Swing Joint on Bottom Inlet



1812 with Swing Pipe on Side Inlet



RAIN BIRD

Specifications

1802, 1803, 1804, 1806 and 1812 Pop-up Full or Part Circle Spray Sprinkler

The full or part circle pop-up sprinkler shall be capable of covering _____ feet radius (m) at _____ pounds per square inch (Bars) with a discharge rate of _____ gallons per minute (m^3/h; l/s). The overall pop-up height shall be _____ inches (cm).

The sprinkler body, stem, nozzle and screen shall be constructed of heavy-duty, ultra-violet resistant plastic. It shall have a heavy-duty stainless steel retract spring for positive pop-down and a ratcheting system for easy alignment of the pattern. The sprinkler shall have a soft elastomer pressure-activated co-molded wiper seal for cleaning debris from the pop-up stem as it retracts into the case to prevent the sprinkler from sticking up to minimize "flow-by."

The sprinkler shall have a matched precipitation rate (MPR) plastic or brass nozzle with an adjusting screw capable of regulating the radius and flow. The sprinkler shall be capable of housing under the nozzle protective, non-clogging filter screens or pressure compensating screens (PCS). The screen shall be used in conjunction with the adjusting screw for regulating. The 6" (15 cm) and 12" (30 cm) models shall have both a side and a bottom ½" (15/21) (FNPT) inlet for ease of installation.

The sprinkler shall have a Pop-Top™ Flush Plug pre-installed. The plug shall prevent debris from clogging the sprinkler during installation and allow for the system to be flushed before nozzling. The plug shall be bright orange in color and constructed of polypropylene material.

1804 SAM, 1806 SAM and 1812 SAM Full or Part Circle Seal-A-Matic™ Pop-up Spray Sprinkler

Optional Feature Specifications:

When so indicated on the design, the 4", 6" or 12" high pop-up spray sprinklers shall also include a Seal-A-Matic (SAM) check valve to prevent low-head drainage of up to 8 feet of head. This feature shall require the use of the bottom inlet only. These units shall be identifiable from the top with "SAM" marking on the cap. The sealing device shall be an integral part of the pop-up stem, removable through the top of the sprinkler, and shall seal against the bottom case inlet. It shall create no more than 1 psi pressure drop at the maximum rated flow.

1804 PRS, 1806 PRS and 1812 PRS Full or Part Circle Pressure Regulating Pop-up Spray Sprinkler

Optional Feature Specifications:

When so indicated on the design, the 4", 6" or 12" high pop-up spray sprinkler shall also include a pressure regulating (PRS) device to prevent high pressure fogging to the nozzle stream. This regulating device shall be an integral part of the pop-up stem, removable through the top of the case. These units shall be identifiable from the top with "PRS" markings on the cap.

The device shall regulate the nozzle pressure to 30 psi for inlet pressures from 35 to 70 psi. Below 35 psi the pressure loss shall not exceed 6 psi.

1804 SAM-PRS, 1806 SAM-PRS and 1812 SAM-PRS Seal-A-Matic Pressure Regulating Pop-up Spray Sprinkler

Optional Feature Specifications:

When so indicated on the design, the 4", 6" or 12" high pop-up spray sprinkler shall also include a Seal-A-Matic (SAM) check valve and a pressure regulating (PRS) device. These units shall be identifiable from the top with "SAM-PRS" markings on the cap.

The check valve shall prevent low-head drainage of up to 8 feet of head. The pressure regulating device shall prevent high pressure fogging of the nozzle stream by regulating the nozzle pressure to 30 psi for inlet pressures from 35 to 70 psi. Below 35 psi the pressure loss shall not exceed 6 psi. These models shall utilize the bottom inlet only.

The sprinkler shall be as manufactured by Rain Bird Sprinkler Mfg. Corp., Glendora, California.

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Rain Bird Technical Service
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RAIN BIRD®

PRELIMINARY TECH SPECS

Rain Bird 5000 Series Rotors

Take Performance to the Top

Primary Application

The 5000 Series Rotor is a rugged mid-range gear-drive rotor, offering durability, performance, and the convenience of arc adjustment from the top, for residential and light commercial applications.

This versatile rotor offers a standard rubber cover and the convenience of reversing full- and part-circle operation (up to 360 degrees) in one unit. And, with a TREE of Rain Curtain™ nozzles, the 5000 Series Rotor offers excellent distribution for top-notch efficiency.

All of this, a proven gear-driven design, and a five-year factory warranty, makes the 5000 Series Rotor one head that will "Take Performance to the Top."

Features

The 5000 Series Rotor is available in a 4", 6"* and 12"* models.

- Top-adjust arc adjustment requiring only a flat-bladed screwdriver
- Five-year trade warranty
- Water-lubricated gear-drive design for durable, reliable operation
- Standard rubber cover
- 40- 360° Arc Rotation for reversing Full- and Part-Circle rotation in one. (A non-reversing full circle only unit is also available)
- TREE of nozzles including low angle (Angle of trajectory 10°) and standard angle Rain Curtain™ nozzles (Angle of trajectory 25°) provide 23 to 40 feet (7 to 12,2m) distance of throw
- Coming Soon! Radius + nozzles for maximum distance of throw from 29 to 50 feet (8,8 to 15,3 m)
- Radius adjustment screw allows up to 25% radius reduction without changing nozzles
- True 4" (10 cm) pop-up (center of nozzle to top of cover)
- Fast Forward Arc Check
- Pressure activated multi-function wiper seal protects internals from debris to assure positive pop-up and retraction
- Reinforced flow path for additional side load strength
- Additional o-rings and seals for extra protection in "gritty" water
- Self-adjusting stator does not require replacement when changing nozzles
- Heavy-duty retract spring assures positive pop-down
- Coming Soon! Optional Pre-installed Rain Curtain ™ nozzle
- Optional Seal-A-Matic (SAM)™ check valve holds up to 7 feet (2,1 m) of elevation change, to prevent puddling and erosion caused by low head drainage
- Optional non-potable cover for easy identification of reclaimed water

*available soon

Operating Range

- Precipitation rate: .22 to 1.02 inches per hour (5 to 26 mm/h)
- Radius: 23 to 40 feet (7,0 to 12,2 m); 50' (15,3 m) available soon!
- Radius with Radius Reduction Screw: 17' (5,2 m)
- Pressure: 25-65 psi (1,7 to 4,5 Bars)
- Flow Rate: .49 to 7.32 gpm (,11 to 1,66 mm/h)

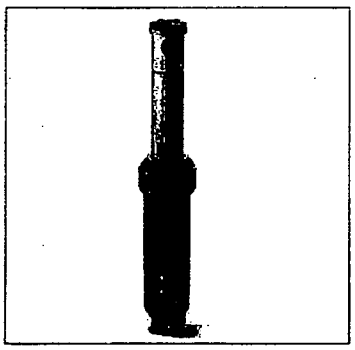
Specifications

- ¾" (20/27) NPT female bottom threaded inlet
- Reversing full-and part-circle adjustment 40° – 360°
- Full circle only adjustment 360°

Dimensions

- Pop-up height: 4" (10cm);
- Overall body height: 4": 7 ¾" (18, 5 cm)
- Exposed surface diameter: 1 ¾" (8 cm)

Note: Pop-up height measured from cover to center of nozzle. Overall body height is measured popped down.



Models

Part Circle units (PC) are adjustable from 40 –360 degrees. Full Circle units (FC) are 360 degrees only.

- 5004-PC
- 5004-FC

How to Specify/Order:

5004-PC-SAM-N

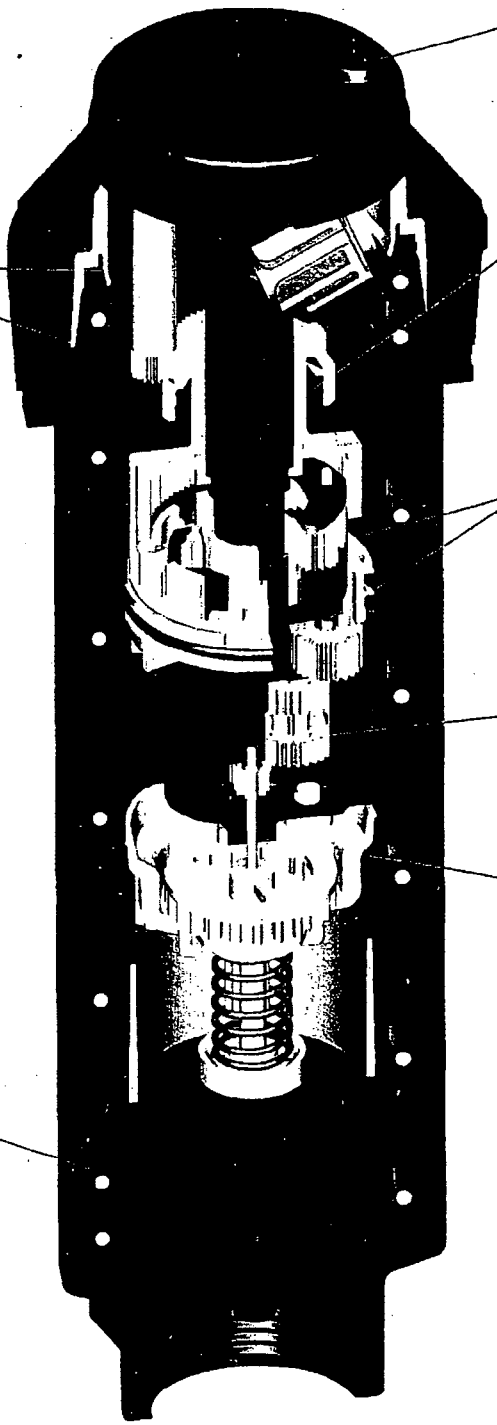
Model
5000 Series Rotor 4" pop-up

Options
SAM; Non-Potable Cover

Rotation
"PC" for 40-360 degrees
"FC" for 360 degree only

Note: 5004 will soon be available with a check-valve, a pre-installed nozzle, and a non-potable cover.

5000 Series Rotor



5000 Standard Angle Nozzle Performance

Pressure psi	Nozzle	Radius ft.	Flow GPM	Square Precip. in/h	Triangular Precip. in/h
25	1.0	27	0.80	0.21	0.24
	1.5	31	1.00	0.20	0.23
	2.0	31	1.65	0.33	0.38
	3.0	35	2.58	0.41	0.47
	4.0	35	3.20	0.50	0.58
	6.0	35	4.48	0.70	0.81
35	1.0	28	0.97	0.24	0.28
	1.5	31	1.25	0.25	0.29
	2.0	32	1.89	0.37	0.43
	3.0	37	3.11	0.44	0.51
	4.0	37	3.88	0.54	0.63
	6.0	37	5.42	0.76	0.88
45	1.0	28	1.12	0.26	0.32
	1.5	32	1.42	0.27	0.31
	2.0	32	2.31	0.43	0.50
	3.0	37	3.59	0.51	0.58
	4.0	37	4.46	0.63	0.72
	6.0	37	6.26	0.89	1.02
55	1.0	28	1.23	0.30	0.35
	1.5	31	1.60	0.32	0.37
	2.0	33	2.56	0.45	0.52
	3.0	37	3.95	0.56	0.64
	4.0	38	4.96	0.66	0.76
	6.0	40	7.03	0.85	0.98
65	1.0	28	1.35	0.33	0.38
	1.5	31	1.77	0.35	0.41
	2.0	33	2.69	0.51	0.59
	3.0	38	4.37	0.58	0.67
	4.0	38	5.40	0.72	0.83
	6.0	40	7.65	0.92	1.06

5000 Low Angle Nozzle Performance

Pressure psi	Nozzle	Radius ft.	Flow GPM	Square Precip. in/h	Triangular Precip. in/h
25	0.75	23	0.49	0.18	0.21
	1.0	23	0.69	0.25	0.29
	1.5	24	1.02	0.34	0.39
	2.0	24	1.45	0.48	0.56
	3.0	25	2.21	0.68	0.79
	4.0	24	3.14	1.05	1.21
35	0.75	24	0.58	0.19	0.23
	1.0	25	0.80	0.25	0.29
	1.5	25	1.23	0.38	0.44
	2.0	26	1.77	0.50	0.58
	3.0	27	2.66	0.70	0.81
	4.0	28	3.84	0.94	1.09
45	0.75	25	0.67	0.21	0.24
	1.0	26	0.94	0.27	0.31
	1.5	26	1.44	0.41	0.47
	2.0	27	2.04	0.54	0.62
	3.0	29	3.06	0.71	0.82
	4.0	31	4.29	0.86	0.99
55	0.75	26	0.74	0.21	0.24
	1.0	26	1.04	0.30	0.34
	1.5	27	1.59	0.42	0.49
	2.0	28	2.27	0.56	0.64
	3.0	30	3.44	0.74	0.85
	4.0	31	4.74	0.95	1.10
65	0.75	26	0.79	0.23	0.26
	1.0	26	1.15	0.33	0.38
	1.5	29	1.71	0.39	0.45
	2.0	29	2.45	0.56	0.65
	3.0	31	3.77	0.76	0.87
	4.0	31	5.21	1.04	1.21

5000 Standard Angle Nozzle Performance - METRIC

Pressure bars	Nozzle	Radius m	Flow m3/h	Flow l/s	Square Precip. mm/h	Triangular Precip. mm/h
2,5	1,0	8,2	0,18	0,05	5	6
	1,5	9,4	0,23	0,06	5	6
	2,0	9,4	0,37	0,10	8	10
	3,0	10,7	0,59	0,16	10	12
	4,0	10,7	0,73	0,20	13	15
	6,0	10,7	1,01	0,28	18	21
2,0	1,0	8,4	0,20	0,05	6	7
	1,5	9,4	0,25	0,07	6	6
	2,0	9,6	0,41	0,11	8	9
	3,0	10,5	0,62	0,18	11	12
	4,0	10,9	0,79	0,22	13	15
	6,0	11,0	1,10	0,31	18	21
2,5	1,0	8,5	0,22	0,06	6	7
	1,5	9,4	0,28	0,08	6	7
	2,0	9,8	0,45	0,13	8	9
	3,0	11,1	0,71	0,20	11	13
	4,0	11,2	0,88	0,24	14	16
	6,0	11,3	1,23	0,34	19	22
3,0	1,0	8,5	0,25	0,07	7	8
	1,5	9,8	0,32	0,09	7	8
	2,0	9,8	0,52	0,15	10	12
	3,0	11,2	0,82	0,23	13	15
	4,0	11,3	1,01	0,28	16	18
	6,0	11,4	1,42	0,39	22	26
3,5	1,0	8,5	0,27	0,08	8	9
	1,5	9,8	0,35	0,10	8	9
	2,0	9,8	0,56	0,16	12	13
	3,0	11,3	0,87	0,24	13	15
	4,0	11,4	1,08	0,30	17	19
	6,0	11,6	1,52	0,42	23	26
4,0	1,0	8,5	0,29	0,08	8	10
	1,5	9,8	0,38	0,11	9	10
	2,0	10,0	0,62	0,17	13	15
	3,0	11,5	0,94	0,26	14	16
	4,0	11,5	1,16	0,32	18	20
	6,0	12,0	1,64	0,46	23	27
4,5	1,0	8,5	0,31	0,09	9	10
	1,5	9,8	0,40	0,11	10	11
	2,0	10,1	0,66	0,18	15	17
	3,0	11,6	0,99	0,28	15	17
	4,0	11,6	1,23	0,34	18	21
	6,0	12,2	1,74	0,48	23	27

5000 Low Angle Nozzle Performance - METRIC

Pressure bars	Nozzle	Radius m	Flow m3/h	Flow l/s	Square Precip. mm/h	Triangular Precip. mm/h
1,7	0,75	7,0	0,11	0,03	5	5
	1,0	7,0	0,16	0,04	6	7
	1,5	7,3	0,23	0,06	8	9
	2,0	7,3	0,33	0,09	12	14
	3,0	7,6	0,50	0,14	17	20
	4,0	7,6	0,71	0,20	27	31
2,0	0,75	7,1	0,12	0,03	5	5
	1,0	7,3	0,17	0,05	6	7
	1,5	7,4	0,25	0,07	9	10
	2,0	7,6	0,36	0,10	13	14
	3,0	7,9	0,54	0,15	18	20
	4,0	8,0	0,78	0,22	25	30
2,5	0,75	7,3	0,13	0,04	5	6
	1,0	7,6	0,18	0,05	6	7
	1,5	7,6	0,28	0,08	10	11
	2,0	7,9	0,40	0,11	13	15
	3,0	8,2	0,60	0,17	18	21
	4,0	8,5	0,87	0,24	24	28
3,0	0,75	7,8	0,15	0,04	5	6
	1,0	7,9	0,21	0,06	7	8
	1,5	7,9	0,33	0,09	10	12
	2,0	8,2	0,46	0,13	14	16
	3,0	8,8	0,70	0,19	18	21
	4,0	9,4	0,97	0,27	22	25
3,5	0,75	7,7	0,16	0,04	5	6
	1,0	7,9	0,23	0,06	7	8
	1,5	8,2	0,35	0,10	10	12
	2,0	8,4	0,49	0,14	14	16
	3,0	9,0	0,75	0,21	19	21
	4,0	9,4	1,04	0,29	23	27
4,0	0,75	7,8	0,17	0,05	6	6
	1,0	7,9	0,25	0,07	8	9
	1,5	8,6	0,37	0,10	10	12
	2,0	8,7	0,53	0,15	14	16
	3,0	9,3	0,81	0,22	19	22
	4,0	9,4	1,12	0,31	25	29
4,5	0,75	7,9	0,18	0,05	6	7
	1,0	7,9	0,26	0,07	8	10
	1,5	8,8	0,39	0,11	10	11
	2,0	8,8	0,56	0,15	14	16
	3,0	9,4	0,86	0,24	19	22
	4,0	9,4	1,18	0,33	27	31

RAIN BIRD.

5000 Series Rotor Technical Specification

Model: 5004-FC and 5004-PC, Full and Reversing Full/Part Circle Sprinkler

Part #: Y54010 and Y54000

The Full and/or Part Circle sprinkler shall be a single-stream, water-lubricated, gear-drive type capable of covering a 40' radius (FT. RAD.) (12,2 m) at 65 pounds per square inch (PSI) (4,5 bars) with a discharge rate of 6 gallons per minute (GPM) (1,36 m3/h). The sprinkler shall have adjustable arc coverage of 40 to 360 degrees. Arc adjustment can be performed with or without the sprinkler in operation and shall require only a flat-blade screwdriver.

The sprinkler shall have a pressure activated multi-function wiper seal that positively seals against the nozzle flange to keep debris out of the rotor and to clean debris from the pop-up stem as it retracts.

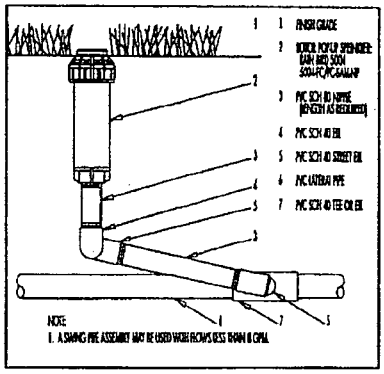
This wiper seal shall prevent sprinkler from sticking up, and be capable of sealing the sprinkler cap to sprinkler body under normal operating pressures.

The sprinkler shall have a screen attached to the drive housing to filter inlet water, protect the drive from clogging and simplify its removal for cleaning and flushing of the system. It shall have a 3/4" (FNPT) bottom inlet.

The sprinkler shall have a standard rubber cover and a strong stainless steel retract spring for positive pop down. Pop-up height as measured from the top of the cap, at normal installation, to the middle of the nozzle orifice shall be 4" inches (10, 2cm). The rotor's overall height shall be 7 3/8 inches (18,5cm).

The sprinkler shall have 12 interchangeable nozzles: 6 Rain Curtain nozzles for superior close in watering, and 6 Low Angle nozzles for reduced radius of throw and superior wind resistance. The angle of trajectory shall be 25 degrees for the Rain Curtain nozzles and 10 degrees for the low angle nozzles. The sprinkler shall come with a stainless steel adjusting screw capable of reducing the radius up to 25%.

The sprinkler shall be as manufactured by Rain Bird Sprinkler Mfg. Corp., Glendora, California.



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Specification Hotline
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RAIN BIRD®

TECH SPECS

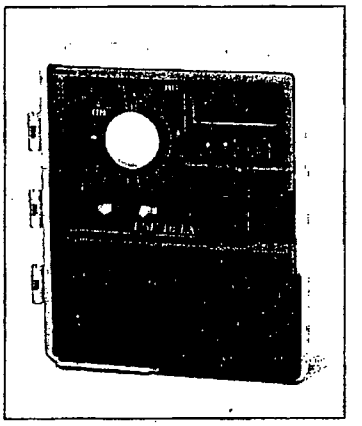
ESP-LX AND -LXi PLUS SERIES CONTROLLERS

Designed for Diverse Landscapes

Designed for light commercial and residential use, these controllers offer an extensive array of advanced and easy-to-use features for professional irrigation control. The controllers' four independent programs with four independent day cycle modes will accommodate a myriad of diverse irrigation requirements, including low volume drip applications. A key-lock door and a durable cabinet make the ESP-LX Plus controllers easy to install, operate, and service even in the most challenging environments.

Features

- ESP: Extra-Simple Programming with self-prompting large alphanumeric LCD display makes this controller easy to program, read and understand.
- Four independent programs (A-, B-, C-, and D-drip), with six start times each, allow mixed irrigation applications in a single controller.
- 365-day calendar with leap year intelligence for one-time date and time setting.
- Non-volatile program memory maintains user's program during a power outage independent of the battery backup.
- Removable, battery-programmable panel for the convenience of both programming instruction and programming prior to installation.
- Four cycle modes (CUSTOM, CYCLICAL, ODD, or EVEN) selectable for each program for maximum flexibility.
- Event-Day-Off option to set any day of the month as a non-watering day for all programs accommodates special occasions and special watering ordinances.
- Programmable Delay-Between-Stations provides time for water well recovery or time for slow-closing valves to turn off completely.
- Start time stacking prevents hydraulic overload.
- Variable test program for system operational testing.
- Water budgeting by program from 0 to 300% in 1% increments makes seasonal adjustments quick and easy.
- Programmable rain delay enables system to stay off for specified period with an auto-restart.
- Sensor inputs and override switch with LED indicate when irrigation is suspended.
- Master valve/pump start circuit, programmable by station, for optimal irrigation control.
- D-drip program can run simultaneously with program A, B or C to maximize hydraulic capacity and minimize watering time.
- Diagnostic circuit breaker and LED fault indicator identify electrical shorts, skip shorted stations, and continue irrigation cycle.
- Battery recharging circuit maintains fully charged NI-MH backup battery (included) to keep current time and date during a power outage.
- Heavy-duty 1.25A external, plug-in style transformer on the ESP-LXi Plus indoor version provides convenient installation.
- Includes easy-to-mount, heavy-duty plastic cabinet with key-lockable door and swing-out, quick release face panel, as well as all internal wiring (no junction box needed), for clean-looking, professional installation.
- UL Listed; CSA, CE, CUL, C-TIK approved
- Remote Ready connector compatible with Rain Bird's remote receiver.
- Rapid Station Test Routine (RASTER) enables the controller to diagnose and troubleshoot field wiring, solenoid, and controller problems quickly and easily.
- Special Fuse Circuitry detects and displays when a fuse has blown.



Operating Specifications

- Station timing: 0 to 12 hours for all stations (0 to 20 hours with water budgeting); 0 to 120 minutes selectable in 1-minute increments; above 120 minutes selectable in 10-minute increments.
- Automatic starts: 6 starts per day for each program, available on the quarter hour (total of 24 start times).
- Independent programming schedule options:
  1. ODD day watering (per program)
  2. EVEN day watering (per program)
  3. CYCLICAL (1 to 31 days, variable per program)
  4. CUSTOM (weekly schedule variable per program)

How to Specify/Order:

ESP-16LXI Plus

Model	Number of Stations
ESP-LX Plus: Outdoor ESP-LXi Plus: Indoor	6: 6 Stations 8: 8 Stations 12: 12 Stations 16: 16 Stations 20: 20 Stations 24: 24 Stations

RAIN BIRD.

Electrical Specifications

- Input required: 117 VAC ± 10%, 60 Hz (International models 230 VAC ± 10%, 50/60 Hz).
- Output: 26.5 VAC, 1.5A (1.25A on ESP-LXi Plus).
- Diagnostic circuit breaker skips and indicates stations with overloaded circuits and continues to run operable stations.
- Overload, backup fuse: 1.5A SLO-BLO (1.25A SLO-BLO on ESP-LXi Plus).
- Battery backup: 9V NI-MH rechargeable battery (included) for programming under battery power and maintaining program current time and date during power outages.
- Station Capacity: Up to two 24 VAC, 7VA solenoid valves per station plus a master valve or pump start relay.
- Terminal strips for up to #12UF wire.
- Electrical surge protection: Primary input side has built-in MOV (metal oxide varistor) to protect microcircuitry; output side has one built-in MOV for each valve station.

Dimensions:

- Width: 9½" (24,1 cm)
- Height: 10¼" (26 cm)
- Depth: 4⅜" (11,1 cm)

Models

- ESP-6LX Plus: 6 stations,* indoor/outdoor
- ESP-8LX Plus: 8 stations,* indoor/outdoor
- ESP-12LX Plus: 12 stations,* indoor/outdoor
- ESP-16LX Plus: 16 stations,* indoor/outdoor
- ESP-20LX Plus: 20 stations,* indoor/outdoor
- ESP-24LX Plus: 24 stations,* indoor/outdoor
- ESP-8LXi Plus: 8 stations, indoor
- ESP-12LXi Plus: 12 stations, indoor
- ESP-16LXi Plus: 16 stations, indoor

* Available in 230 VAC models.

Specifications

The controller shall be a hybrid type, that combines electromechanical and microprocessor based circuitry capable of fully automatic, semi-automatic, and manual control of irrigation systems. The controller shall be housed in a wall-mountable, heavy-duty, plastic, (weather-resistant in ESP-LX Plus) cabinet with a key-lock door and shall be suitable for indoor or outdoor applications.

The controller shall operate on 117 VAC± 10% at 60Hz (230 VAC± 10% 50/60Hz for International Models) and shall be capable of operating up to two 5.5 VA 24 VAC electric remote control valves per station plus a master valve or a pump start relay. The controller shall have an electronic, diagnostic circuit breaker that shall sense a station with an electrical overload or short circuit and shall bypass the station and shall continue to operate all other stations in the program in sequence.

The controller shall have four separate irrigation programs (A, B, C, & D-drip) which may be programmed for different start times, station assignments, station watering time lengths and any of four independent cycle modes CUSTOM, CYCLICAL, ODD, or EVEN. Each program shall be capable of up to 6 start times per day. The controller shall have _____stations, each capable of an operating range of from 0 to 12 hours, with 0 to 120 minutes selectable in 1 minute increments and above 120 minutes selectable in 10-minute increments. The controllers shall have a separate water budget feature for each of the A, B, C, or D-drip programs. Water budget shall allow simultaneous adjustment for all stations on a program from zero % of set running time to 300% of set running time. Adjustments shall be in 1% increments. The controller shall be capable of "stacking" A, B, and C programs and operating them sequentially to prevent overlapping irrigation cycles. Only the D-drip program shall be allowed to start at any time regardless of another program in operation. When the D-drip program is in operation along with an A, B, or C program, the controller shall be capable of displaying both stations that are in operation and their program assignments. The controller shall have a 365-day calendar with a day-of-the-month OFF feature allowing the operator to set specific dates to be off up to 30 days in advance. A date set to OFF shall override the normal, repeating day schedule and shall remain off on that date, and shall display to the operator that the current day is a non-water day. All OFF days shall revert to ON once the day passes, with the exception of the 31st which must be manually reset to ON.

Each of the four programs shall have the ability to be set with a time delay between operation of stations. This delay shall occur at the end of each station's watering and before proceeding to the next assigned watering station. The delay shall be adjustable from 0 seconds to 9 hours.

The controller shall have a master valve/ pump start circuit that shall provide 24-volt A. C. power for either a master valve or pump start relay when any of the controller's stations are in operation. The controller shall provide the operator the capability to disable concurrent operation of the master valve/pump start circuit from any station desired.

The controller shall have a sensor circuit for connection to a rain sensor or to an underground moisture sensor system. When the sensor reaches its "wet" setting and is either interrupting or restricting voltage, the same restriction shall be made to the valve common terminal to prevent or interrupt irrigation. The controller shall have an indicator light that shall be on whenever the sensor switch is set to "ACTIVE". The controller shall have a front-face-panel-mounted sensor bypass switch that shall allow the operator to override the sensor if desired.

The controller shall have a battery recharging circuit and a factory-supplied 9-volt rechargeable battery. A fully charged battery shall maintain clock time and program memory up to one week during a power outage. The controller shall have a non-volatile memory to maintain the program during power outage in the absence of battery backup. The front panel shall be removable and programmable under battery power.

The controller shall have a connector to mate to the remote control receiver. The operator shall be able to remotely initialize and advance a manual test program that sequentially runs all stations that have time scheduled in any program for the default run time, start and stop any station without sequencing, start and stop any program and program the run time on any station in the program. The remote operation shall override the controller's rain sensor and off modes.

The controller shall be as manufactured for Rain Bird Corporation, Glendora, California.

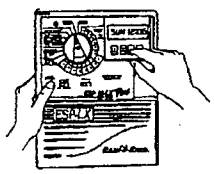
Rain Bird Corporation
Contractor Division
970 West Sierra Madre Avenue, Azusa, CA 91702
Phone: (626) 963-9311 Fax: (626) 812-3411

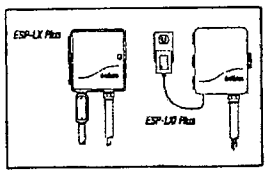
Rain Bird Corporation
Commercial Division
6991 East Southpoint Road, Tucson, AZ 85706
Phone: (520) 741-6100 Fax: (520) 741-6522

Rain Bird International, Inc.
145 North Grand Avenue, Glendora, CA 91741
Phone: (626) 963-9311 Fax: (626) 963-4287

Rain Bird Technical Service
(800) 247-3782 (U.S. only)

www.rainbird.com





Rain Bird. Conserving More Than Water

® Registered trademark of Rain Bird Corporation.
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D302438

DIVISION 3- CONCRETE

CONCRETE- JC CONCRETE

Breezeways
Sidewalks

WARRANTY AGREEMENT

Project: Belle Hall Condominiums

Owner: Belle Hall Direct 101, LP
Contractor: TCR NC Construction I Limited Partnership

Subcontractor: JC Concrete

Subcontractor hereby expressly warrants and guarantees that all labor, materials, and equipment furnished and work performed in conjunction with the above referenced project are in accordance with the plans, specifications, the Subcontract Agreement and authorized modifications thereto. All labor, materials and equipment shall be free from defects, due to defective materials and/or workmanship, for a period of one (1) year from the date of Certificate of Occupancy for each building/structure, unless otherwise stated in the Subcontract Agreement.

Should any defects develop during the warranty period due to improper workmanship and/or arrangement, the same shall, upon notice, be made good by this Subcontractor at no expense to the Contractor, Owner, or Owner's Representative. Nothing in the above shall be deemed to apply to work or equipment which has been abused, neglected or altered by the Contractor, Owner, or Owner's Representative.

Unless otherwise stated in the Subcontract Agreement, warranty work shall be responded to within twenty-four (24) hours of notification by the Contractor, Owner, or Owner's Representative, including weekends and holidays. Warranty notices received before 10:00 am shall be responded to on the same day. Should Subcontractor fail to respond within twenty-four (24) hours of notification or correct the defective work or equipment within seventy-two (72) hours, the Contractor, Owner, or Owner's Representative shall proceed with the correction of the defective work. All costs associated with this corrective action shall be reimbursed by this Subcontractor or charged against its account. Subcontractor shall remit payment for such charges within five (5) calendar days of notification by the Contractor, Owner, or Owner's Representative.

Signature: [signature]

Printed Name: Robert Lutz

Position/Title: Owner

Date: 12/6/06

DIVISION 3- CONCRETE

GYPCRETE – KMAC OF THE CAROLINA'S

used in units
Light weight
Concrete
"insulation"

WARRANTY AGREEMENT

Project: Belle Hall Condominiums

Owner: Belle Hall Direct 101, LP
Contractor: TCR NC Construction I Limited Partnership

Subcontractor: KMSC of the Carolinas, Inc

Subcontractor hereby expressly warrants and guarantees that all labor, materials, and equipment furnished and work performed in conjunction with the above referenced project are in accordance with the plans, specifications, the Subcontract Agreement and authorized modifications thereto. All labor, materials and equipment shall be free from defects, due to defective materials and/or workmanship, for a period of one (1) year from the date of Certificate of Occupancy for each building/structure, unless otherwise stated in the Subcontract Agreement.

Should any defects develop during the warranty period due to improper workmanship and/or arrangement, the same shall, upon notice, be made good by this Subcontractor at no expense to the Contractor, Owner, or Owner's Representative. Nothing in the above shall be deemed to apply to work or equipment which has been abused, neglected or altered by the Contractor, Owner, or Owner's Representative.

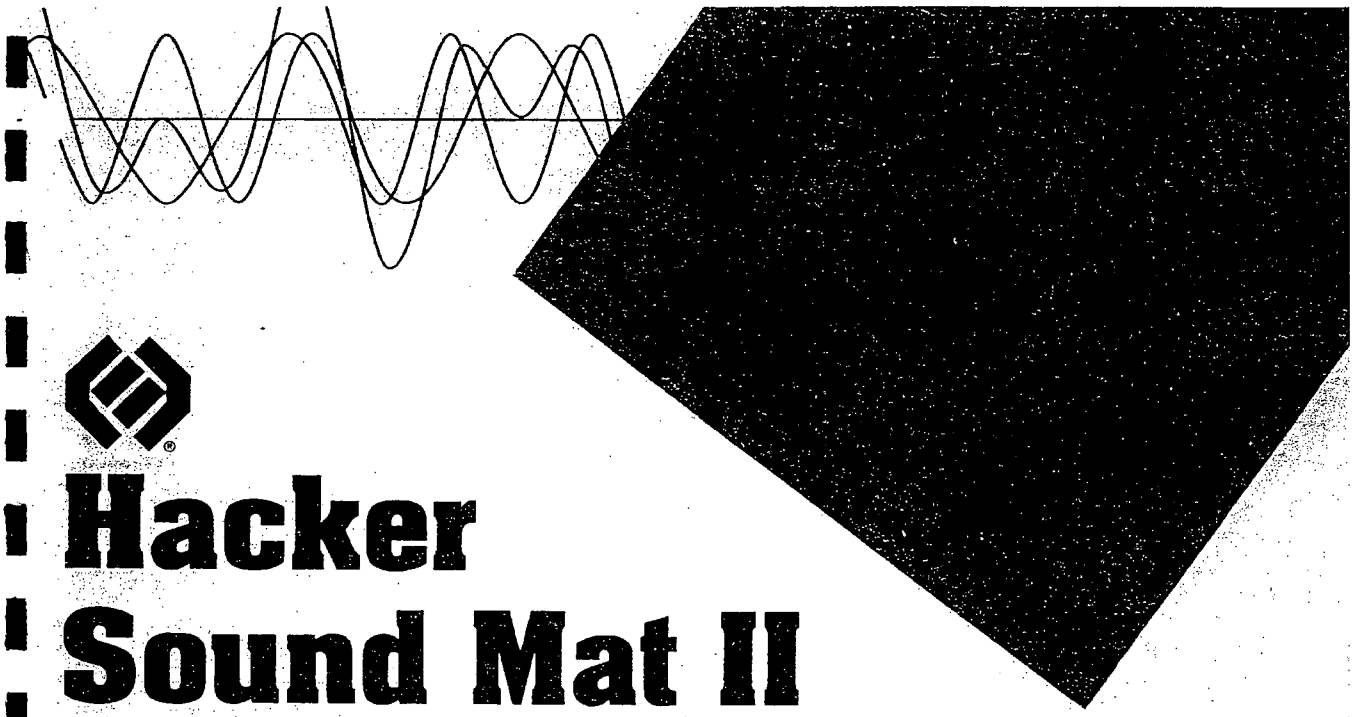
Unless otherwise stated in the Subcontract Agreement, warranty work shall be responded to within twenty-four (24) hours of notification by the Contractor, Owner, or Owner's Representative, including weekends and holidays. Warranty notices received before 10:00 am shall be responded to on the same day. Should Subcontractor fail to respond within twenty-four (24) hours of notification or correct the defective work or equipment within seventy-two (72) hours, the Contractor, Owner, or Owner's Representative shall proceed with the correction of the defective work. All costs associated with this corrective action shall be reimbursed by this Subcontractor or charged against its account. Subcontractor shall remit payment for such charges within five (5) calendar days of notification by the Contractor, Owner, or Owner's Representative.

Signature: _____

Printed Name: Jerry Krasen

Position/Title: Vice President

Date: 12/5/06



Hacker Sound Mat II

Your problems with impact sound abatement have just been solved.

Hacker Industries, Inc. provides the solution to controlling sound transmission in multi-family projects, commercial buildings, and custom homes. Hacker Sound Mat II, a strong, dimpled sound mat composed of 100 percent recycled rubber, is designed to provide a quieter environment and meet demanding project specifications.

Installed under FIRM-FILL Gypsum Concrete, FIRM-FILL 2010, FIRM-FILL 3310, FIRM-FILL High Strength, or GYP-SPAN Radiant, Hacker Sound Mat II is an integral component of a highly effective sound reduction system.

- Used in both new construction and renovation projects
- Effective under all types of finished floor coverings
- Reduces sound transmission; improves STC and IIC ratings
- System rated for commercial & residential use, ASTM C627-93
- Meets ASTM F2419 Standard Practice for the Installation of Thick Poured Gypsum Concrete Underlayments...
- Listed in over 83 UL Assemblies
- Applied by a network of highly trained, Licensed Applicators

Regupol-QT™
IMPACT SOUND INSULATION

15 January 2007

VIA ELECTRONIC MAIL
lmartinez@hackerindustries.com

Kerry Hacker
Hacker Industries, Inc.
610 Newport Center Drive, Suite 250
Newport Beach, CA 92660

Warranty from Dodge-Regupol for Hacker Sound Mat 2

Dear Kerry:

Per your request, this letter confirms that all elements of the warranty for Regupol-QTrbm are also applicable to Hacker Sound Mat 2.

If you have any questions, please contact me.

Best Regards,

Paul Downey, P.Eng
Director, Business Development
Dodge-Regupol Inc.
p. 416.440.1094

Regupol®-QT

Specification Guidelines for Regupol-QTscu
09618 Acoustical Barriers
(Rebonded Recycled Rubber Impact Sound Insulation)

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes: Impact Sound Insulation, specifically those made from rebonded recycled rubber, to be placed under flooring in living units.

1. Types: Types of rebonded recycled rubber Impact Sound Insulation

a. Rebonded recycled rubber underlayment

B. Related Sections: Section(s) related to this section include:

1. Concrete Substrate
2. Plywood Substrate
3. Tile
4. Carpeting
5. Noise Control and Vibration Isolation

1.02 REFERENCES

A. Standards listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.

B. American Society for Testing and Materials (ASTM):

1. ASTM E492 Standard Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine

2. ASTM C627 Standard Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester

3. ASTM E989 Standard Classification for Determination of Impact Insulation Class (IIC)

4. ASTM E1007 Standard Test Method for Field Measurement of Tapping Machine Impact Sound Transmission Through Floor-Ceiling Assemblies and Associated Support Structures

5. ASTM E2179 Standard Test Method for Laboratory Measurement of the Effectiveness of Floor Coverings in Reducing Impact Sound Transmission Through Concrete Floors

6. ASTM E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

7. ASTM E336 Standard Test Method for Measurement of Airborne Sound Insulation in Buildings

1.03 SYSTEM DESCRIPTION

A. Performance Requirements: Provide rebonded recycled rubber impact sound insulation which has been manufactured and installed to maintain performance criteria stated by manufacturer without defects, damage or failure.

1.04 SUBMITTAL PROCEDURES

A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.

B. Product Data: Submit product data, including manufacturer's published literature, for specified products.

C. Shop Drawings: Manufacturer's specifications, catalog cuts and other items needed to demonstrate compliance with the specified requirements. Also the manufacturer's recommended installation procedures, which, when approved by the architect, will become the basis for accepting or rejecting actual installation procedures used on the work.

D. Samples: Submit a verification sample.

E. Quality Assurance Submittals: Submit the following:

1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.

2. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics, criteria and physical requirements.
3. Manufacturer's Instructions: Manufacturer's installation instructions (EPG8010).

F. Closeout Submittals: Submit the following:

1. Warranty: Warranty documents specified herein.

1.05 QUALITY ASSURANCE

A. Qualifications:

1. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
   a. Certificate: When requested, submit certificate indicating qualification.
2. Manufacturer's Qualifications: Manufacturer capable of approving application method.

B. Regulatory Requirements

C. Mock-Ups: Install at project site a job mock-up using acceptable products and manufacturer-approved installation methods. Comply with workmanship standard. Comply with Division 1 Quality Control (Mock-Up Requirements) Section.

1. Mock-Up Size: As determined by acoustical consultant.
2. Maintenance: Maintain mock-up during construction for workmanship comparison; remove and legally dispose of mock-up when no longer required.
3. Incorporation: Mock-up may be incorporated into final construction upon Owner's approval.

D. Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's instructions and manufacturer's warranty requirements. Comply with Division 1 Project Management and Coordination (Project Meetings) Section.

1.06 DELIVERY, STORAGE & HANDLING

A. General: Comply with Division 1 Product Requirements Sections.

B. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

ROA_01173

D. Storage and Protection: Store materials at temperature and humidity conditions recommended by manufacturer and protect from exposure to harmful weather conditions.

1.07 PROJECT CONDITIONS

A. Temperature Requirements: Maintain air temperature in spaces where products will be installed for time period before, during and after installation as recommended by manufacturer.

B. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.08 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

1. The recommendations for applications and installation are based on our extensive experience and on current technological practice. Our liability and responsibility in the event of damages are limited to the extent defined in our General Terms and Conditions of Business and are not in any way increased by the above recommendations or by advice given by our sales representatives or applications engineering staff.

2. Dodge-Regupol, Inc. is a corporation duly organized and validly existing under the laws of the Commonwealth of Pennsylvania. Dodge-Regupol offers a limited lifetime warranty on the Regupol-QT brand of Impact Sound Insulation products against defects in material and workmanship and that Regupol-QT shall meet all published specifications and shall perform effectively. Dodge-Regupol, Inc. warranties that during the warranty period that Regupol-QT shall not harden, become brittle, chip, crack, tear or exhibit any signs of excessive deterioration except for normal wear and tear. All other warranties including implied warranties for a particular purpose are expressly excluded. The sole remedy against the seller will be the replacement or repair of the defective goods, or at seller's option, credit may be issued not exceeding the selling price of the defective goods.

1.09 MAINTENANCE

A. Extra Materials: Deliver to Owner extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Division 1 Closeout Submittals (Maintenance Materials) Section.

1. Quantity: Furnish quantity of rebonded recycled rubber Impact Sound Insulation units as requested on purchase order.
2. Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage and protection of extra materials.

PART 2 – PRODUCTS

2.01 REBONDED RECYCLED RUBBER IMPACT SOUND INSULATION

A. Manufacturer: Dodge-Regupol Inc.

1. Contact: 715 Fountain Ave., Lancaster, PA 17601; Telephone: (866) 326-5712, (717) 295-3400; Fax: (717) 295-3414.
2. Proprietary Product(s): Dodge-Regupol Rebonded Recycled Rubber Impact Sound Insulation:
   a. Dodge-Regupol Regupol-QTscu

B. Dodge-Regupol Regupol-QTscu Rebonded Recycled Rubber Impact Sound Insulation:

1. Roll Dimension: [48" (1219mm) x 30' (9144mm) x .196" (5mm) standard] or [48" (1219mm) x 15' (4572mm) x 0.394" (10mm) standard]
2. Product Testing:
   a. Laboratory Impact Insulation Class (ASTM E492): Specified floor-ceiling assembly must be tested in a NVLAP certified laboratory and comply with ASTM standards.
   b. Field Impact Insulation Class (ASTM E1007): Floor-ceiling assembly must meet requirement as stated by building code and/or acoustical consultant.
   c. Shall be ICC-ES certified
   d. Shall be UL listed

2.02 PRODUCT SUBSTITUTIONS

A. Substitutions: No substitutions permitted.

2.03 RELATED MATERIALS

A. Related Materials: Refer to other sections listed in Related Sections paragraph herein for related materials

2.04 SOURCE QUALITY

A. Source Quality: Obtain rebonded recycled rubber Impact Sound Insulation materials from a single manufacturer.

PART 3 – EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.

3.02 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.

3.03 PREPARATION

A. Surface Preparation: Surface shall be prepared in accordance with ANSI standards.

3.04 ERECTION/INSTALLATION/APPLICATION/CONSTRUCTION

A. Rebonded Recycled Rubber Impact Sound Insulation: Comply with the Dodge-Regupol technical manual (EPG8010) for procedures and techniques for rebonded recycled rubber Impact Sound Insulation installation.

B. Related Products Installation: Refer to other sections listed in Related Sections paragraph herein for related products installation.

C. Installation should not begin until all other trades are finished in the area.

D. Areas to receive the rebonded recycled rubber Impact Sound Insulation should be weather tight and maintained at a minimum uniform temperature of 65°F (18°C) for 48 hours before, during and after the installation.

3.05 FIELD QUALITY REQUIREMENTS

A. Manufacturer's Field Services: Upon Owner's request, provide manufacturer's field service consisting of product use recommendations in accordance with manufacturer's instructions.

B. Field Tests should be performed by an independent acoustical laboratory accredited by the U.S. Department of Commerce, National Institute of Standards and Technology under the National Voluntary Laboratory Accreditation Program for the specified test procedure.

C. The cost for all field acoustical testing, corrective work associated with the installation of the rebonded recycled rubber Impact Sound Insulation and flooring to meet the minimum requirements, shall be borne by the flooring contractor(s).

3.06 CLEANING

A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove construction debris from project site and legally dispose of debris.

3.07 PROTECTION

A. Protection: Protect installed product and finish surfaces from damage during construction.

3.08 SCHEDULES

A. Schedules: [Specify reference to applicable schedules].

For more information, call 1-866-326-5712 or visit www.regupolqt.com

Regupol®-QT

Manufactured by:

DODGE-REGUPOL INCORPORATED.
Leaders in recycled products technology
www.regupol.com

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Regupol is a registered trademark of Dodge-Regupol, Inc.
Regupol-QTscu is a patented product.

EPG8012-506

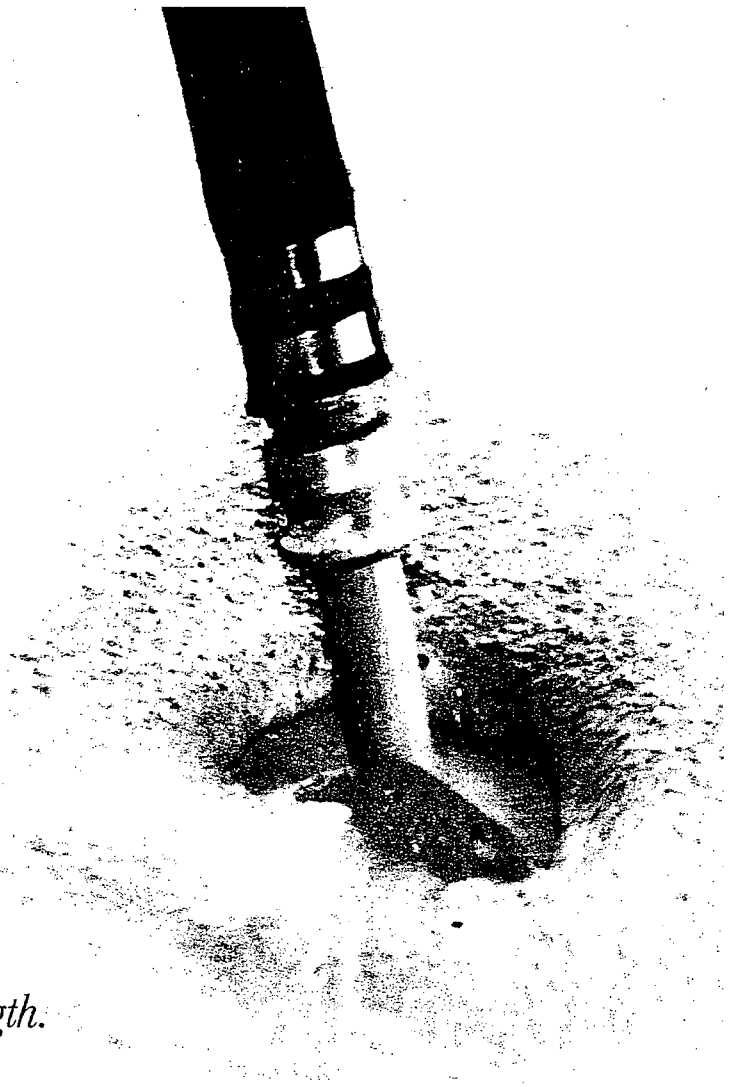
Hacker Industries, Inc. 23 Corporate Plaza, Suite 200, Newport Beach, California 92660
(800) 642-3455 Fax (800) 906-8548

FULL STATEMENT
WARRANTY

HACKER warrants that FIRM-FILL Gypsum Concretes sold hereunder shall be specially compounded products consisting primarily of gypsum and cement and shall conform to the specifications therefor. LICENSEE shall test the FIRM-WILL Gypsum Concretes upon arrival at destination by taking at least one (1) sample from each rail car and/or truck, and subjecting each such sample to tests as prescribed by HACKER from time to time. In the event that any FIRM-FILL Gypsum Concretes fails to meet the requirements of this Agreement, LICENSEE shall give immediate notice to HACKER. LICENSEE agrees to test such sample for conformance to specifications supplied by HACKER from time to time, and to notify HACKER within ten (10) days of delivery at destination of any failure of the shipment to meet the specifications then in force. Failure to so test or to notify shall constitute a material breach of this Agreement; and LICENSEE's failure to notify HACKER of any such failure within ten (10) business days of the delivery of any such FIRM-FILL Gypsum Concretes, or LICENSEE's failure to test such sample, shall require the LICENSEE to immediately cease to use the FIRM-FILL Gypsum Concretes trademarks in connection with the application of said FIRM-FILL Gypsum Concretes. LICENSEE's sole and exclusive remedy for any of FIRM-FILL Gypsum Concretes not meeting the requirements of this Agreement, shall be, at HACKER' s option, either (a) a refund of the purchase price thereof, or (b) prompt and timely delivery of an equal quantity of FIRM-FILL Gypsum Concretes to replace the rejected FIRM-FILL Gypsum Concretes. In no event shall HACKER be liable for any special or consequential damages resulting from the failure of FIRM-FILL Gypsum Concretes to meet the requirements of this Agreement, and in no event shall HACKER be liable for refund or replacement of FIRM-FILL Gypsum Concretes for which no notice of a failure of FIRM-FILL Gypsum Concretes to meet specifications was made.

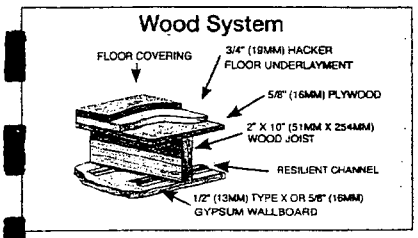
HACKER INDUSTRIES, INC., DOES NOT INSTALL HACKER UNDERLAYMENTS AND CANNOT BE HELD RESPONSIBLE FOR THE RESULTS OF THE APPLICATION. HACKER INDUSTRIES, INC., GIVES NO WARRANTY, EXPRESS OR IMPLIED, AS TO DESCRIPTION, QUALITY, MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, PRODUCTIVENESS, OR ANY OTHER MATTER, FOR ANY GOODS WHICH HACKER INDUSTRIES, INC., SHALL SUPPLY. HACKER INDUSTRIES, INC., SHALL NOT BE LIABLE FOR INCIDENTAL AND CONSEQUENTIAL DAMAGES, DIRECTLY OR INDIRECTLY SUSTAINED, OR BY ANY LOSS CAUSED BY THE APPLICATION OF THESE PRODUCTS. HACKER INDUSTRIES, INC.. EXPRESSLY LIMITS ITS LIABILITY TO REPLACEMENT OF DEFECTIVE BAGGED PRODUCT. HACKER INDUSTRIES, INC., SHALL BE IN NO WAY RESPONSIBLE FOR IMPROPER USE AND/OR SERVICE.

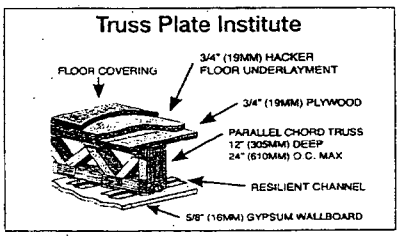
Firm-Fill® 3310

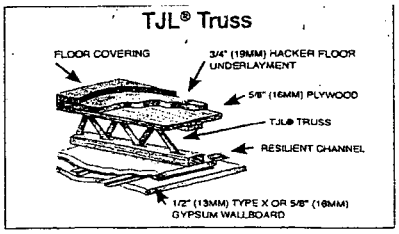


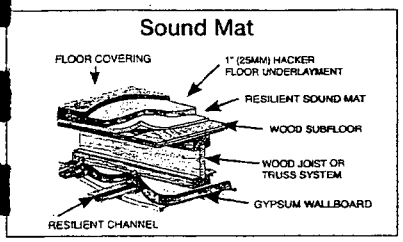
An innovative new product from Hacker Industries, Inc. specially formulated to decrease the amount of water used and enhance the rock-solid floor strength.

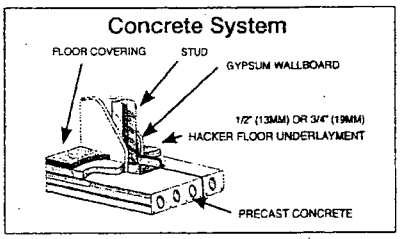
- ***Unparalleled levels of strength and finish*** providing exceptional compressive strengths up to 3300 psi. Poured before or after drywall, FIRM-FILL 3310 flows evenly over the sub-floor creating a smooth, flat, crack-resistant surface for virtually any finished floor covering. FIRM-FILL 3310 meets ASTM F2419 Standard Practice for the Installation of Thick Poured Gypsum Concrete Underlayments...
- ***Unequaled quality of installation,*** FIRM-FILL 3310's fast setting properties and low water demand rapidly eliminate water allowing for accelerated drying time. FIRM-FILL 3310 is only available from expertly trained, Licensed Applicators who have installed over a billion square feet of Hacker Floor Underlayments in residential and commercial projects across North America.
- ***With the proven performance of Hacker Floor Underlayments,*** FIRM-FILL 3310 delivers fire-resistant, sound-rated and resilient surfaces ready for finished floor coverings in both new construction and renovation projects. Hacker Industries, Inc. only delivers the highest quality floor underlayments and continues to set the standard for reliable, cost-effective solutions for the most demanding project specifications.

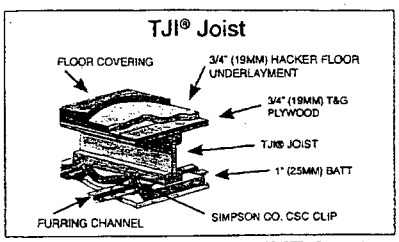












TRUS® TJI® and TJL® are trademarks of the TRUS JOIST™ Corporation

Recommended Specifications

PART I GENERAL

1.1 Scope – Specify to meet project requirements

A. Work included:
   1. **FIRM-FILL 3310**
   2. Hacker Floor Primer
   3. Hacker Floor Sealer
   4. Hacker TopCoat

1.2 Qualifications

A. **FIRM-FILL 3310** shall be installed by Licensed Applicators of Hacker Industries, Inc., using approved mixing and pumping equipment.

B. **FIRM-FILL 3310** shall be delivered in original, unopened bags and protected from exposure to the elements after delivery. Do not allow bags to get wet.

C. Install before or after drywall as specified.

D. Before, during, and after installation of **FIRM-FILL 3310**, the building interior must be continuously ventilated and heated to a minimum of 50°F (approx. 10°C).

E. Compressive strength can be specified from 2000 psi to 3300 psi (approx. 13.8 to 22.8 MPa).

F. All materials specified herein shall be approved by Hacker Industries, Inc.

PART II PRODUCTS

2.1 Materials

A. Gypsum Concrete: **FIRM-FILL 3310** as supplied by Hacker Industries, Inc.

B. Hacker Floor Primer

C. Hacker Floor Sealer

D. Hacker TopCoat

E. Sand: 1/8" (approx. 3mm) or less washed plaster or mortar sand meeting requirements of Hacker Industries, Inc. Sand Guidelines.

F. Mix Water: Potable and free from impurities.

PART III EXECUTION

3.1 Condition of Subfloor

A. General Contractor is responsible for providing a structurally sound (L/360) subfloor, broom cleaned, dry, and free of oil, grease or other contaminants.

B. Before installation, the General Contractor shall inspect and approve the condition of the subfloor.

3.2 Preparation of Subfloor

A. All cracks and voids should be filled with a quick-setting taping compound.

B. Plywood/OSB: Spray one coat Hacker Primer using one gallon (approx. 3.8L) per 500 square feet (approx. 46 sq.m).

C. Other substrate: Conditions may vary. Consult Hacker Industries, Inc. for recommended floor preparation.

3.3 Mixing Instructions

A. 4 to 5.5 gallons (approx. 15.1 to 20.8L) of water and sand as specified per 80 pound (approx. 36.3 kg) bag of **FIRM-FILL 3310.** Do not over water. Water amount will change with wetness of sand.

B. **FIRM-FILL 3310** mix proportions and methods shall be in strict accordance with Hacker recommendations.

3.4 Underlayment Application

A. Application: **FIRM-FILL 3310** can be installed at 3/4" (approx. 19mm) minimum over wood, 1/2" (approx. 13mm) minimum over precast or poured in place concrete. Place as continuously as possible until installation is complete.

B. Protection: After installation, temporary wood planking shall be placed wherever the underlayment will be subject to heavy wheeled or concentrated loads.

C. Drying: The General Contractor shall provide continuous ventilation and adequate heat to rapidly remove moisture from the area until the underlayment is dry. Prior to the installation of finished floor goods, the **FIRM-FILL 3310** must be free from any moisture.

D. **FIRM-FILL 3310** is suitable for interior applications only and must be covered by a finished floor material.

3.5 Preparation for Installation of Floor Coverings

A. Sealing: Any areas where the underlayment surface has been damaged shall be cleaned and sealed regardless of specified floor covering. Floor covering manufacturers' specifications and requirements supercede these recommendations.

B. Floor Covering Procedures: Please see Hacker Industries, Inc.'s "Guidelines for Installing Finished Floor Coverings." The guideline is not a warranty and should be used as a guideline only. Also see ASTM F2419 for recommended procedures.

3.6 Field Quality Control

A. Slump Test: **FIRM-FILL 3310** shall be tested for slump as it is being installed using a 2" by 4" (approx. 51mm by 102mm) cylinder. The patty size should be 7-1/2" (approx. 191mm) plus or minus 1/2" (approx 13mm) in diameter.

B. Field Samples: Testing of molded cube samples shall be in accordance with ASTM C472 modified using split brass molds. Prior to independent testing, contact Hacker Industries, Inc., to insure proper ASTM methods are followed.

Hacker Industries, Inc.
610 Newport Center Drive, Suite 250
Newport Beach, CA 92660 USA
(949) 729-3101 FAX: (949) 729-3108
Toll Free: (800) 642-3455 FAX: (800) 906-8548
e-mail: info@HackerIndustries.com
www.HackerIndustries.com

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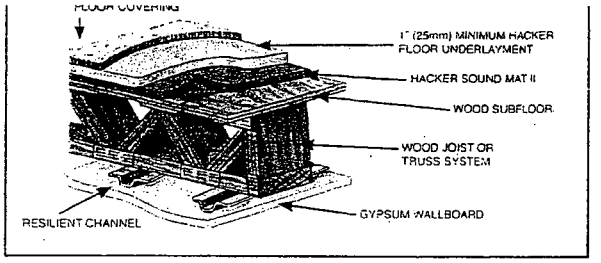
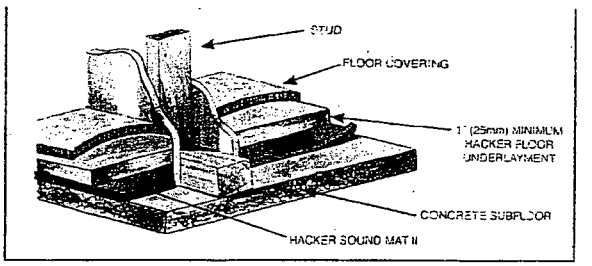
FIRM-FILL® and the associated logos are the registered trademarks of Hacker Industries, Inc., Newport Beach, CA.

For the Licensed Applicator in your area, please call our toll-free number, (800) 642-3455.

ROA_01180





Hacker Industries, Inc. supplies five high-quality floor underlayments for new construction, renovation, and repair projects: FIRM-FILL Gypsum Concrete, FIRM-FILL 2010, FIRM-FILL 3310, FIRM-FILL High Strength and GYP-SPAN Radiant. For product literature on any of these products, please contact Hacker Industries, Inc.

Recommended Specifications

PART I GENERAL

1.1 Scope – Specify to meet project requirements
- A. Work included:
  1. HACKER SOUND MAT II
  2. Hacker Floor Primer
  3. Hacker Floor Underlayment
  4. Hacker Top Coat

1.2 Qualifications
- A. HACKER SOUND MAT II shall be installed by Licensed Applicators of Hacker Industries, Inc.
- B. HACKER SOUND MAT II shall be delivered in original, unopened rolls and protected from exposure to the elements after delivery.
- C. Before, during, and after installation, the building interior shall be ventilated and heated to a minimum of 50°F (10°C) to assure completion of the drying process for Hacker Floor Underlayment.
- D. All materials specified herein shall be approved by Hacker Industries, Inc.

PART II PRODUCTS

2.1 Materials
- A. HACKER SOUND MAT II supplied by Hacker Industries, Inc.
- B. Gypsum Concrete: **FIRM-FILL Gypsum Concretes** or **GYP-SPAN Radiant** as supplied by Hacker Industries, Inc.
- C. Hacker Floor Primer and Sealer.
- D. Hacker Top Coat.
- E. Sand: 1/8" (approx. 3mm) or less washed plaster or mortar sand meeting the requirments of Hacker Industries, Inc.'s Sand Guidelines.
- F. Mix Water: Potable and free from impurities.

PART III EXECUTION

3.1 Condition of Subfloor
- A. The General Contractor is responsible for providing a structurally sound L/360 subfloor, cleaned, dry, and free of oil, grease or other contaminants.
- B. Before installation, the General Contractor shall inspect and approve the elevations and subfloor.

3.2 Preparation of Subfloor
- A. All cracks and voids shall be filled with a quick-setting taping compound to prevent leakage.
- B. Priming: Spray one coat Hacker Primer using one gallon (approx. 3.8L) per 500 sq. ft. (approx. 46 sq. m).

3.3 Application of HACKER SOUND MAT II
Install HACKER SOUND MAT II adhering to manufacturers' specifications and recommendations.

3.4 Mix Designs
General Requirements: Mix proportions and methods shall be in strict accordance with Hacker Floor Underlayment specifications and recommendations.

3.5 Underlayment Application
- A. Scheduling: Application of Hacker Floor Underlayments shall not begin until the building is enclosed. Install after drywall unless otherwise specified. If HACKER SOUND MAT II is to be installed before drywall, a 3.4 lb per sq. yd. galvanized metal lath shall be laid over the entire HACKER SOUND MAT II surface. Schedule the HACKER SOUND MAT II installation as late as possible in the construction schedule.
- B. Priming: Spray a coat of Hacker Floor Primer (diluted 4:1 with water) at a rate of 400 sq. ft. per gallon over the HACKER SOUND MAT II prior to the underlayment application.
- C. A 1" (25mm) minimum application of either **FIRM-FILL Gypsum Concrete, FIRM-FILL 2010, FIRM-FILL 3310, FIRM-FILL High Strength**, or **GYP-SPAN** Radiant must be installed over the HACKER SOUND MAT II according to Hacker specifications (see applicable literature for product specifications).
- D. Extreme care must be taken when rolling out the hose so that the HACKER SOUND MAT II is not torn. Do not puncture the HACKER SOUND MAT II.
- E. Drying: The General Contractor shall provide continuous ventilation and adequate heat to rapidly remove moisture from the area until the underlayment is dry. Prior to the installation of finished floor goods, the Hacker Floor Underlayment must be free of any moisture. Consult the flooring contractor for recommended procedures to test for dryness (See ASTM F2419).
- F. Hacker Floor Underlayments are suita for interior applications only and shall be covered by a finished floor material.

3.6 Preparation for Installation of Floor Coverings
- A. Sealing: Any areas where the underlayment surface has been damaged shall be cleaned and sealed regardless of specified floor covering. The floor covering manufacturers' specifications and requirements supercede these recommendations.
- B. Floor Covering Procedures: Please see Hacker Industries, Inc.'s "Guidelines for Installing Finished Floor Coverings." The guideline is not a warranty and shall be used as a guideline only.

3.7 Field Quality Control
- A. Slump Test: Hacker Floor Underlayment shall be tested for slump as it is being installed using a 2" by 4" (51mm by 102mm) cylinder.
- B. Field Samples: Testing of molded cube samples shall be in accordance with ASTM C472 modified, using split brass molds. Prior to independent sampling contact Hacker Industries, Inc., to insure proper ASTM methods are followed.

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Toll Free: (800) 642-3455 FAX: (800) 906-8548
e-mail: info@HackerIndustries.com
www.HackerIndustries.com

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FIRM-FILL ™ and the associated logos are the registered trademarks of Hacker Industries, Inc., Newport Beach, CA.

For the Licensed Applicator in your area, please call our toll-free number, (800) 642-3455.

ROA_01181

TAMKO® TWP-1 QUICK DRY PRIMER

Low VOC Waterproofing Primer

PRODUCT DATA

DESCRIPTION

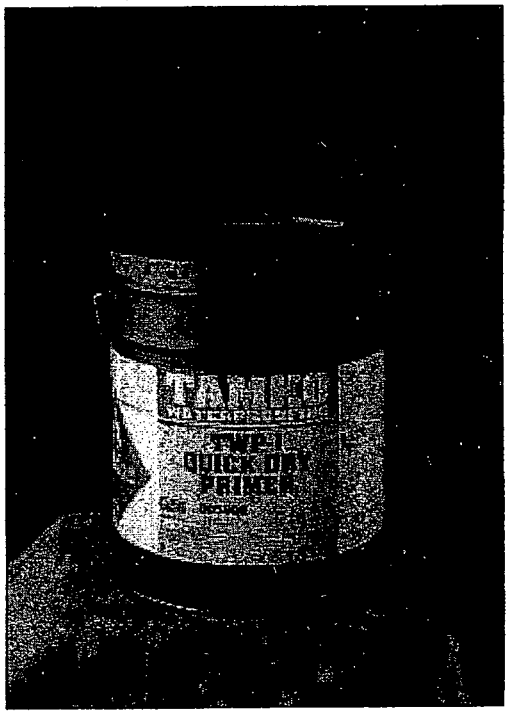
TAMKO TWP-1 is a high quality, rubberized, low VOC primer, formulated for the professional waterproofing contractor.

USES

This quick dry, high-tack primer provides maximum bond to asphalt, concrete, masonry and metal surfaces.

APPLICATION

Apply with a long nap roller or spray equipment at the rate of 250 to 300 square feet per gallon. Allow to cure until the surface is tacky, but will not transfer when touched. Primer should be allowed to dry a minimum of 1 hour, and a maximum of 8 hours. Do not thin with organic solvents.



TYPICAL PHYSICAL PROPERTIES*

Property	Results
Weight per Gallon	7.63 lbs
Solids Content	38% by weight
Tack Free Time	30 min. @ 75°F
VOC	Less than 450 grams/litre**
Flash Point	<68°F
Packaging	5 Gallon pails

*All values stated as nominal at time of manufacture.
**This primer does not meet the VOC requirements in the state of California.

For safety, health, and handling information contact TAMKO at 800-641-4691 ext. 51 for Material Safety Data Sheets (MSDS).

CAUTION: The National Institute for Occupational Safety and Health (NIOSH) has concluded that fumes of heated asphalt are a potential occupational carcinogen. Do not heat or burn this product.

www.tamko.com

Corporate	220 West 4th Street, Joplin, Missouri 64801	800-641-4691
Central District	220 West 4th Street, Joplin, Missouri 64801	800-641-4691
Northeast District	4500 Tamko Drive, Frederick, Maryland 21701	800-368-2055
Southeast District	2300 35th Street, Tuscaloosa, Alabama 35401	800-228-2656
Southwest District	7910 South Central Expressway, Dallas, Texas 75216	800-443-1834
Western District	5300 East 43rd Avenue, Denver, Colorado 80216	800-530-8868

TAMKO™ WATERPROOFING

JP37046 4/04

ROA_01182

TAMKO
WATERPROOFING
P.O. Box 1404 - Joplin, MO 64802
www.tamko.com

TWP-1 Quick Dry Primer
Product Name

FIVE YEAR LIMITED MATERIAL WARRANTY
(A LIMITED WARRANTY)

This limited warranty is personal to the original owner and is not assignable or transferable under any circumstances

TERMS AND CONDITIONS

TAMKO ROOFING PRODUCTS, INC. ("TAMKO"), warrants to the first consumer purchaser or owner that, subject to the conditions set forth herein, for a period of five (5) years from the Job Completion Date for the TAMKO product identified above ("Product"), if manufacturing defects in the Product cause the Product to lose its watertight integrity and leaks result, then subject to the conditions, exclusions and other provisions detailed below, TAMKO, at its sole option, will either (1) refund the original purchase cost of the Product; or (2) provide the amount of Product necessary to make repairs. This limited warranty does not cover any cost or expenses associated with removal, excavation, or replacement of concrete or other materials in connection with the testing, repair, removal, or replacement of the Product. This limited warranty does not cover any cost or expenses associated with removal, excavation, or replacement of concrete or other materials in connection with the testing, repair, removal, or replacement of the Product. **This limited warranty applies to Product applied in accordance with, and as part of, TAMKO published specifications in effect at the time of the application. This Product is sold AS IS and without warranty of any kind when used in any other application.**

EXCLUSIONS FROM COVERAGE: TAMKO shall not be liable under any circumstances for:

1. Leaks or damages resulting from Acts of God including, but not limited to, lightning, flood, wind, earthquake, hurricane, tornado, hail, or other violent storm or casualty or impact of objects.
2. Leaks or damages resulting from insurrection, war, riot or vandalism.
3. Exposure of the Product to ionized radiation or contamination by radioactivity from any nuclear source, or leaks or damages resulting therefrom.
4. Chemical attack on the Product or other system components as the result of exposure to chemicals including, but not limited to, aliphatic or aromatic solvents, chlorinated hydrocarbons, turpentine, oils, or organic or inorganic polar materials.
5. Inadequate drainage or leaks or damages resulting therefrom.
6. Structural defects or failures in the building(s) or structure(s) to which the Product is applied.
7. Building or structural expansion or additions or reductions, settling, shifting, distortion, failure or cracking of foundations or other system components exceeding 1/16" or leaks or damage caused or attributable to traffic, or for damage attributable to alterations.
8. Leaks or damage resulting from any additional installation on or through the Product or flashing after the Job Completion Date.
9. Repairs or alterations to the Product or other system components or leaks or damages resulting therefrom, after the Job Completion Date unless done in a manner prescribed by TAMKO and approved in writing by TAMKO.
10. Infiltration or condensation of moisture around or under the foundation or other system components.
11. Splitting, cracking, blistering, delamination or separation of the Product due to underlying or overlying materials.
12. Misuse or abuse of the Product or leaks or damages resulting therefrom.
13. Faulty or improper workmanship or application of the Product or leaks or damages resulting therefrom.
14. Damages to the building or structure, its contents, foundation, or other system components.
15. Removal, excavation, or replacement of concrete or other materials in connection with the testing, repair, removal, or replacement of the Product.
16. Leaks or damage from any cause other than inherent manufacturing defect in the Product.

CONDITIONS TO WARRANTY COVERAGE:

This limited warranty is additionally specifically conditioned upon the following matters, each and all of which shall be a precondition to any of TAMKO's obligations hereunder:

1. **PROOF OF PURCHASE:** Claims under this warranty will require proof of purchase by the first consumer purchaser or owner. TAMKO shall not be responsible for any claims without such proof of purchase.
2. **NOTIFICATION TO TAMKO:** The owner named herein must notify TAMKO by certified mail at P.O. Box 1404, Joplin, Missouri 64802, of any leaks alleged to result directly from manufacturing defects within thirty (30) days following discovery of such leaks.
3. **COMPLIANCE WITH TAMKO RECOMMENDATIONS AND WARRANTIES:** In no event shall TAMKO be liable under this warranty or otherwise unless the Product has been stored, handled, installed and maintained in compliance with TAMKO's instructions, specifications and recommendations, and unless all of the terms and provisions of this warranty have been complied with.
4. **BUILDING AND STRUCTURE PLANS:** Because TAMKO does not practice engineering or architecture, neither the issuance of this limited warranty nor any review or inspection of the building, structure, plans, specifications or construction by a TAMKO representative shall constitute any warranty or representation by TAMKO with respect to the building, structure, plans, specifications or construction or in any way constitute an extension of the terms and conditions of this limited warranty. ALL SUCH WARRANTIES ARE EXPRESSLY DISCLAIMED.
5. **NONWAIVER:** Owner agrees that any post application inspection of the Product by TAMKO or its authorized representative shall not constitute a waiver of any terms, conditions, or limitations set forth in this limited warranty, including, but not limited to, the requirement that the Product be installed in full compliance with the terms and conditions set forth in TAMKO's most recent published instructions, specifications and recommendations. FURTHER, THE OWNER HEREBY ACKNOWLEDGES THAT IT IS SOLELY THE OWNER'S RESPONSIBILITY TO DETERMINE THAT THE PRODUCT HAS BEEN INSTALLED IN COMPLIANCE WITH (I) ANY CONTRACT SPECIFICATIONS PROVIDED BY THE OWNER TO THE CONTRACTOR AND (II) THE TERMS AND CONDITIONS OF THIS LIMITED WARRANTY.

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RIGHT OF INSPECTION:
TAMKO shall have a reasonable time after notification of a leak to inspect the Product, and if TAMKO determines there are manufacturing defects covered by this warranty, TAMKO shall have ninety (90) days after receipt of notification to either (1) refund the purchase price of the product pursuant to the Limitation of Remedies section on page 1, or (2) provide the amount of replacement Product necessary to make repairs pursuant to the Limitation of Remedies section on page 1. Prior to the expiration of such 90-day period TAMKO shall not be liable for any cost of repair or replacement unless TAMKO has given its written approval of the repair or replacement of said defective Product and the cost thereof.

NO WARRANTY MODIFICATION:
This limited warranty may not be modified except in a writing signed by TAMKO's president. No representative, employee, agent of TAMKO or any person, other than the President of TAMKO, has any authority to assume for TAMKO any additional or other liability or responsibility in connection with the Product or this limited material warranty.

NON-TRANSFERABILITY OF WARRANTY:
This limited warranty shall accrue and inure only to the benefit of the first consumer purchaser or owner of the TAMKO Product and shall not be assigned, sold, or transferred in any manner whatsoever. Any assignment, sale or transfer of this warranty or of the building to which the Product is applied shall void all warranties contained herein or hereunder and all implied warranties including warranties of merchantability and fitness for a particular purpose.

MANDATORY BINDING ARBITRATION:
EVERY CLAIM, CONTROVERSY, OR DISPUTE OF ANY KIND WHATSOEVER (EACH AN "ACTION") BETWEEN YOU AND TAMKO (INCLUDING ANY OF TAMKO'S EMPLOYEES AND AGENTS) RELATING TO OR ARISING OUT OF THE PRODUCT SHALL BE RESOLVED BY FINAL AND BINDING ARBITRATION, REGARDLESS OF WHETHER THE ACTION SOUNDS IN WARRANTY, CONTRACT, STATUTE OR ANY OTHER LEGAL OR EQUITABLE THEORY. TO ARBITRATE AN ACTION AGAINST TAMKO, YOU MUST INITIATE THE ARBITRATION IN ACCORDANCE WITH THE APPLICABLE RULES OF ARBITRATION OF THE AMERICAN ARBITRATION ASSOCIATION (WHICH ARE AVAILABLE ONLINE AT www.adr.com OR BY CALLING THE AMERICAN ARBITRATION ASSOCIATION AT 1-800-778-7879) AND PROVIDE WRITTEN NOTICE TO TAMKO BY CERTIFIED MAIL AT P. O. BOX 1404, JOPLIN, MISSOURI 64802 WITHIN THE TIME PERIOD PRESCRIBED IMMEDIATELY BELOW.

LEGAL REMEDIES: THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY AND ALL OTHER OBLIGATIONS GUARANTEES AND WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND OF ANY OTHER OBLIGATION OR WARRANTY ON THE PART OF TAMKO ROOFING PRODUCTS, INC. IN NO EVENT SHALL TAMKO BE LIABLE FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES OF ANY KIND. SOME STATES DO NOT ALLOW EXCLUSION OR LIMITATION OF IMPLIED WARRANTIES OR INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS OR EXCLUSIONS MAY NOT APPLY TO YOU. NO ACTION FOR BREACH OF THIS LIMITED WARRANTY OR ANY OTHER ACTION RELATING TO OR ARISING OUT OF THE PRODUCT, ITS PURCHASE OR THIS TRANSACTION SHALL BE BROUGHT LATER THAN ONE YEAR AFTER ANY CAUSE OF ACTION HAS ACCRUED. IN JURISDICTIONS WHERE STATUTORY CLAIMS OR IMPLIED WARRANTIES CAN NOT BE EXCLUDED, ALL SUCH STATUTORY CLAIMS, IMPLIED WARRANTIES AND ALL RIGHTS TO BRING ACTIONS FOR BREACH THEREOF EXPIRE ONE YEAR (OR SUCH LONGER PERIOD OF TIME IF MANDATED BY APPLICABLE LAWS) AFTER THE DATE OF PURCHASE. SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU. THIS LIMITED WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE. Invalidity or unenforceability of any provision herein shall not affect the validity or enforceability of any other provision which shall remain in full force and effect.

MISCELLANEOUS:
Invalidity or unenforceability of any provisions herein shall not affect the validity or enforceability of any other provision which shall remain in full force and effect. This warranty is valid only in the 48 contiguous United States, and the Provinces of British Columbia and Alberta in Canada. Products described herein are sold "AS IS" and "WITH ALL FAULTS" when used outside of the 48 contiguous United States or the Provinces of British Columbia and Alberta in Canada.

Retain this warranty with the contractor's receipt for future reference.

WARRANTY INFORMATION

Owner's Name Belle Hall Direct 101 Limited Partnership Telephone (____) _____

Building Address 1000 South Egypt Rd City Mt. Pleasant State SC Zip 29464

Owner's Signature _____

Contractor's Name Kmac of the Carolinas Contractor's Signature _____

Job Completion Date 8 / 18 / 2006

Product(s) Used

JP3448

01/08

TW1003

TAMKO® TWM-1 MASTIC
Rubberized Bitumen Waterproofing Mastic

PRODUCT DATA

DESCRIPTION
TAMKO TWM-1 is a high quality, trowel grade, rubberized bitumen mastic that dries to a durable but pliable seal allowing for minor expansion and contraction.

USES
TAMKO TWM-1 has multiple uses including, sealing seams, overlaps, patches and terminations of the TAMKO Membrane.

APPLICATION
Apply with a trowel or caulking gun

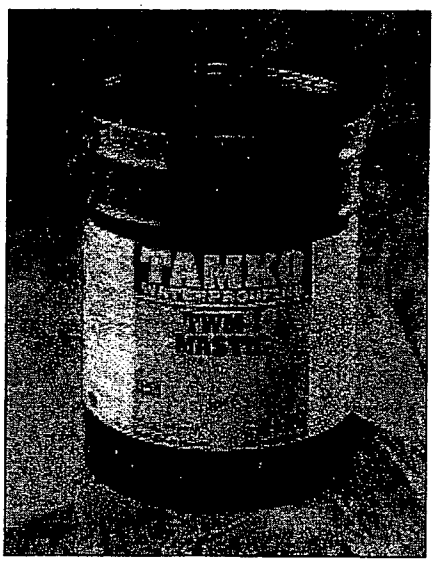
COVERAGE RATES

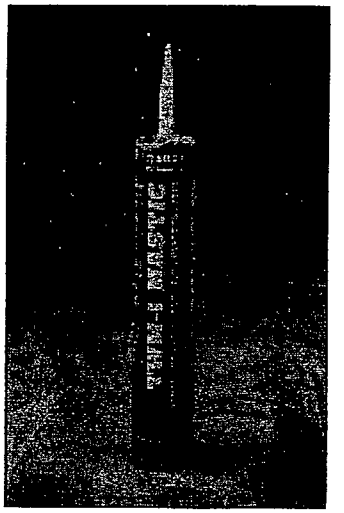
Side laps:	900 lineal feet per gallon
End laps:	600 lineal feet per gallon

TYPICAL PHYSICAL PROPERTIES*

Color	Black
Weight	10.7 lbs per gallon
Viscosity, Brookfield (36 @ 20 rpm)	<4000 poise
VOC	280 grams per liter
Flash Point (COC)	>100° F
Packaging	5 Gallon pails or 29 Ounce tubes

*All values stated as nominal at time of manufacture.





CAUTION: The National Institute for Occupational Safety and Health (NIOSH) has concluded that fumes of heated asphalt are a potential occupational carcinogen. Do not heat or burn this product.

www.tamko.com

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Northeast District	4500 Tamko Drive, Frederick, Maryland 21701	800-368-2055
Southeast District	2300 35th Street, Tuscaloosa, Alabama 35401	800-228-2656
Southwest District	7910 South Central Expressway, Dallas, Texas 75216	800-443-1834
Western District	5300 East 43rd Avenue, Denver, Colorado 80216	800-530-8868

TAMKO™ WATERPROOFING

TAMKO WATERPROOFING
P.O. Box 1404 • Joplin, MO 64802
www.tamko.com

IWM-1 Mastic
Product Name

FIVE YEAR LIMITED MATERIAL WARRANTY (A LIMITED WARRANTY)

This limited warranty is personal to the original owner and is not assignable or transferable under any circumstances

TERMS AND CONDITIONS

TAMKO ROOFING PRODUCTS, INC. ("TAMKO"), warrants to the first consumer purchaser or owner that, subject to the conditions set forth herein, for a period of five (5) years from the Job Completion Date for the TAMKO product identified above ("Product"), if manufacturing defects in the Product cause the Product to lose its watertight integrity and leaks result, then subject to the conditions, exclusions and other provisions detailed below, TAMKO, at its sole option, will either (1) refund the original purchase cost of the Product; or (2) provide the amount of Product necessary to make repairs. This limited warranty does not cover any cost or expenses associated with removal, excavation, or replacement of concrete or other materials in connection with the testing, repair, removal, or replacement of the Product. This limited warranty does not cover any cost or expenses associated with removal, excavation, or replacement of concrete or other materials in connection with the testing, repair, removal, or replacement of the Product. This limited warranty applies to Product applied in accordance with, and as part of, TAMKO published specifications in effect at the time of the application. This Product is sold AS IS and without warranty of any kind when used in any other application.

EXCLUSIONS FROM COVERAGE: TAMKO shall not be liable under any circumstances for:

1. Leaks or damages resulting from Acts of God including, but not limited to, lightning, flood, wind, earthquake, hurricane, tornado, hail, or other violent storm or casualty or impact of objects.
2. Leaks or damages resulting from insurrection, war, riot or vandalism.
3. Exposure of the Product to ionized radiation or contamination by radioactivity from any nuclear source, or leaks or damages resulting therefrom.
4. Chemical attack on the Product or other system components as the result of exposure to chemicals including, but not limited to, aliphatic or aromatic solvents, chlorinated hydrocarbons, turpentine, oils, or organic or inorganic polar materials.
5. Inadequate drainage or leaks or damages resulting therefrom.
6. Structural defects or failures in the building(s) or structure(s) to which the Product is applied.
7. Building or structural expansion or additions or reductions, settling, shifting, distortion, failure or cracking of foundations or other system components exceeding 1/16" or leaks or damage caused or attributable to traffic, or for damage attributable to alterations.
8. Leaks or damage resulting from any additional installation on or through the Product or flashing after the Job Completion Date.
9. Repairs or alterations to the Product or other system components or leaks or damages resulting therefrom, after the Job Completion Date unless done in a manner prescribed by TAMKO and approved in writing by TAMKO.
10. Infiltration or condensation of moisture around or under the foundation or other system components.
11. Splitting, cracking, blistering, delamination or separation of the Product due to underlying or overlying materials.
12. Misuse or abuse of the Product or leaks or damages resulting therefrom.
13. Faulty or improper workmanship or application of the Product or leaks or damages resulting therefrom.
14. Damages to the building or structure, its contents, foundation, or other system components.
15. Removal, excavation, or replacement of concrete or other materials in connection with the testing, repair, removal, or replacement of the Product.
16. Leaks or damage from any cause other than inherent manufacturing defect in the Product.

CONDITIONS TO WARRANTY COVERAGE:

This limited warranty is additionally specifically conditioned upon the following matters, each and all of which shall be a precondition to any of TAMKO's obligations hereunder:

1. **PROOF OF PURCHASE:** Claims under this warranty will require proof of purchase by the first consumer purchaser or owner. TAMKO shall not be responsible for any claims without such proof of purchase.
2. **NOTIFICATION TO TAMKO:** The owner named herein must notify TAMKO by certified mail at P.O. Box 1404, Joplin, Missouri 64802, of any leaks alleged to result directly from manufacturing defects within thirty (30) days following discovery of such leaks.
3. **COMPLIANCE WITH TAMKO RECOMMENDATIONS AND WARRANTIES:** In no event shall TAMKO be liable under this warranty or otherwise unless the Product has been stored, handled, installed and maintained in compliance with TAMKO's instructions, specifications and recommendations, and unless all of the terms and provisions of this warranty have been complied with.
4. **BUILDING AND STRUCTURE PLANS:** Because TAMKO does not practice engineering or architecture, neither the issuance of this limited warranty nor any review or inspection of the building, structure, plans, specifications or construction by a TAMKO representative shall constitute any warranty or representation by TAMKO with respect to the building, structure, plans, specifications or construction or in any way constitute an extension of the terms and conditions of this limited warranty. ALL SUCH WARRANTIES ARE EXPRESSLY DISCLAIMED.
5. **NONWAIVER:** Owner agrees that any post application inspection of the Product by TAMKO or its authorized representative shall not constitute a waiver of any terms, conditions, or limitations set forth in this limited warranty, including, but not limited to, the requirement that the Product be installed in full compliance with the terms and conditions set forth in TAMKO's most recent published instructions, specifications and recommendations. FURTHER, THE OWNER HEREBY ACKNOWLEDGES THAT IT IS SOLELY THE OWNER'S RESPONSIBILITY TO DETERMINE THAT THE PRODUCT HAS BEEN INSTALLED IN COMPLIANCE WITH (I) ANY CONTRACT SPECIFICATIONS PROVIDED BY THE OWNER TO THE CONTRACTOR AND (II) THE TERMS AND CONDITIONS OF THIS LIMITED WARRANTY.

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(over)

RIGHT OF INSPECTION:
TAMKO shall have a reasonable time after notification of a leak to inspect the Product, and if TAMKO determines there are manufacturing defects covered by this warranty, TAMKO shall have ninety (90) days after receipt of notification to either (1) refund the purchase price of the product pursuant to the Limitation of Remedies section on page 1, or (2) provide the amount of replacement Product necessary to make repairs pursuant to the Limitation of Remedies section on page 1. Prior to the expiration of such 90-day period TAMKO shall not be liable for any cost of repair or replacement unless TAMKO has given its written approval of the repair or replacement of said defective Product and the cost thereof.

NO WARRANTY MODIFICATION:
This limited warranty may not be modified except in a writing signed by TAMKO's president. No representative, employee, agent of TAMKO or any person, other than the President of TAMKO, has any authority to assume for TAMKO any additional or other liability or responsibility in connection with the Product or this limited material warranty.

NON-TRANSFERABILITY OF WARRANTY:
This limited warranty shall accrue and inure only to the benefit of the first consumer purchaser or owner of the TAMKO Product and shall not be assigned, sold, or transferred in any manner whatsoever. Any assignment, sale or transfer of this warranty or of the building to which the Product is applied shall void all warranties contained herein or hereunder and all implied warranties including warranties of merchantability and fitness for a particular purpose.

MANDATORY BINDING ARBITRATION:
EVERY CLAIM, CONTROVERSY, OR DISPUTE OF ANY KIND WHATSOEVER (EACH AN "ACTION") BETWEEN YOU AND TAMKO (INCLUDING ANY OF TAMKO'S EMPLOYEES AND AGENTS) RELATING TO OR ARISING OUT OF THE PRODUCT SHALL BE RESOLVED BY FINAL AND BINDING ARBITRATION, REGARDLESS OF WHETHER THE ACTION SOUNDS IN WARRANTY, CONTRACT, STATUTE OR ANY OTHER LEGAL OR EQUITABLE THEORY. TO ARBITRATE AN ACTION AGAINST TAMKO, YOU MUST INITIATE THE ARBITRATION IN ACCORDANCE WITH THE APPLICABLE RULES OF ARBITRATION OF THE AMERICAN ARBITRATION ASSOCIATION (WHICH ARE AVAILABLE ONLINE AT www.adr.com OR BY CALLING THE AMERICAN ARBITRATION ASSOCIATION AT 1-800-778-7879) AND PROVIDE WRITTEN NOTICE TO TAMKO BY CERTIFIED MAIL AT P. O. BOX 1404, JOPLIN, MISSOURI 64802 WITHIN THE TIME PERIOD PRESCRIBED IMMEDIATELY BELOW.

LEGAL REMEDIES: THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY AND ALL OTHER OBLIGATIONS GUARANTEES AND WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND OF ANY OTHER OBLIGATION OR WARRANTY ON THE PART OF TAMKO ROOFING PRODUCTS, INC. IN NO EVENT SHALL TAMKO BE LIABLE FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES OF ANY KIND. SOME STATES DO NOT ALLOW EXCLUSION OR LIMITATION OF IMPLIED WARRANTIES OR INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS OR EXCLUSIONS MAY NOT APPLY TO YOU. NO ACTION FOR BREACH OF THIS LIMITED WARRANTY OR ANY OTHER ACTION RELATING TO OR ARISING OUT OF THE PRODUCT, ITS PURCHASE OR THIS TRANSACTION SHALL BE BROUGHT LATER THAN ONE YEAR AFTER ANY CAUSE OF ACTION HAS ACCRUED. IN JURISDICTIONS WHERE STATUTORY CLAIMS OR IMPLIED WARRANTIES CAN NOT BE EXCLUDED, ALL SUCH STATUTORY CLAIMS, IMPLIED WARRANTIES AND ALL RIGHTS TO BRING ACTIONS FOR BREACH THEREOF EXPIRE ONE YEAR (OR SUCH LONGER PERIOD OF TIME IF MANDATED BY APPLICABLE LAWS) AFTER THE DATE OF PURCHASE. SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU. THIS LIMITED WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE. Invalidity or unenforceability of any provision herein shall not affect the validity or enforceability of any other provision which shall remain in full force and effect.

MISCELLANEOUS:
Invalidity or unenforceability of any provisions herein shall not affect the validity or enforceability of any other provision which shall remain in full force and effect. This warranty is valid only in the 48 contiguous United States, and the Provinces of British Columbia and Alberta in Canada. Products described herein are sold "AS IS" and "WITH ALL FAULTS" when used outside of the 48 contiguous United States or the Provinces of British Columbia and Alberta in Canada.

Retain this warranty with the contractor's receipt for future reference.

WARRANTY INFORMATION

Owner's Name Belle Hall Direct 101 Limited Partnership Telephone (_____) _____

Building Address 1000 South Egypt Rd. City Mt. Pleasant State SC Zip 29464

Owner's Signature _____

Contractor's Name Kmac of the Carolinas Contractor's Signature _____

Job Completion Date 8, 11, 2006

Product(s) Used

JF92448

01/06

TW1003

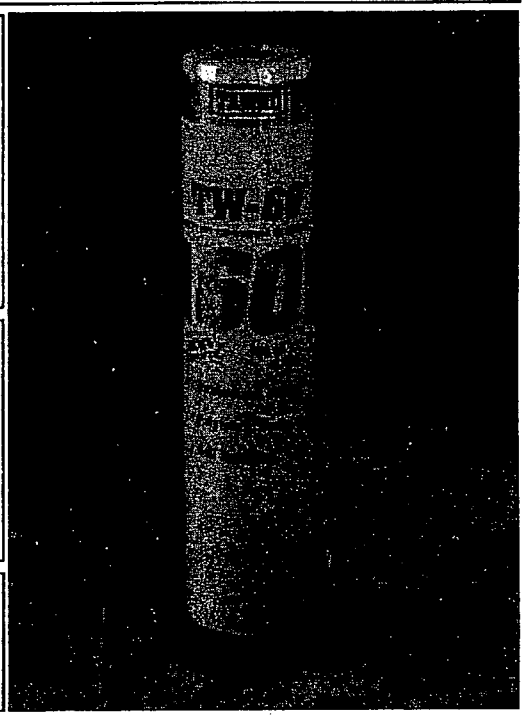
TAMKO® TW-60
Self-Adhering Sheet Waterproofing Membrane

PRODUCT DATA

DESCRIPTION
TW-60 is a flexible, self-adhering rubberized asphalt sheet membrane with a polymeric film on the surface and a removable silicone treated release film on the adhesive side.

USES
TW-60 is especially well suited for below grade waterproofing of foundation walls, tunnels, earth shelters, and similar structures. Also suitable for waterproofing plaza decks, parking decks, balconies, and terraces.

ADVANTAGES
- Excellent tensile, elongation, and permeance characteristics.
- Rubberized asphalt sheet and polymeric surfacing provide superior waterproofing protection.
- Silicone treated release film for easier installation and handling.
- Also available in factory pre-cut widths of 6", 9", 12", 18", and 39-3/8" rolls.
- ICC-ES (Formerly ICBO Evaluation Services, Inc.) Legacy Report ER-5943.



LIMITATIONS
- Membrane or primer should not be applied to damp, frosty or contaminated surfaces.
- Membrane should not be left exposed to sunlight for extended periods of time.
- Membrane should not come into contact with products containing coal-tar pitch.
- Best applied between the temperatures of 35°F and 90°F.

PRODUCT DATA**

Asphalt Modifier	SBS
Roll Size (200 sq. ft.)	39-3/8" x 61'
Product Thickness	60 mil

TYPICAL PHYSICAL PROPERTIES

Property	ASTM Standard	Results
Tensile, Membrane	D 412 (C)	425 psi
Tensile, Film	D 882	6300 psi
Elongation***	D 412 (C)	300% (min.)
Permeance	E 96 (D)	0.05 perms (max.)
Low Temp. Flexibility	D 1970	Unaffected @ -25°F
Crack Cycling (100 cycles)	C 836	Unaffected @ -15°F
Peel Strength	D 903	9.0 lb/in. width (min.)
Lap Adhesion	D 1876	5.5 lb/in. width
Puncture Resistance	E 154	50 lb. (min.)
Hydrostatic Head	D 5385	231 ft. (min.)
Resistance to Soil Organisms (Fungi)	E 154	No effect (Permeability)

**All values stated as nominal at time of manufacture.
***% of elongation to ultimate failure of rubberized asphalt membrane.

www.tamko.com

Corporate	220 West 4th Street, Joplin, Missouri 64801	800-641-4691
Central District	220 West 4th Street, Joplin, Missouri 64801	800-641-4691
Northeast District	4500 Tamko Drive, Frederick, Maryland 21701	800-368-2055
Southeast District	2300 35th Street, Tuscaloosa, Alabama 35401	800-228-2656
Southwest District	7910 South Central Expressway, Dallas, Texas 75216	800-443-1834
Western District	5300 East 43rd Avenue, Denver, Colorado 80216	800-530-8868

TAMKO™ WATERPROOFING

JP32331 4/04

TW-60 Self-Adhering Sheet Waterproofing Membrane

APPLICATION INSTRUCTIONS

SURFACE PREPARATION

The concrete surface should be dry and have a smooth (not broomed) finish and be free of form release agents, voids, and sharp protusions. Forms should be removed as quickly as possible. On a horizontal deck do not apply membrane when forms are in place, unless the forms are vented. Concrete should be allowed to cure for a minimum of 7 days or until dry. Curing agents containing wax, oil, or pigment should not be used.

Any holes or voids should be repaired with non-shrink grout. **Note: On masonry surfaces mortar joints should be flush to the face of the concrete block or brick and have a thorough parge coat.**

Cracks greater than 1/16" in width shall be cut out to a minimum width of 1/4" with a minimum depth of 1/4" and sealed using polyurethane sealant prior to the installation of the sheet membrane.

All penetrations and drains should be flashed with TW-60 membrane, extending the membrane a minimum of 6" on all sides. All cracks and joints should be sealed with a polyurethane sealant and flashed with a 12" wide strip of TW-60 membrane centered on the axis of the corners.

PRIMING

Prime the area to be sealed with TWP-1* or TWP-2 primer, stir primer until thoroughly mixed. Apply primer at recommended coverage rates with a sprayer or a long nap roller. Primer should be allowed to dry a minimum of 1 hour, or until completely tack-free. Drying time may vary according to weather conditions.

HORIZONTAL APPLICATION

Starting at the low point of the surface and working to the high point, install TW-60 membrane by simultaneously rolling the sheet into place while pulling and rolling the release film. Side laps should be 2.5", and end laps should be 5". Stagger all end laps. All terminating edges should be sealed with TWM-1 Mastic. Roll the entire membrane as soon as possible with a minimum 75 lb. garden roller wrapped with indoor/outdoor carpet.

Before the application of a protection layer all horizontal applications should be flood tested with a minimum 2" head of water for 24 hours. Check for leaks and make repairs immediately. Before flood testing be sure the structure is capable of withstanding the dead load of the water. Re-test after repairs have been made.

VERTICAL APPLICATION

Install TW-60 Sheet Membrane in lengths of 8' or less. Overlap edge seams 2 1/2". On walls above 8', apply in 8' sections, starting at the lowest point with the higher section overlapping the lower section 5". Use heavy hand pressure or a suitable roller to press membrane firmly against wall.

Terminations: TW-60 sheet should be installed over the top of a wall or over the edge of a slab. If the membrane must terminate on a vertical surface, use a reglet or counter flashing. Press terminating edge firmly with a hammer handle or equal. Apply TWM-1 Mastic to all terminating edges.

TW-60 Sheet Membrane shall be installed on the base of the foundation wall, over the edge of the footing and the terminating edge pressed firmly against the vertical surface of the footing. Apply TWM-1 Mastic to the terminating edge.

Apply TWM-1 Mastic to all vertical and horizontal terminations.

Note: Failure to use adequate pressure at terminating edges will result in poor seal and potential leak. The use of mastic is not a substitute for a good seal.

MEMBRANE PROTECTION

Vertical surfaces should be protected immediately following installation of the membrane. Horizontal surfaces should be protected immediately following the 24 hour flood test. If the flood test is delayed, a temporary protection layer must be installed to protect the membrane from future operations and other trades.

***WARNINGS AND HAZARDS**

TWP-1 contains combustible solvents. Avoid exposure to sparks, open flame, heat, and other forms of ignition. Use in well-ventilated areas. Avoid breathing vapors. Refer to MSDS for detailed product information and warnings.

CAUTION: The National Institute for Occupational Safety and Health (NIOSH) has concluded that fumes of heated asphalt are a potential occupational carcinogen. Do not burn this product.

TAMKO WATERPROOFING
P.O. Box 1404 • Joplin, MO 64802
www.tamko.com

TW-60
Product Name

FIVE YEAR LIMITED MATERIAL WARRANTY (A LIMITED WARRANTY)

This limited warranty is personal to the original owner and is not assignable or transferable under any circumstances

TERMS AND CONDITIONS

TAMKO ROOFING PRODUCTS, INC. ("TAMKO"), warrants to the first consumer purchaser or owner that, subject to the conditions set forth herein, for a period of five (5) years from the Job Completion Date for the TAMKO product identified above ("Product"), if manufacturing defects in the Product cause the Product to lose its watertight integrity and leaks result, then subject to the conditions, exclusions and other provisions detailed below, TAMKO, at its sole option, will either (1) refund the original purchase cost of the Product; or (2) provide the amount of Product necessary to make repairs. This limited warranty does not cover any cost or expenses associated with removal, excavation, or replacement of concrete or other materials in connection with the testing, repair, removal, or replacement of the Product. This limited warranty does not cover any cost or expenses associated with removal, excavation, or replacement of concrete or other materials in connection with the testing, repair, removal, or replacement of the Product. **This limited warranty applies to Product applied in accordance with, and as part of, TAMKO published specifications in effect at the time of the application. This Product is sold AS IS and without warranty of any kind when used in any other application.**

EXCLUSIONS FROM COVERAGE: TAMKO shall not be liable under any circumstances for:

1. Leaks or damages resulting from Acts of God including, but not limited to, lightning, flood, wind, earthquake, hurricane, tornado, hail, or other violent storm or casualty or impact of objects.
2. Leaks or damages resulting from insurrection, war, riot or vandalism.
3. Exposure of the Product to ionized radiation or contamination by radioactivity from any nuclear source, or leaks or damages resulting therefrom.
4. Chemical attack on the Product or other system components as the result of exposure to chemicals including, but not limited to, aliphatic or aromatic solvents, chlorinated hydrocarbons, turpentine, oils, or organic or inorganic polar materials.
5. Inadequate drainage or leaks or damages resulting therefrom.
6. Structural defects or failures in the building(s) or structure(s) to which the Product is applied.
7. Building or structural expansion or additions or reductions, settling, shifting, distortion, failure or cracking of foundations or other system components exceeding 1/16" or leaks or damage caused or attributable to traffic, or for damage attributable to alterations.
8. Leaks or damage resulting from any additional installation on or through the Product or flashing after the Job Completion Date.
9. Repairs or alterations to the Product or other system components or leaks or damages resulting therefrom, after the Job Completion Date unless done in a manner prescribed by TAMKO and approved in writing by TAMKO.
10. Infiltration or condensation of moisture around or under the foundation or other system components.
11. Splitting, cracking, blistering, delamination or separation of the Product due to underlying or overlying materials.
12. Misuse or abuse of the Product or leaks or damages resulting therefrom.
13. Faulty or improper workmanship or application of the Product or leaks or damages resulting therefrom.
14. Damages to the building or structure, its contents, foundation, or other system components.
15. Removal, excavation, or replacement of concrete or other materials in connection with the testing, repair, removal, or replacement of the Product.
16. Leaks or damage from any cause other than inherent manufacturing defect in the Product.

CONDITIONS TO WARRANTY COVERAGE:

This limited warranty is additionally specifically conditioned upon the following matters, each and all of which shall be a precondition to any of TAMKO's obligations hereunder:

1. **PROOF OF PURCHASE:** Claims under this warranty will require proof of purchase by the first consumer purchaser or owner. TAMKO shall not be responsible for any claims without such proof of purchase.
2. **NOTIFICATION TO TAMKO:** The owner named herein must notify TAMKO by certified mail at P.O. Box 1404, Joplin, Missouri 64802, of any leaks alleged to result directly from manufacturing defects within thirty (30) days following discovery of such leaks.
3. **COMPLIANCE WITH TAMKO RECOMMENDATIONS AND WARRANTIES:** In no event shall TAMKO be liable under this warranty or otherwise unless the Product has been stored, handled, installed and maintained in compliance with TAMKO's instructions, specifications and recommendations, and unless all of the terms and provisions of this warranty have been complied with.
4. **BUILDING AND STRUCTURE PLANS:** Because TAMKO does not practice engineering or architecture, neither the issuance of this limited warranty nor any review or inspection of the building, structure, plans, specifications or construction by a TAMKO representative shall constitute any warranty or representation by TAMKO with respect to the building, structure, plans, specifications or construction or in any way constitute an extension of the terms and conditions of this limited warranty. ALL SUCH WARRANTIES ARE EXPRESSLY DISCLAIMED.
5. **NONWAIVER:** Owner agrees that any post application inspection of the Product by TAMKO or its authorized representative shall not constitute a waiver of any terms, conditions, or limitations set forth in this limited warranty, including, but not limited to, the requirement that the Product be installed in full compliance with the terms and conditions set forth in TAMKO's most recent published instructions, specifications and recommendations. FURTHER, THE OWNER HEREBY ACKNOWLEDGES THAT IT IS SOLELY THE OWNER'S RESPONSIBILITY TO DETERMINE THAT THE PRODUCT HAS BEEN INSTALLED IN COMPLIANCE WITH (I) ANY CONTRACT SPECIFICATIONS PROVIDED BY THE OWNER TO THE CONTRACTOR AND (II) THE TERMS AND CONDITIONS OF THIS LIMITED WARRANTY.

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(over)

RIGHT OF INSPECTION:
TAMKO shall have a reasonable time after notification of a leak to inspect the Product, and if TAMKO determines there are manufacturing defects covered by this warranty, TAMKO shall have ninety (90) days after receipt of notification to either (1) refund the purchase price of the product pursuant to the Limitation of Remedies section on page 1, or (2) provide the amount of replacement Product necessary to make repairs pursuant to the Limitation of Remedies section on page 1. Prior to the expiration of such 90-day period TAMKO shall not be liable for any cost of repair or replacement unless TAMKO has given its written approval of the repair or replacement of said defective Product and the cost thereof.

NO WARRANTY MODIFICATION:
This limited warranty may not be modified except in a writing signed by TAMKO's president. No representative, employee, agent of TAMKO or any person, other than the President of TAMKO, has any authority to assume for TAMKO any additional or other liability or responsibility in connection with the Product or this limited material warranty.

NON-TRANSFERABILITY OF WARRANTY:
This limited warranty shall accrue and inure only to the benefit of the first consumer purchaser or owner of the TAMKO Product and shall not be assigned, sold, or transferred in any manner whatsoever. Any assignment, sale or transfer of this warranty or of the building to which the Product is applied shall void all warranties contained herein or hereunder and all implied warranties including warranties of merchantability and fitness for a particular purpose.

MANDATORY BINDING ARBITRATION:
EVERY CLAIM, CONTROVERSY, OR DISPUTE OF ANY KIND WHATSOEVER (EACH AN "ACTION") BETWEEN YOU AND TAMKO (INCLUDING ANY OF TAMKO'S EMPLOYEES AND AGENTS) RELATING TO OR ARISING OUT OF THE PRODUCT SHALL BE RESOLVED BY FINAL AND BINDING ARBITRATION, REGARDLESS OF WHETHER THE ACTION SOUNDS IN WARRANTY, CONTRACT, STATUTE OR ANY OTHER LEGAL OR EQUITABLE THEORY. TO ARBITRATE AN ACTION AGAINST TAMKO, YOU MUST INITIATE THE ARBITRATION IN ACCORDANCE WITH THE APPLICABLE RULES OF ARBITRATION OF THE AMERICAN ARBITRATION ASSOCIATION (WHICH ARE AVAILABLE ONLINE AT www.adr.com OR BY CALLING THE AMERICAN ARBITRATION ASSOCIATION AT 1-800-778-7879) AND PROVIDE WRITTEN NOTICE TO TAMKO BY CERTIFIED MAIL AT P. O. BOX 1404, JOPLIN, MISSOURI 64802 WITHIN THE TIME PERIOD PRESCRIBED IMMEDIATELY BELOW.

LEGAL REMEDIES; THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY AND ALL OTHER OBLIGATIONS GUARANTEES AND WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND OF ANY OTHER OBLIGATION OR WARRANTY ON THE PART OF TAMKO ROOFING PRODUCTS, INC. IN NO EVENT SHALL TAMKO BE LIABLE FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES OF ANY KIND. SOME STATES DO NOT ALLOW EXCLUSION OR LIMITATION OF IMPLIED WARRANTIES OR INCIDENTAL OR CONSEQUENTIAL DAMAGES. SO THE ABOVE LIMITATIONS OR EXCLUSIONS MAY NOT APPLY TO YOU. NO ACTION FOR BREACH OF THIS LIMITED WARRANTY OR ANY OTHER ACTION RELATING TO OR ARISING OUT OF THE PRODUCT, ITS PURCHASE OR THIS TRANSACTION SHALL BE BROUGHT LATER THAN ONE YEAR AFTER ANY CAUSE OF ACTION HAS ACCRUED. IN JURISDICTIONS WHERE STATUTORY CLAIMS OR IMPLIED WARRANTIES CAN NOT BE EXCLUDED, ALL SUCH STATUTORY CLAIMS, IMPLIED WARRANTIES AND ALL RIGHTS TO BRING ACTIONS FOR BREACH THEREOF EXPIRE ONE YEAR (OR SUCH LONGER PERIOD OF TIME IF MANDATED BY APPLICABLE LAWS) AFTER THE DATE OF PURCHASE. SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU. THIS LIMITED WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE. Invalidity or unenforceability of any provision herein shall not affect the validity or enforceability of any other provision which shall remain in full force and effect.

MISCELLANEOUS:
Invalidity or unenforceability of any provisions herein shall not affect the validity or enforceability of any other provision which shall remain in full force and effect. This warranty is valid only in the 48 contiguous United States, and the Provinces of British Columbia and Alberta in Canada. Products described herein are sold "AS IS" and "WITH ALL FAULTS" when used outside of the 48 contiguous United States or the Provinces of British Columbia and Alberta in Canada.

Retain this warranty with the contractor's receipt for future reference.

WARRANTY INFORMATION

Owner's Name Belle Hall Direct 101 Limited Partnership Telephone (____) _____

Building Address 1000 South Egypt Rd. City Mt Pleasant State SC Zip 29464

Owner's Signature _____

Contractor's Name Compac of the Carolina's Contractor's Signature _____

Job Completion Date 8 / 11 / 2006

Product(s) Used

JP22648

01/06

TW1003

DIVISION 4- MASONRY

MASONRY- SUPERIOR CONSTRUCTION SERVICES

WARRANTY AGREEMENT

Project: Belle Hall Condominiums

Owner: Belle Hall Direct 101, LP
Contractor: TCR NC Construction I Limited Partnership

Subcontractor: Superior Construction

Subcontractor hereby expressly warrants and guarantees that all labor, materials, and equipment furnished and work performed in conjunction with the above referenced project are in accordance with the plans, specifications, the Subcontract Agreement and authorized modifications thereto. All labor, materials and equipment shall be free from defects, due to defective materials and/or workmanship, for a period of one (1) year from the date of Certificate of Occupancy for each building/structure, unless otherwise stated in the Subcontract Agreement.

Should any defects develop during the warranty period due to improper workmanship and/or arrangement, the same shall, upon notice, be made good by this Subcontractor at no expense to the Contractor, Owner, or Owner's Representative. Nothing in the above shall be deemed to apply to work or equipment which has been abused, neglected or altered by the Contractor, Owner, or Owner's Representative.

Unless otherwise stated in the Subcontract Agreement, warranty work shall be responded to within twenty-four (24) hours of notification by the Contractor, Owner, or Owner's Representative, including weekends and holidays. Warranty notices received before 10:00 am shall be responded to on the same day. Should Subcontractor fail to respond within twenty-four (24) hours of notification or correct the defective work or equipment within seventy-two (72) hours, the Contractor, Owner, or Owner's Representative shall proceed with the correction of the defective work. All costs associated with this corrective action shall be reimbursed by this Subcontractor or charged against its account. Subcontractor shall remit payment for such charges within five (5) calendar days of notification by the Contractor, Owner, or Owner's Representative.

Signature: _____

Printed Name: Paul R. Irwin

Position/Title: President

Date: 12/5/6

DIVISION 5- METALS

METAL STAIRS AND RAILINGS- ALLEN'S STEEL

WARRANTY AGREEMENT

Project: Belle Hall Condominiums

Owner: Belle Hall Direct 101, LP
Contractor: TCR NC Construction I Limited Partnership

Subcontractor: Allen's Steel

Subcontractor hereby expressly warrants and guarantees that all labor, materials, and equipment furnished and work performed in conjunction with the above referenced project are in accordance with the plans, specifications, the Subcontract Agreement and authorized modifications thereto. All labor, materials and equipment shall be free from defects, due to defective materials and/or workmanship, for a period of one (1) year from the date of Certificate of Occupancy for each building/structure, unless otherwise stated in the Subcontract Agreement.

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Signature: TEAL

Printed Name: Trent E. Allen

Position/Title: Vice President

Date: 12/6/06

DIVISION 5 – METALS

ALUMINUM RAILINGS – P & P METALS

ROA_01196

WARRANTY AGREEMENT

Project: Belle Hall Condominiums

Owner: Belle Hall Direct 101, LP
Contractor: TCR NC Construction I Limited Partnership

Subcontractor: P & P Metals

Subcontractor hereby expressly warrants and guarantees that all labor, materials, and equipment furnished and work performed in conjunction with the above referenced project are in accordance with the plans, specifications, the Subcontract Agreement and authorized modifications thereto. All labor, materials and equipment shall be free from defects, due to defective materials and/or workmanship, for a period of one (1) year from the date of Certificate of Occupancy for each building/structure, unless otherwise stated in the Subcontract Agreement.

Should any defects develop during the warranty period due to improper workmanship and/or arrangement, the same shall, upon notice, be made good by this Subcontractor at no expense to the Contractor, Owner, or Owner's Representative. Nothing in the above shall be deemed to apply to work or equipment which has been abused, neglected or altered by the Contractor, Owner, or Owner's Representative.

Unless otherwise stated in the Subcontract Agreement, warranty work shall be responded to within twenty-four (24) hours of notification by the Contractor, Owner, or Owner's Representative, including weekends and holidays. Warranty notices received before 10:00 am shall be responded to on the same day. Should Subcontractor fail to respond within twenty-four (24) hours of notification or correct the defective work or equipment within seventy-two (72) hours, the Contractor, Owner, or Owner's Representative shall proceed with the correction of the defective work. All costs associated with this corrective action shall be reimbursed by this Subcontractor or charged against its account. Subcontractor shall remit payment for such charges within five (5) calendar days of notification by the Contractor, Owner, or Owner's Representative.

Signature: Misty A. Martin

Printed Name: Misty A. Martin

Position/Title: Secretary

Date: 12/12/06

DIVISION 6 – WOOD AND PLASTICS

FRAMING – COASTAL FRAMING

ROA_01198

WARRANTY AGREEMENT

Project: Belle Hall Condominiums

Owner: Belle Hall Direct 101, LP
Contractor: TCR NC Construction I Limited Partnership

Subcontractor: Coastal Lumber & Framing

Subcontractor hereby expressly warrants and guarantees that all labor, materials, and equipment furnished and work performed in conjunction with the above referenced project are in accordance with the plans, specifications, the Subcontract Agreement and authorized modifications thereto. All labor, materials and equipment shall be free from defects, due to defective materials and/or workmanship, for a period of one (1) year from the date of Certificate of Occupancy for each building/structure, unless otherwise stated in the Subcontract Agreement.

Should any defects develop during the warranty period due to improper workmanship and/or arrangement, the same shall, upon notice, be made good by this Subcontractor at no expense to the Contractor, Owner, or Owner's Representative. Nothing in the above shall be deemed to apply to work or equipment which has been abused, neglected or altered by the Contractor, Owner, or Owner's Representative.

Unless otherwise stated in the Subcontract Agreement, warranty work shall be responded to within twenty-four (24) hours of notification by the Contractor, Owner, or Owner's Representative, including weekends and holidays. Warranty notices received before 10:00 am shall be responded to on the same day. Should Subcontractor fail to respond within twenty-four (24) hours of notification or correct the defective work or equipment within seventy-two (72) hours, the Contractor, Owner, or Owner's Representative shall proceed with the correction of the defective work. All costs associated with this corrective action shall be reimbursed by this Subcontractor or charged against its account. Subcontractor shall remit payment for such charges within five (5) calendar days of notification by the Contractor, Owner, or Owner's Representative.

Signature: Keith Ward

Printed Name: Keith D Ward

Position/Title: Controller

Date: 12-11-2006

DIVISION 6 – WOOD AND PLASTICS

INT. AND EXT. DOORS, INT. TRIM – WHOLESALE BUILDING SUPPLY

WARRANTY AGREEMENT

Project: Belle Hall Condominiums

Owner: Belle Hall Direct 101, LP
Contractor: TCR NC Construction I Limited Partnership

Subcontractor: Wholesale Building Products

Subcontractor hereby expressly warrants and guarantees that all labor, materials, and equipment furnished and work performed in conjunction with the above referenced project are in accordance with the plans, specifications, the Subcontract Agreement and authorized modifications thereto. All labor, materials and equipment shall be free from defects, due to defective materials and/or workmanship, for a period of one (1) year from the date of Certificate of Occupancy for each building/structure, unless otherwise stated in the Subcontract Agreement.

Should any defects develop during the warranty period due to improper workmanship and/or arrangement, the same shall, upon notice, be made good by this Subcontractor at no expense to the Contractor, Owner, or Owner's Representative. Nothing in the above shall be deemed to apply to work or equipment which has been abused, neglected or altered by the Contractor, Owner, or Owner's Representative.

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Signature: _____

Printed Name: Matt Berry

Position/Title: Senior Project Manager

Date: 12/15/06

Wholesale Building Products
A Division of VRS Corporation
1600 McIntosh Street • P.O. Box 1659 • Vidalia, GA 30475
(912) 537-4100 • 800-476-3577 • FAX (912) 537-6490

Warranty Packages for

Belle Hall

Mt Pleasant, SC

ROA_01202

Kwikset

PRODUCT WARRANTY

Warranties cover the original residential user of Kwikset Products against defects in material and workmanship as long as the original user occupies the residential premises upon which the Product was originally installed. This warranty DOES NOT COVER abused or misused products or non-commercial products used in commercial applications. Upon return of a defective Product to Kwikset Corporation, Kwikset shall either replace the Product or refund the purchase price, at our discretion. If a covered defect occurs, call 1-800-327-LOCK (5625) in the U.S. and Canada or return it to Kwikset Corporation, Consumer Services, 19701 DaVinci, Lake Forest, California 92610. A finish deterioration occurring from the use of paints, solvents, or other chemicals is not a defect in the finish and is not covered by this warranty. Kwikset is not liable for incidental or consequential damages. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusion may not apply to you. This warranty gives you specific legal rights and you may also have other rights that vary from state to state.

BETTER HOME PRODUCTS

534 Eccles Ave, South San Francisco, CA 94080-1979, Phone: 650-827-9270, Fax: 650-827-9271

TERMS AND CONDITIONS

- **Payment Terms:** Net 30 days from the date of invoice. ***A 3% 10-day Payment Discount Is available for early payment.***
- **Pricing:** All prices are subject to change without notice. However, when prices change, we make every effort to distribute new prices prior to effective date.
- **Freight Policy:** Freight will be prepaid and added to the invoice total. Orders exceeding $500, shipped anywhere in the continental U.S., will be invoiced with no charge for freight.
- **Minimum Orders:** There is a $30 minimum order requirement. However, we will accept orders for less than $30 and will add a $5 service charge to cover our cost in handling the order.
- **Backorder Policy:** Products not shipped with your original order will be automatically backordered and shipped when stock is available.
- **Claims:** In the event that merchandise arrives in damaged condition, do not refuse the shipment. Notate next to your receiving signature that you have received damaged boxes. Then, notify us right away and we will work with you in resolving your claim.
- **Returns:** All merchandise returns must have prior approval and an approval number to receive proper credit. A 25% restocking charge applies to all authorized returns, unless the reason for return is due to an error on our part.
- **Limited Warranty:** All of our products are warranted to be of good quality. We will replace any product deemed defective in workmanship or material, up to one year from the purchase date. Warranty covers only the replacement of the product. Warranty specifically does not cover any labor-related charges.

Technical

PREMDOR
Entry Systems

Door 1E
Door 18
Door 21

Entergy Brand Metal Edge Steel Door

General and Technical Information

PREMDOR SPECIFICATIONS

Part 1: GENERAL

1.01 Scope: This specification applies to door frames, doors, hinges and accessories as shown on the architect's plans and schedules, and as furnished by Premdor Entry Systems. See ISDI-108 for the correct definition of entry system nomenclature.

1.02 Work not included: Installation of frames and doors. Field painting or staining of primed painted doors and frames. Protection at the building site of items furnished under this specification.

1.03 Shop drawings: Doors and frames shall be as shown on technical drawings prepared by Premdor Entry Systems and shall be approved by the architect (when required).

1.04 Test reports and compliance:
a. Acoustical qualities: Entergy doors shall have a minimum sound transmission classification of 24 as tested under ISDI-103 as a fully operable opening.
b. Insulation properties: The polyurethane foam core of Entergy doors shall have a "U" factor of 0.067 and a 15.0 "R" factor.
c. Air and water performance: Entergy doors shall meet the acceptance criteria for air infiltration and water penetration as shown in ISDI-101 and ISDI-104.

1.05 Storage and handling: Doors and frames shall be received and handled in a manner so as not to be damaged. They shall be stored upright in a protection area on wood runners or skids and shall be covered with vented tarpaulins or vented plastic.

Part 2: PRODUCTS

2.01 Basic materials:
a. Entergy doors shall be fabricated from roller-leveled prime-quality galvanized sheets.
b. Premdor Entry Systems wood frames shall be fabricated from finger jointed, kiln dried Western pine or equivalent, preservative treated and prime painted.

2.02 Construction of doors:
a. Entergy entry doors shall be 1-3/4" thick of composite construction and fabricated from two galvanized steel sheets engaged over a perimeter steel framing. The interior of the doors shall be completely filled with a rigid polyurethane core, foamed-in-place and chemically bonded to all interior surfaces. Polyurethane foam is to be self-bonding and self-hardening. The doors shall have flush or embossed face sheets. Hinge preparation will consist of multiple locations of specially prepared thread formed holes.
Preparation is non-handed and will permit left or right hand swing application. The top and bottom of the doors shall be closed with steel channels. The bottom channel will be inverted and designed to accept a sweep.
b. Hardware preparation, doors: All doors shall be prepared to receive 4" x 4" x .085" non-template hinges and for Govt.160-4 (2-3/4" backset and 2-1/8" cross bore) cylindrical lock preparation or for Govt.160-8 (2-3/8" backset and 2-1/8" cross bore), Govt.161-8 or 161-4(same as 160-8 or 160-4 except edge prep is 1-1/8" wide). Optional deadlock preparations available at 3-5/8", 4" 5-1/2", or 6" centerlines.
c. Hinges: All doors shall be furnished with 4" x 4" x 5/8" radius corners, residential weight (.085") non-template hinges. The hinge is to be either brass (yellow zinc dichromate) plated or prime painted.

2.03 Doors swinging in pairs: Entergy pairs of doors shall have a solid astragal with complete thermal break. Top and bottom bolts are furnished and shall be concealed within the astragal. Astragal shall contain integral weatherseal, and shall be furnished with lock preparation to receive latch bolt and strike plate. Strike plates for latch set and variable-centerline deadbolt shall be furnished by others.

2.04 Frames: Premdor Entry Systems wood frames shall be 4-9/16" deep (architect note 5-1/4" or 6-9/16" available, specify depth required) with weatherstrip installed. Frames shall be furnished with brickmould (WM180).

2.05 Hardware preparation, frames: All frames shall have the strike jamb mortised for a full lip strike. Hinge jamb shall be mortised for 4" x 4" x .085" non-template hinges with 5/8" radius corner.

2.06 Thresholds: All Premdor Entry Systems thresholds shall have extruded aluminum exterior with complete thermal break and wood substrate.
Adjustable models for inswing applications shall have prefinished hardwood riser.
Outswing model shall have hardwood riser.
Optional fixed threshold for inswing applications shall have riser of hardwood material bonded to wood substrate.

2.07 Weatherstrip: Weatherstrip shall be foam filled compression or foam filled magnetic weatherstrip specifically designed for use with frames.

2.08 Painting: All doors shall be chemically treated for optimum paint adherence and painted a uniform coat of rust-inhibiting primer-oven dried, and of a type tested in accordance with ISDI 106. (Note to architect - it is recommended that a minimum of one coat of quality exterior finish paint to be applied on the jobsite by others).

Part 3: EXECUTION

3.01 Doors and frames shall be installed by others and shall be erected plumb and in true alignment per ISDI-102. Frames shall be rigid and securely anchored in place. Door shall be installed in a manner to achieve the intended functional operation and appearance. Installation of labeled fire doors, including all operating characteristics, labeled frames, and listed hardware shall be in accordance with NFPA publication No. 80 and No. 1010 and with the codes of local authorities having jurisdiction.

These specifications reflect the construction of products available from inventory or as manufactured to order, at the time of publication and are not intended to be all-inclusive. Certain operations incur added cost. When the product or option specified is not available from inventory, additional time will be required. NOTE: Due to industrywide shortages, substitutions of raw materials may be required from time to time to meet delivery schedules. Consult your local dealer for shipping estimates, selection of inventoried items and custom services including technical support.

Part 4: TEST REPORTS

4.01 Fire Resistance Test: UL listed; ASTM E152; CSFP 43.7; CAN 4-S104 (UL S104); NFPA 252; UBC 43.2; UL10(b); UL10(c); UBC7-2-1997
90 minute 36" x 79-5/16"

Door #1E, 18, 21

4.02 Department of Housing and Urban Development: Use of materials bulletin No. 89; AAMA 1702.2.

4.03 Physical Endurance Test: ANSI A151.1; ISDI 105 level C.

4.04 Thermal Performance Test: ANSI/ISDI 107; ASTM C236; NFRC100
U = 0.18 without glass
U = 0.22 with 1/2" I.G. QTR. LT
U = 0.33 with 1/2" I.G. HALF LT
U = 0.42 with 1/2" I.G. FULL LT

4.05 Air Infiltration Test:
ANSI/ISDI 101; NFRC 400 ASTM E283

4.06 Acoustical Performance Test:
STC 24; ANSI/ISDI 103; ASTM E90; ASTM E413.

4.07 Water Penetration Test: ANSI/ISDI 104; ASTM E331

4.08 Static Air Pressure Test: ASTM E330; Dade County Building Code Compliance Protocol PA202. +76 psf, -76 psf, 3'0 x 6'8".

4.09 Cyclic Wind Load Test: Dade County Building Code Compliance Protocol PA203. +76 psf, -76 psf, 3'0 x 6'8".

4.10 Impact Test: Dade County Building Code Compliance Protocol PA201

4.11 Forced Entry Test: ASTM F842 Dade County Building Code Compliance Protocol PA202.

4.12 Water Resistance Test: ASTM E331; Dade County Building Code Compliance Protocol PA 202. Outswing 8.25 psf

4.13 National Standards of Canada: CGSB 82.5-M88.

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OBH - O&M 68

ETG-790/98

General and Technical Information for

Entergy™ Entry Systems

24 Gauge Metal Edge Steel Doors

PREMDOR®
Family of Door Brands

Technical

PREMDOR
Entry Systems

Door #18, 21

Entergy Metal Edge Steel Door

Standard Sizes and Hardware Locations

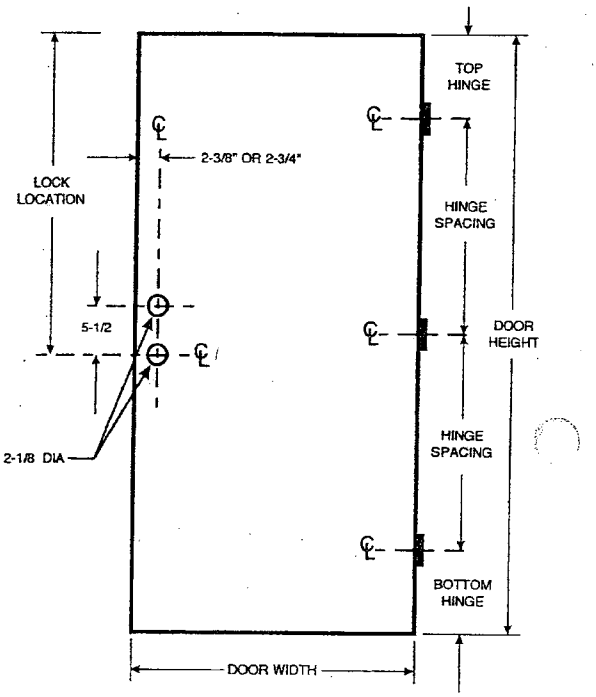
PREMDOR SPECIFICATIONS

FLUSH

DOOR STYLE

Notes:

1. **Dimensions from top of door are measured with straight edge laying on top edge, straight edge must cover endrail and toe bends.**
2. **See lock preparation guide 5-60.01 pages 3 through 5 to determine available options.**
3. **See hinge preparation guide 5-60.01 page 7 to determine available options.**
4. **See style guide 5-60.01 pages 10 through 22 to determine available backset.**
5. **See bottom sweep guide 5-60.01 page 8 to determine available options.**
6. **Doors are coated with Premdor white prime which meets ISDI-106 prime paint standards.**
7. **Face sheets are available in premium grade (24 gauge) or heavy duty grade (22 gauge). 8'-0" door height only available with heavy duty grade (22 gauge) face sheet.**



Door Height

	DOOR HEIGHTS	TOP HINGE	HINGE SPACING	BOTTOM HINGE	LOCK LOCATION
NOMINAL	6'-6"				
ACTUAL (in)	77-5/16	8-7/16	30-3/16	8-1/2	41-11/16
NOMINAL	6'-8"				
ACTUAL (in)	79-5/16	8-7/16	31-3/16	8-1/2	43-11/16
NOMINAL	6'-10"				
ACTUAL (in)	81-5/16	8-7/16	32-3/16	8-1/2	45-11/16
NOMINAL	7'-0"				
ACTUAL (in)	83-5/16	8-7/16	33-3/16	8-1/2	47-11/16
NOMINAL	8'-0"				
ACTUAL (in)	95-5/16	8-3/8	26-1/8	8-9/16	59-11/16

Door Width

NOMINAL	2'-0"	2'-4"	2'-6"	2'-8"	2'-10"	3'-0"	3'-6"
ACTUAL (in)	23-23/32	27-23/32	29-23/32	31-23/32	33-23/32	35-23/32	41-23/32

February 2, 1996

Technical

PREMDOR
Entry Systems

Entergy Metal Edge Steel Door

Standard Sizes and Hardware Locations

Door # 1E

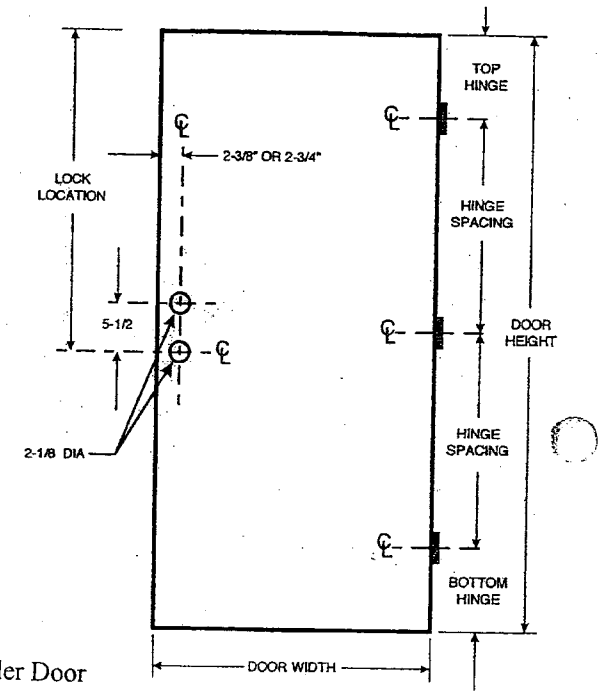
PREMDOR SPECIFICATIONS

FLUSH

DOOR STYLE

Notes:

1. **Dimensions from top of door are measured with straight edge laying on top edge, straight edge must cover endrail and toe bends.**
2. **See lock preparation guide 5-60.01 pages 3 through 5 to determine available options.**
3. **See hinge preparation guide 5-60.01 page 7 to determine available options.**
4. **See style guide 5-60.01 pages 10 through 22 to determine available backset.**
5. **See bottom sweep guide 5-60.01 page 8 to determine available options.**
6. **Doors are coated with Premdor white prime which meets ISDI-106 prime paint standards.**
7. **Face sheets are available in premium grade (24 gauge) or heavy duty grade (22 gauge). 8'-0" door height only available with heavy duty grade (22 gauge) face sheet.**



2 Panel Arch Top is a Special Order Door

Door Height

	DOOR HEIGHTS	TOP HINGE	HINGE SPACING	BOTTOM HINGE	LOCK LOCATION
NOMINAL	6'-6"				
ACTUAL (in)	77-5/16	8-7/16	30-3/16	8-1/2	41-11/16
NOMINAL	6'-8"				
ACTUAL (in)	79-5/16	8-7/16	31-3/16	8-1/2	43-11/16
NOMINAL	6'-10"				
ACTUAL (in)	81-5/16	8-7/16	32-3/16	8-1/2	45-11/16
NOMINAL	7'-0"				
ACTUAL (in)	83-5/16	8-7/16	33-3/16	8-1/2	47-11/16
NOMINAL	8'-0"				
ACTUAL (in)	95-5/16	8-3/8	26-1/8	8-9/16	59-11/16

Door Width

NOMINAL	2'-0"	2'-4"	2'-6"	2'-8"	2'-10"	3'-0"	3'-6"
ACTUAL (in)	23-23/32	27-23/32	29-23/32	31-23/32	33-23/32	35-23/32	41-23/32

Door #'s 1E, 18, 21

PREMDOR®

INSULATED STEEL DOOR
PREMIUM GRADE STEEL EDGE SERIES
FIFTEEN YEAR LIMITED WARRANTY

Premdor Entry Systems warrants to the purchaser for fifteen years from date of purchase, subject to the limitations and conditions contained below, that the door will be free of defects in materials and workmanship. If a defect occurs, it will be Premdor's option to furnish a door or refund the purchase price of the defective door.

The warranty excludes failures which are the result of: (1) Accidents, fire, acids, fumes; (2) Improper use; (3) Improper installation; (4) Glass failure; (5) Problems relating to applied finishes.

NOTHING IN THIS WARRANTY SHALL RENDER PREMDOR IN ANY RESPECT LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING ANY DAMAGE TO BUILDINGS OR OTHER PROPERTY, OR FOR ANY INJURIES OR DAMAGES SUSTAINED BY ANY PERSONS WHOMSOEVER. (SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.)

This warranty is in lieu of and excludes all other express warranties, guaranties, obligations or promises. Any implied warranties are limited in duration to the term hereof. (Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.) No representative of Premdor or any other person has any authority whatsoever to assume for Premdor any other liability or responsibility in connection with our steel insulated doors warranted herein.

Premdor's liability hereunder shall be limited in all events to the cost of the door to a maximum of the full amount of the original purchase price. Premdor will in no event be liable for labor or finish painting.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

In the event of a warranty claim, send a written notice of any defect occurring within the warranty period by certified U.S. Mail to Premdor Entry Systems, One Premdor Drive, Dickson, TN 37055.

The written notice must include:

a. Catalog number and description of door.
b. Name and address of owner and installer.
c. Proof of sale.
d. Detailed explanation of defect.

5-979.12/95

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Future

PREMDOR®

LIMITED WARRANTY

for Wood Doors

The above manufacturer warrants all doors sold under this warranty (except those doors expressly excluded from this warranty), for 1 year or years from the date of shipment, and at the time of shipment, to be of good material and workmanship and to be free of defects which would render said doors unserviceable or unfit for their ordinary, recommended use.

This warranty extends only to the first purchaser at retail of said door(s) and may not be enforced by any person to whom the said door(s) are transferred.

ANY IMPLIED WARRANTIES WHICH THE PURCHASER MAY HAVE ARE LIMITED IN DURATION TO 1 YEAR OR YEARS FROM DATE OF SHIPMENT.

PHOTOGRAPHING AND WARP TOLERANCES

1. Stile, rail, and core show-through (photographing) on flush doors shall not be considered a defect unless the faces of the door vary from a true plane in excess of 1/100 inch in any three-inch span.
2. Warp shall not be considered a defect unless it exceeds 1/4 inch in the plane of the door itself.

   The following warp allowances are for 1-3/4-inch or thicker doors. Doors wider than 3'6" and higher than 7' in height, the warp shall not exceed 1/4" in a section 3'6" by the height of door. Doors wider than 3'6" and higher than 7', the warp shall not exceed 1/4" in any 3'6" by 7' section. Doors up to and including 3'6" wide and over 7' in height, the warp shall not exceed 1/4" in any 7' by width of door section.

   Doors which are 1-1/8 inch or 1-3/8 inch thick, the warp shall not exceed 1/4", other than excluded below.

   "Warp" is any distortion in the door itself and does not refer to the relationship of the door to the frame or jamb in which it is hung. The term "warp" shall include bow, cup, and twist. Measuring the amount of warp present in a door, the following method shall be used: bow, cup, and twist shall be measured by placing a straight edge, taut wire or string on the supposed concave face of the door at any angle (i.e., horizontally, vertically, diagonally), with door in its installed position. The measurement of bow, cup, and twist shall be made at the point of maximum distance between the bottom of the straight-edge, taut wire or string and the face of the door.

MATTERS EXCLUDED FROM THIS WARRANTY

1. Unsatisfactory service or appearance caused by failure to follow recommended "Handling, Job Finishing and Installation Instructions", appearing below this warranty, is not covered by this warranty.
2. The appearance of field finished doors is not warranted in any event.
3. Natural variations in the color or texture of wood are not to be considered as defects.
4. The warranty against warp does not apply to the following:
   a. All 1-1/8 inch and 1-3/8 inch thick doors which are wider than 3'0" and higher than 7'0".
   b. All 1-3/4 inch thick stile and rail doors wider than 3'0" and higher than 7'0".
   c. Doors with face veneers of different species.
   d. Doors that are improperly hung or do not swing freely.
5. This warranty does not cover:
   a. Flush doors with cutouts for lights and/or louvers, any edge of which is nearer than 5 inches to any edge of the door.
   b. Flush doors with cutout areas exceeding 40% of the area of the face of the door.
   c. Flush doors with cutouts exceeding one-half the height of the door.
   d. All doors having less than 5 inches between cutouts for lights (flush doors), unit locks, closures and/or other hardware cutouts.
   e. Any delamination caused by failure to protect and seal all exposed surfaces of the door.

If warranted doors are found to contain defects as stated above, the manufacturer may, at its option, either: (1) repair the door(s) without charge; (2) replace the door(s) without charge, in the same stage of fitting and/or finishing as was originally supplied; or (3) refund the price paid to it for the door(s). The manufacturer will perform its obligations under the warranty within 30 days after an appropriate notice is given by the purchaser to it.

The procedure which the purchaser should follow in order to obtain performance of any warranty obligation is as follows:

(1) If at the time a door shipment is received, said door(s) is found to have a defect(s) which can be reasonably discovered by inspection of each door(s), the purchaser must, prior to hanging or fitting, and within 30 days, send written notice of said discovered defect(s) to the manufacturer.

(2) If a defect is discovered or occurs after a door is fitted and hung, written notice of said defect(s) must be sent to the manufacturer within one year from the date of shipment.

The manufacturer will not be liable for any door(s) repaired or replaced without its prior written consent.

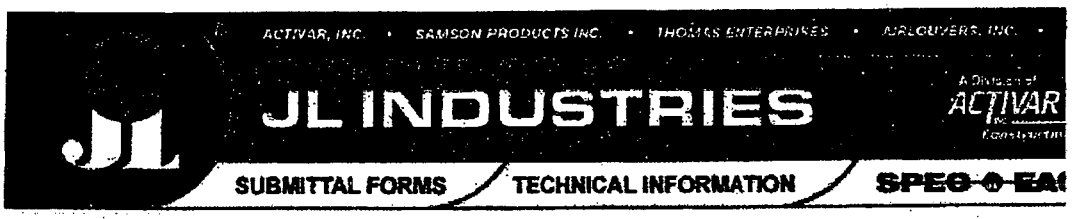
Action on any claim for warp or for photographing defects may be delayed, at the option of the manufacturer for a period not to exceed 12 months from the date of claim, if a door has been installed prior to such claim being made, the door must remain hung in the original installation during the period of delay(s) in plant conditioning to humidity and temperature.

The manufacturer's sole responsibility under this warranty is as stated herein, and it shall not be liable for consequential, indirect, or incidental damages, or for any amount in excess of its price for the shipment involved, whether the claim is for breach of warranty or negligence.

This warranty gives the purchaser specific legal rights. The purchaser also has implied warranty rights. In the event of a problem with warranty service or performance, the purchaser may be able to go to a small claims court, a State court, or a Federal district court.

HANDLING, JOB FINISHING AND INSTALLATION INSTRUCTIONS

1. Deliver door(s) to building site after plaster or cement is dry. If doors are stored at job site for more than one week, all edges should be sealed.
2. Handle with clean gloves and do not drag doors across one another or across other surfaces.
3. Store flat on a level surface in a dry, well ventilated building. Cover to keep clean, but allow air circulation.
4. Doors should not be subjected to abnormal heat, extreme dryness, humid conditions or sudden changes therein. They should be conditioned to average prevailing relative humidity of the locality before hanging.
5. The utility or structural strength of the door must not be impaired in the fitting of the door, the application of hardware, or cutting and altering the door for lights, louvers, panels or any other special details.
6. For exterior doors, use three hinges on doors 7' in height or less, and four hinges on doors over 7' in height.
7. For all interior doors use three hinges; except hollow core doors weighing less than 50 pounds or 6'6" or less in height. All doors 7'6" or higher require four hinges. Allow a fitting clearance of 1/16 inch on the hinge side and 1/8 inch on the lock side.
8. When light or louver cutouts are made in exterior doors, they shall be properly protected to prevent moisture from leaking into the core. Where installed for outward swing with no protection from the elements, doors must be properly protected by flashing or other suitable means.
9. Before finishing, remove handling marks or effects of exposure to moisture with a thorough, final sanding over all surfaces of the door using 3/0 and 6/0 sandpaper and clean before sealer or finish. Some species of wood contain a chemical (oak particularly) which reacts unfavorably with certain finishes. Where possible, the surface should be tested for such unfavorable reactions. Application of a sealer before finishing will usually prevent this difficulty. The full beauty of wood is best emphasized by the use of a satin or semi-gloss finish.
10. Immediately after fitting, or cutting for closures, weatherstrip and/or threshold, and before hanging any interior or exterior door on the job, the entire door, including the top and bottom edges must receive the following finishing requirements. This procedure must be followed to insure a uniform appearance and meet the requirements of the warranty on this door. (1) Sand lightly with fine sandpaper and clean thoroughly. (2) Apply one or more even coats of clear sanding sealer until the wood is completely sealed. (3) Sand lightly and clean thoroughly. (4) Apply oil base stain per the stain manufacturer's recommendations, being sure that the stain is compatible with the sealer. (5) Apply top or protective coating per the manufacture's recommendations being sure that the top coat is compatible with the stain. For site finishing, do not use a water-thinned paint unless an oil base prime coat is first applied. Failure to follow the instructions above will invalidate all warranties, written or implied. *Note: Stains applied over sanding sealer will not be the same as those applied to raw wood. All trim components should be finished using the same technique to insure reasonable color match.*
11. Dark colored finishes should be avoided on exterior surfaces of exterior doors.



Warranty Information

J.L. Industries, Inc. warrants it purchases the J.L. Fire Extinguishers, Fire Cabinets, Access Panels, Roc sold will be free of any defects in material and workmanship for a period of one year from the date of liability of J.L. Industries is strictly limited to the repair and replacement of units that in our opinion ar defective, and no claims for consequential damages of any nature will be allowed. This warranty is in l warranties, expressed or implied.

JL INDUSTRIES, INC. • 4450 W. 78TH STREET CIRCLE • BLOOMINGTON, MN 55435 • 1-800-554-6077
© Copyright 2006-2007 J.L. Industries, Inc. All Rights Reserved

Century Folding Attic Stairways Limited Warranty

Century Industries, Inc. warrants to the first retail purchaser of the Century Industries attic stair product line that the unit will be free from any defect in materials or workmanship for one year from the date of purchase. The product must be installed and used in accordance with the Century instructions for installation, operation, and care to qualify under this warranty.

This warranty does not cover: non-defect damage, damage caused by unreasonable use, labor charges for removing or reinstalling a repaired unit or component, damage caused by improper installation, and damage caused as a result of exceeding the weight limitations specified for each unit.

If, during the warranty period, the product or a component appears as though it may be defective, do not return the attic stair to the place of purchase. Instead, call our customer service department first at 501-897-5253 before dismantling it and verify that the alleged problem cannot be corrected. If it is determined that the product or component is defective, Century will, at its option, send replacement parts to correct the defect, or authorize you to return the product to the place of purchase. Proof of purchase is required in any event.

EXCLUSIONS AND DISCLAIMERS

The duration of implied warranties of merchantability and fitness for a particular purpose is limited to the duration of this written warranty. All claims for consequential or incidental damages for breach of this warranty are excluded and in no event shall the manufacturers liability for breach of warranty, negligence, strict liability or breach of contract exceed the cost of this product. However, the purchaser is entitled to the remedies provided herein. Some states do not allow limitations on how long an implied warranty lasts, or exclusion or limitation of incidental or consequential damages, so the above limitation may not apply to you.

No representative or person is authorized to assume for us any other liability in connection with the sale of this product. This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

INSULATION – SOUTHERN SPECIALTIES

WARRANTY AGREEMENT

Project: Belle Hall Condominiums

Owner: Belle Hall Direct 101, LP
Contractor: TCR NC Construction I Limited Partnership

Subcontractor: Southern Specialties

Subcontractor hereby expressly warrants and guarantees that all labor, materials, and equipment furnished and work performed in conjunction with the above referenced project are in accordance with the plans, specifications, the Subcontract Agreement and authorized modifications thereto. All labor, materials and equipment shall be free from defects, due to defective materials and/or workmanship, for a period of one (1) year from the date of Certificate of Occupancy for each building/structure, unless otherwise stated in the Subcontract Agreement.

Should any defects develop during the warranty period due to improper workmanship and/or arrangement, the same shall, upon notice, be made good by this Subcontractor at no expense to the Contractor, Owner, or Owner's Representative. Nothing in the above shall be deemed to apply to work or equipment which has been abused, neglected or altered by the Contractor, Owner, or Owner's Representative.

Unless otherwise stated in the Subcontract Agreement, warranty work shall be responded to within twenty-four (24) hours of notification by the Contractor, Owner, or Owner's Representative, including weekends and holidays. Warranty notices received before 10:00 am shall be responded to on the same day. Should Subcontractor fail to respond within twenty-four (24) hours of notification or correct the defective work or equipment within seventy-two (72) hours, the Contractor, Owner, or Owner's Representative shall proceed with the correction of the defective work. All costs associated with this corrective action shall be reimbursed by this Subcontractor or charged against its account. Subcontractor shall remit payment for such charges within five (5) calendar days of notification by the Contractor, Owner, or Owner's Representative.

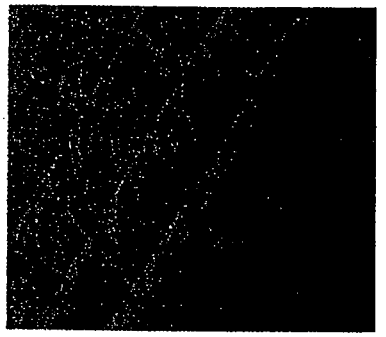
Signature: K D Vaughan

Printed Name: K. D. Vaughan

Position/Title: Vice President

Date: 12-6-06

Thermal Batt Insulation – Unfaced Fiber Glass



Unfaced Thermal Batt Insulation is designed to improve the thermal performance of wall and roof/ceiling assemblies. Thermal Batts fit tightly between framing and are held in place by friction.

Cathedral Batts are designed to fit tightly between cathedral rafters and when properly installed, still provide the necessary air ventilation space above the insulation.

☐ **Unfaced**

Technical Data

Metal Frame Construction

13.0	☐ 16"/406mm	☐ 24"/609mm			☐ 96"/2438mm	3½"/89mm
19.0	☐ 16"/406mm	☐ 24"/609mm		☐ 48"/1219mm	☐ 96"/2438mm	6¼"/159mm

Wood Frame Construction

11.0	☐ 15"/381mm	☐ 19¼"/488mm*	☑ 23"/584mm	☐ 93"/2362mm	☐ 105"/2664mm*	3½"/89mm
13.0	☑ 11"/279mm*	☐ 19¼"/488mm*		☐ 93"/2362mm		3½"/89mm
13.0	☑ 15"/381mm		☐ 23"/584mm*	☐ 93"/2362mm	☐ 105"/2664mm	3½"/89mm
15.0	☐ 15"/381mm		☐ 23"/584mm	☐ 93"/2362mm		3½"/89mm
19.0	☐ 15"/381mm		☐ 23"/584mm	☐ 93"/2362mm	☐ 105"/2664mm	6¼"/159mm
19.0		☐ 19¼"/488mm		☐ 48"/1219mm		6¼"/159mm
21.0	☐ 15"/381mm		☐ 23"/584mm	☐ 93"/2362mm		5½"/139mm

Roof/Ceiling Construction

19.0	☐ 15"/381mm		☐ 23"/584mm	☐ 48"/1219mm	☐ 93"/2362mm	6¼"/159mm
19.0	☐ 16"/406mm	☐ 19¼"/488mm	☐ 24"/609mm	☐ 48"/1219mm	☐ 96"/2438mm	6¼"/159mm
22.0	☐ 15"/381mm		☐ 23"/584mm*	☐ 48"/1219mm*		6¾"/171mm
25.0	☐ 15"/381mm		☐ 23"/584mm*		☐ 96"/2438mm*	8"/203mm
25.0	☐ 16"/406mm	☐ 19¼"/488mm	☐ 24"/609mm		☐ 96"/2438mm	8"/203mm
30.0	☐ 15"/381mm		☐ 23"/584mm*	☐ 48"/1219mm*		9½"/241mm
30.0	☐ 16"/406mm	☐ 19¼"/488mm	☐ 24"/609mm	☐ 48"/1219mm		9½"/241mm
30.0C	☐ 15½"/394mm		☐ 23¾"/603mm	☐ 48"/1219mm		8¼"/209mm
38.0	☐ 16"/406mm		☐ 24"/609mm	☐ 48"/1219mm		12"/305mm
38.0C	☐ 15½"/394mm		☐ 23¾"/603mm	☐ 48"/1219mm		10¼"/260mm

* limited geographic offering.

Unfaced Thermal Batt Insulation complies with the property requirements of ASTM C 665, Type I and ASTM E 136.

Surface Burning Characteristics/Building Code Construction Classification

Flame Spread	Smoke Developed	[illegible]	[illegible]	[illegible]	[illegible]
10	10	All Types	All Types	All Types	All Types

Thermal Batt Insulation – Kraft Faced Fiber Glass

☐ **Kraft Faced**
Perm Rating 1

Kraft-faced Thermal Batt Insulation is designed to improve the thermal performance of wall and roof/ceiling assemblies. Kraft-faced Thermal Batts have a strong asphalt-coated paper facing on one side. Stapling flanges are provided for standard wood frame widths.

Cathedral Batts are designed to fit tightly between cathedral rafters without stapling the flanges and when properly installed, still provide the necessary air ventilation space above the insulation.

Technical Data

Metal Frame Construction						
11.0	☐ 16"/406mm	☐ 24"/609mm		☐ 48"/1219mm*	☐ 96"/2438mm	3½"/89mm
13.0	☐ 16"/406mm				☐ 96"/2438mm	3½"/89mm
19.0	☐ 16"/406mm	☐ 24"/609mm		☐ 48"/1219mm	☐ 96"/2438mm	6¼"/159mm
Wood Frame Construction						
11.0	☐ 15"/381mm		☐ 23"/584mm	☐ 93"/2362mm	☐ 105"/2664mm	3½"/89mm
13.0	☐ 11"/279mm			☐ 93"/2362mm		3½"/89mm
13.0	☐ 15"/381mm	☐ 19¼"/488mm*	☐ 23"/584mm	☐ 93"/2362mm	☐ 105"/2664mm	3½"/89mm
15.0	☐ 15"/381mm		☐ 23"/584mm	☐ 93"/2362mm	☐ 105"/2664mm*	3½"/89mm
19.0	☐ 11"/279mm			☐ 93"/2362mm		6¼"/159mm
19.0	☐ 15"/381mm		☐ 23"/584mm	☐ 93"/2362mm	☐ 105"/2664mm*	6¼"/159mm
21.0	☐ 15"/381mm		☐ 23"/584mm	☐ 93"/2362mm		5½"/139mm
Roof/Ceiling Construction						
19.0	☐ 11"/279mm	☐ 15"/381mm	☐ 23"/584mm	☐ 48"/1219mm	☐ 93"/2362mm	6¼"/159mm
19.0	☐ 16"/406mm	☐ 19¼"/488mm	☐ 24"/609mm	☐ 48"/1219mm	☐ 96"/2438mm	6¼"/159mm
22.0	☐ 15"/381mm		☐ 23"/584mm	☐ 48"/1219mm		6¼"/159mm
25.0	☐ 15"/381mm		☐ 23"/584mm	☐ 48"/1219mm*		8"/203mm
30.0	☐ 12"/305mm	☐ 19¼"/488mm		☐ 48"/1219mm		9½"/241mm
30.0	☐ 16"/406mm		☐ 24"/609mm	☐ 48"/1219mm		9½"/241mm
30.0C	☐ 15½"/394mm		☐ 23¾"/603mm	☐ 48"/1219mm		8¼"/209mm
38.0	☐ 16"/406mm		☐ 24"/609mm	☐ 48"/1219mm		12"/305mm
38.0C	☐ 15½"/394mm		☐ 23¾"/603mm	☐ 48"/1219mm		10¼"/260mm

* limited geographic offering.
Kraft-faced Thermal Batt Insulation complies with the property requirements of ASTM C 665, Type II, Class C.

Surface Burning Characteristics/Building Code Construction Classification

N/R	N/R	III, IV, V	III, IV, V	3, 4, 5	III, V, VI

Kraft-faced Insulation will burn and must not be left exposed. The facing must be installed in substantial contact with the finish material. Protect facing from open flame or heat source.

Submittal Sheet

R-30C Fiberglas® Insulation for 2X10 Cathedral Ceilings

R-30C Fiberglas® Insulation Unfaced, Kraft faced

Superior Thermal Control

Owens Corning R-30C Thermal Batt Insulation is designed to provide maximum thermal performance for cathedral ceiling applications. R-30C Thermal Batt Insulation is available unfaced or with a kraft vapor retarder.

Long Term In-Place Performance

R-30C Thermal Batt Insulation is dimensionally stable and will not slump within the cathedral ceiling cavity. Due to its inorganic nature, Thermal Batt Insulation will not rot or mildew and is noncorrosive to steel, copper and aluminum.

Sized for Proper Ventilation

R-30C, Thermal Batts are designed to eliminate R-value loss caused by compressing standard R-30 products in 2 X 10 cathedral ceiling construction. 8 1/4" thick, R-30C Batts prevent moisture damage and help assure long roof life by providing 1" of ventilation air space between the insulation and roof deck.

Easy Installation

R-30C Thermal Batt Insulation is easy to handle and install. Designed to friction-fit in standard 2 X 10 cathedral ceiling construction, R-30C Batts eliminate the need, in most applications, for ventilation baffles. Trimming and fabrication can be done with an ordinary utility knife.

Technical Design Considerations

The kraft facing on this insulation will burn and must not be left exposed. Install facing in substantial contact with the finish material. Protect from open flame or other heat source.

Cathedral ceiling applications require that the building envelope block the movement or air from the outdoor environment to the conditioned space. Neither the insulation nor its facing should be relied upon to provide an air barrier. Failure to provide an air barrier could lead to loss of thermal control, discomfort of the building occupants and frozen pipes.

Owens Corning recommends that a vapor retarder should be used in most climates. In climates requiring winter heating, the vapor retarder should be placed toward the warm-in-winter side. In humid climates, like the Gulf Coast, follow local building practices for vapor retarder placement. In all applications utilizing a vapor retarder, maintaining the facing integrity may be important for effective moisture / humidity control. Repair any punctures or tears in the facing by taping. Follow the tape manufacture's application recommendations.

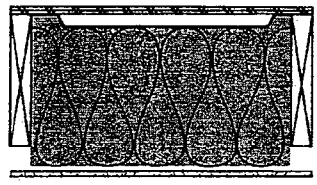
Insulation installed too close to light fixtures may affect the luminaire's performance. Do not install insulation on top of or within 3 inches of recessed light fixtures unless the fixtures are approved for such use. This is a requirement of the National Electric Code.

Installation

R-30C Thermal Batts are intended to be friction-fit between wood rafters. In applications with irregular spaced rafters, staple the facing flange to the bottom face of the roof rafter at 8 to 12 inch intervals. Tightly abut batts to prevent thermal leaks.

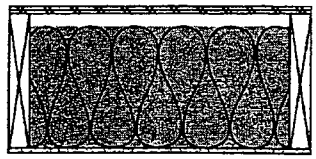
Provide vent openings at eave and peak. Cathedral ceiling insulation should be installed to provide a minimum 1" ventilation passageway between the roof deck and insulation. Use a vent baffle to assure proper clearance where necessary.

9 1/2", R-30 Insulation Batts



Standard Batts compressed into a 9 1/4" cavity with ventilation baffle added to allow 1" air space deliver approximately R-28.

8 1/4", R-30C Insulation Batts



New R-30C batts provide the recommended ventilation air space when properly installed and deliver a full R-30.

R-30C Fiberglas® Insulation

R-30C Fiberglas Insulation Technical Data

	Width		Length	Thickness	R-value*
Cathedral Ceiling Construction	15½" 394mm	23¾" 603mm	48" 1219mm	8¼" 209mm	30.0

* The higher the R-value, the greater the insulating power. Ask your Owens Corning representative for the fact sheet on R-values.

C Insulation for cathedral ceiling applications.

Surface Burning Characteristics / Building Code Construction Classifications

Products	Flame Spread	Smoke Developed	ICBO	BOCAI	SBCCI
Unfaced	10	10	All Types	All Types	All Types
Kraft-faced	N/R	N/R	III, IV, V	3, 4, 5	III, V, VI

Thermal Batt Insulation complies with Uniform Building Code (ICBO), National Building Code (BOCAI) and Standard Building Code (SBCCI) model code requirements for building construction types listed above.

The kraft facing on Thermal Batt Insulation will burn and must not be left exposed. Install facing in substantial contact with the finish material. Protect from open flame or other heat source.

Available Vapor Retarder Facings	**Kraft**
Max. by Volume	1.00

Water Absorption	
Max. by Volume	Less than 0.05%

Dimensional Stability	
Linear Shrinkage	Less than 0.1%

Applicable Standards

Unfaced R-30C Thermal Batt Insulation complies with ASTM C 665, Type I and ASTM E 136. Kraft-faced R-30C Thermal Batt Insulation complies with ASTM C 665, Type II, Class C. Federal Specification HH-I-521F has been cancelled and is replaced by ASTM C 665.

The thermal resistance value for R-30C Thermal Batt Insulation was tested in accordance with ASTM C 518; R-value for insulation only.

The surface burning characteristics of R-30C Thermal Batt Insulation were derived from products tested in accordance with ASTM E 84. This standard is used solely to measure and describe properties of products in response to heat and flame under controlled laboratory conditions. These numerical ratings are not intended to reflect hazards presented by this or any other material under actual fire conditions. Values are reported to the nearest five rating.

The vapor retarder permeance of the kraft facing on R-30C Thermal Batt Insulation was developed from tests conducted in accordance with ASTM E 96, desiccant method.

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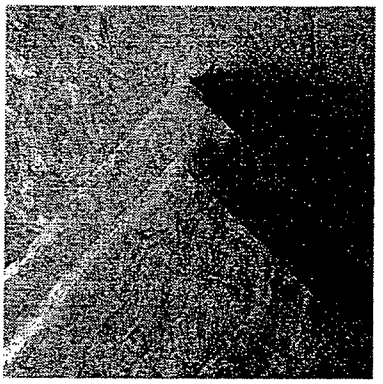
Submittal Sheet

Sonobatts® Insulation

Insulation



☑ **Unfaced**

☐ **Kraft-Faced**

Description

Sonobatts Insulation are flexible, fiberglass insulation, made in R-values from 11 to 38. *Sonobatts* Insulation are available plain, or faced with a kraft vapor retarder. The product is manufactured in thicknesses from 3 1/2" to 12".

Uses

Sonobatts Insulation are designed for use over suspended ceiling panels to economically improve both the noise control and thermal performance of new or existing ceiling systems. The product is sized to fit over standard ceiling tiles.

Features and Benefits

Excellent Thermal Performance

The excellent thermal resistance of *Sonobatts* Insulation may help reduce both the size requirements and operating costs of HVAC equipment. An optional kraft vapor retarder facing is available where needed.

Acoustically Effective

Sonobatts Insulation is not only a good thermal insulator, but it has excellent noise control properties as well. *Sonobatts* Insulation can significantly improve the ceiling Sound Transmission Class (STC) rating by 4-10 points. When *Sonobatts* Insulation is used in a return air plenum for acoustical benefit, the unfaced insulation has been tested according to UL 181 air erosion test and can be used for air velocities up to 1000 fpm.

Easy Installation

Installation of *Sonobatts* Insulation is easy. It can be installed in suspended ceiling systems by simply laying the product on top of the ceiling panels. Easy installation makes *Sonobatts* Insulation the ideal product for upgrading thermal values in renovation and remodeling projects.

Design Considerations

KRAFT FACINGS ON THIS INSULATION WILL BURN AND MUST NOT BE LEFT EXPOSED. INSTALL FACINGS IN SUBSTANTIAL CONTACT WITH THE FINISH MATERIAL. PROTECT FACINGS FROM OPEN FLAME OR OTHER HEAT SOURCE.

Sonobatts Insulation is designed for use with suspended ceiling systems to improve building energy efficiency. This application requires that the building envelop block the movement of air from the outdoor environment to the conditioned space. Neither the insulation nor its facing should be relied upon to provide an air barrier. Failure to provide an adequate air barrier could lead to loss of thermal control, discomfort of the building occupants and frozen pipes.

Maximum thermal performance is obtained by minimizing the number of penetrations in the ceiling. Surface mounted lighting and large ceiling panels, 48" x 48", can be utilized to reduce penetrations and improve thermal performance.

When insulation is added to the inside perimeter of a structure, the area outside the insulation becomes exposed to greater temperature extremes. Building structures should be inspected to ensure they can withstand the additional expansion and contraction forces. Check for piping which should be protected against freezing.

In thermal applications, the area above the insulation should not act as a return air plenum. This would render the insulation thermally ineffective as the air space above the ceiling would be at the same temperature as the room below. Thermal insulation in return plenum areas would best be added at the roof and side walls.

Sonobatts Insulation can also provide acoustical control at the ceiling. Insulation placed on top of a suspended ceiling at a floor-to-ceiling partition helps reduce the transfer of sound over the partition between offices. In acoustical applications, the area above the insulation may serve as a return air plenum.

Insulation installed too close to light fixtures may affect the luminaire's performance. Do not install insulation on top of or within 3 inches of recessed light fixtures unless the fixtures are approved for such use. This is a requirement of the National Electric Code.

Consult the ceiling panel manufacturer for information on time-design hourly fire resistance rated assemblies and maximum backloading recommendations.

ROA_01219

Insulation

Sonobatts® Insulation

Technical Data

Width		Length		Thickness		R-value*
24"	609mm	48"	1219mm	12"	305mm	38.0
24"	609mm	48"	1219mm	9.5"	241mm	30.0
24"	609mm	48"	1219mm	6.25"	159mm	19.0
24"	609mm	48"	1219mm	3.5"	89mm	11.0

*Unfaced Sonobatts® Insulation complies with the property requirements of ASTM C 665, Type I and ASTM E 136. Kraft-faced Sonobatts® Insulation complies with the property requirements of ASTM C 665, Type II, Class C.

Surface Burning Characteristics/Building Code Construction Classification

Products	Flame Spread	Smoke Developed	ICBO	IGC	BOCA	SBCCI
Unfaced	10	10	All Types	All Types	All Types	All Types
Kraft-faced	N/R	N/R	III, IV, V	III, IV, V	III, IV, V	III, V, VI

Sonobatts® Insulation complies with ICBO (Uniform Building Code), BOCA (National Building Code), SBCCI (Standard Building Code) and ICC (International Building Code) model code requirements for building construction types listed above.

Kraft facing on Sonobatts® Insulation will burn and must not be left exposed. The facing must be installed in substantial contact with an approved ceiling construction material. Protect facing from open flame or heat source.

Available Vapor Retarder Facings	Kraft
Perms Maximum*	1

Water Absorption	
Maximum by Volume	Less than 0.05%

Dimensional Stability	
Linear Shrinkage	Less than 0.1%

Air Erosion	
Air Velocities per UL 181 Up to 1000 fpm	Less than 0.1%

* Products are tested in accordance:

R-value	ASTM C 518
Surface Burning Characteristics	ASTM E 84
Perm Rating	ASTM E 96

R-values differ. Find out why in the sellers fact sheet on R-values. Higher R-values mean greater insulating power.

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Installation

Sonobatts Insulation are easily installed in suspended ceiling systems by simply laying them on top of the ceiling panel and suspension system. *Sonobatts* should fit tightly together to reduce the amount of heat loss.

Product should be kept dry during shipping, storage and installation.

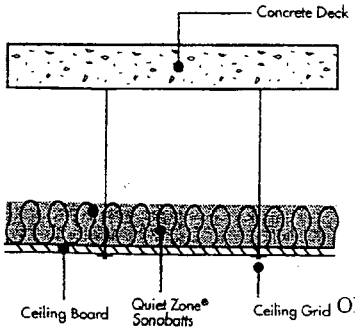
Applicable Standards

Unfaced *Sonobatts* Insulation complies with ASTM C 665, Type I and ASTM E 136. Kraft-faced *Sonobatts* Insulation complies with ASTM C 665, Type II, Class C.

The thermal resistance values for *Sonobatts* Insulation were tested in accordance with ASTM C 518; R-value for insulation only.

The surface burning characteristics of *Sonobatts* Insulation were derived from products tested in accordance with ASTM E 84. This standard is used solely to measure and describe properties of products in response to heat and flame under controlled laboratory conditions, and should not be used to describe or approve the fire hazard of materials under actual fire conditions. However, the results of these tests may be used as elements of a fire risk assessment that takes into account all of the factors pertinent to an assessment of the fire hazard of a particular end use. Values are reported to the nearest five rating.

The vapor retarder permeance of the kraft facing on *Sonobatts* Insulation was developed from tests conducted in accordance with ASTM E 96, desiccant method.

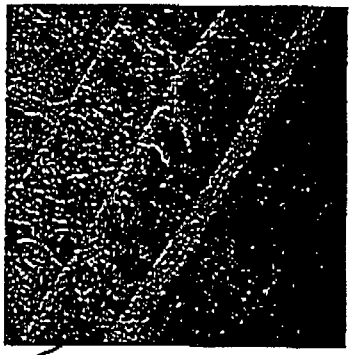


ROA_01220

Submittal Sheet

Thermal Batt Insulation

Insulation



- [x] Unfaced
- [x] Kraft-Faced
- [ ] Foil-Faced

Description

Thermal Batts are flexible, fiberglass insulation, made in R-values from 11 to 38. Thermal Batts are available plain, or faced with either a kraft or foil vapor retarder. The product is manufactured in thicknesses from 3 1/2" to 12".

Uses

Thermal Batt Insulation can be used in a wide range of exterior wall and roof/ceiling applications. The product can be installed in wood or metal framing cavities, or can be installed between furring channels.

Features and Benefits

Superior Thermal Control

With the range of R-values and thicknesses available, Thermal Batts can meet most thermal specifications with ease. The R 30C and R 38C provide optimum thermal performance in the limited space of cathedral ceilings.

Effective Acoustical Control

Thermal Batt Insulation enhances interior noise control by improving the Sound Transmission Class (STC) of walls and floor/ceiling assemblies.

Long Term Performance

Thermal Batt Insulation is dimensionally stable and will not slump within the wall cavity. Due to its inorganic nature, Thermal Batt Insulation will not rot or mildew and is noncorrosive to steel, copper and aluminum.

Easy Installation

Thermal Batt Insulation is easy to handle and install. Sized for installation in either wood or metal stud construction, Thermal Batt Insulation can either be friction-fit or stapled into place. Trimming and fabrication can be done with an ordinary utility knife.

SpaceSaver Packaging

Thermal Batts are compression packaged in exclusive SpaceSaver packaging from Owens Corning. SpaceSaver packaging reduces freight and speeds job site handling/installation.

Design Considerations

Kraft and standard foil facings on this insulation will burn and must not be left exposed. Install facings in substantial contact with the finish material. Protect from open flame or other heat source.

Buildings utilizing curtainwall construction may be required to be equipped with a sprinkler system to provide adequate fire protection. Check local building codes for specific requirements.

Commercial roof/ceiling thermal applications require that the building envelope block the movement of air from the outdoor environment to the conditioned space. Neither the insulation nor its facing should be relied upon to provide an air barrier. Failure to provide an adequate air barrier could lead to loss of thermal control, discomfort of the building occupants and frozen pipes.

When insulation is added to the inside perimeter of a structure, the area outside the insulation becomes exposed to greater temperature extremes. Building structures should be inspected to ensure they can withstand the additional expansion and contraction forces. Check for piping which should be protected against freezing.

The need for and placement of a vapor retarder in commercial construction depends on many factors. The architect or specifier should evaluate the requirements of each project. If a vapor retarder is specified, maintaining the facing integrity may be important for effective moisture/humidity control. Repair any punctures or tears in the facing by taping. Follow the tape manufacturer's application recommendations.

Insulation installed too close to light fixtures may affect the luminaire's performance. Do not install insulation on top of or within 3 inches of recessed light fixtures unless the fixtures are approved for such use. This is a requirement of the National Electrical Code.

Due to the potential for skin irritation, unfaced Thermal Batt Insulation should not be used for exposed applications where it will be subject to human contact.

Installation

Between Wood Studs/Rafters

Thermal Batt Insulation fits between studs with the flanges stapled to either the face or the side of the stud every 8-12" to prevent gaping or "fishmouthing" of the vapor retarder.

Insulation

Thermal Batt Insulation

Unfaced insulation can be friction-fit between studs after the cover material has been installed on one side of the cavity. Use wire or metal straps to hold insulation in place in applications without a cover material, or where the insulation does not fill the depth of the cavity.

Cathedral ceiling products (R30C and R38C) are intended to be friction-fit between rafters. Cathedral ceiling insulation should be installed to provide a minimum 1" ventilation passageway between the roof deck and insulation. Where necessary use a vent baffle to assure proper clearance.

Between Metal Studs

Thermal Batt Insulation can be friction-fit in place until the interior finish is applied. Insulation should fill the cavity and the wall should eventually be closed on both sides.

In areas where it will be applied in heights over 8 feet, use wire or metal straps to hold the product in place until the interior finish is applied. When faced insulation is used, the attachment flanges may be taped to the face of the metal stud prior to applying the interior finish. Wire or metal straps should also be used to hold the product in place in applications without a cover material or where the stud depth is larger than the insulation thickness.

Furring Strips

Thermal Batt Insulation can be applied between furring strips, hat channels, or Z-shaped furring in areas where a finish surface will be installed. Contact the furring strip manufacturer for appropriate fastening system.

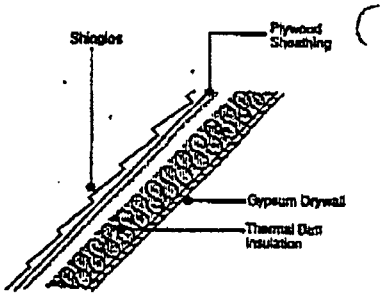
Applicable Standards

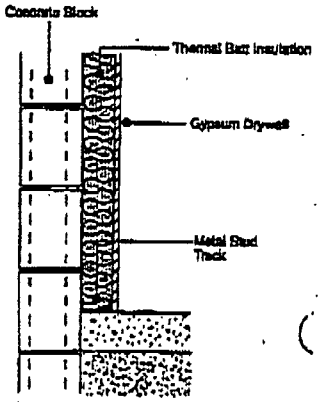
Unfaced Thermal Batt Insulation complies with ASTM C 665, Type I and ASTM E 136. Kraft-faced Thermal Batt Insulation complies with ASTM C 665, Type II, Class C. Foil-faced Thermal Batt Insulation complies with ASTM C 665, Type III, Class B and C. Federal Specification HH-I-521F has been canceled and is replaced by ASTM C 665.

The thermal resistance values for Thermal Batt Insulation were tested in accordance with ASTM C 518; R-value for insulation only.

The surface burning characteristics of Thermal Batt Insulation were derived from products tested in accordance with ASTM E 84. This standard is used solely to measure and describe properties of products in response to heat and flame under controlled laboratory conditions, and should not be used to describe or approve the fire hazard of materials under actual fire conditions. However, the results of these tests may be used as elements of a fire risk assessment that takes into account all of the factors pertinent to an assessment of the fire hazard of a particular end use. Values are reported to the nearest five rating.

The vapor retarder permeance of the kraft and foil facings on Thermal Batt Insulation were developed from tests conducted in accordance with ASTM E 96, desiccant method.





Thermal Batt Insulation Technical Data/Wall or Ceiling

System	Stud Spacing	Joist Spacing	Length	Thickness	R-value
Metal Frame Construction	16"/406mm	24"/609mm	48"	96"/2438mm	3.5"/89mm	11.0
	16"/406mm	24"/609mm	48"	96"/2438mm	3.5"/89mm	13.0
	16"/406mm	24"/609mm		96"/2438mm	3.5"/89mm	15.0
	16"/406mm	24"/609mm	48"	96"/2438mm	6.25"/159mm	19.0
	16"/406mm	24"/609mm		96"/2438mm	5.5"/139mm	21.0
Wood Frame Construction	15"/381mm	19.25"	23"/584mm	48"	93"/2362mm	3.5"/89mm	11.0
	15"/381mm	19.25"	23"/584mm	48"	93"/2362mm	3.5"/89mm	13.0
	15"/381mm		23"/584mm		93"/2362mm	3.5"/89mm	15.0
	15"/381mm	19.25"	23"/584mm	48"	93"/2362mm	6.25"/159mm	19.0
	15"/381mm		23"/584mm		93"/2362mm	5.5"/139mm	21.0
	15"/381mm		23"/584mm	48"		6.75"/171mm	22.0
Wood Frame Roof/ Ceiling Construction	15"/381mm	19.25"	23"/584mm	48"	93"/2362mm	6.25"/159mm	19.0
	15"/381mm		23"/584mm	48"		6.75"/171mm	22.0
	15"/381mm		23"/584mm		48"/1219mm	8"/203mm	25.0
	15 1/2"/394mm		23 3/4"/603mm		48"/1219mm	8.25"/209mm	30.0 C**
	16"/406mm	19.25"	24"/609mm		48"/1219mm	9.5"/241mm	30.0
	15 1/2"/394mm		23 3/4"/603mm		48"/1219mm	10.25"/260mm	38.0 C**
	16"/406mm		24"/609mm		48"/1219mm	12"/305mm	38.0

Unfaced Thermal Batt Insulation complies with the property requirements of ASTM C 665, Type I and ASTM E 136. Kraft-faced Thermal Batt Insulation complies with ASTM C 665, Type II, Class C. Foil-faced Thermal Batt Insulation complies with ASTM C 665, Type III, Class B and C.

*R-values differ. Find out why in the seller's fact sheet on R-values. Higher R-values mean greater insulating power.

**C = Cathedral Ceilings

Surface Burning Characteristics/Building Code Construction Classification

Facing	Flame Spread	Smoke Developed	SBCCI	ICBO	BOCA	IBCC
Unfaced	10	10	All Types	All Types	All Types	All Types
Foil Faced	75	150	III, IV, V	All Types	All Types	III, IV, V
Kraft Faced	N/R	N/R	III, IV, V	III, IV, V	III, IV, V	III, IV, V

Thermal Batt Insulation complies with ICC (International Building Code), ICBO (Uniform Building Code), BOCA (National Building Code) and SBCCI (Standard Building Code) model code requirements for building construction types listed above.

Kraft and standard foil facing on Thermal Batt Insulation will burn and must not be left exposed.

The facing must be installed in substantial contact with an approved interior partition construction material. Protect facing from open flame of other heat source.

Due to the potential for skin irritation, unfaced Thermal Batt Insulation should not be used for exposed applications where it will be subject to human contact.

Available Vapor Retarder Facings	Kraft	Foil
Perms Maximum*	1	0.5

Water Absorption	
Maximum by Volume	Less than 0.05%

Dimensional Stability	
Linear Shrinkage	Less than 0.1%

* Products are tested in accordance:

R-value	ASTM C 518
Surface Burning characteristics	ASTM E 84
Foam Rating	ASTM E 96

R-values differ. Find out why in the sellers fact sheet on R-values. Higher R-values mean greater insulating power.

ONE OWENS CORNING PARKWAY
TOLEDO, OHIO 43659
419.248.8000

OWENS CORNING CORPORATION
PRODUCT WARRANTY
AND
STATEMENT OF LIMIT OF LIABILITY

PRODUCT WARRANTY

In the case of goods having a special written warranty, that warranty shall apply. Otherwise, Owens Corning warrants only that the goods shall be manufactured in accordance with its published specifications.

THERE ARE NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PURPOSE, EVEN IF DISCLOSED TO OWENS-CORNING.

LIMITATION OF LIABILITY

Buyer's exclusive remedy for goods proven to be other than as warranted, provided Buyer makes its claim within one year of the date of shipment of the goods, shall be at Owens Corning's option, the repair or replacement of the goods, without charge, F.O.B. point of destination, but only within the continental United States.

Owens Corning's liability for any and all loss or damage to Buyer, or its customers, resulting from any cause whatsoever, including Owens Corning's negligence, damaged or defective goods, irrespective of whether such defects are discoverable or latent, from strict liability, tort, if Owens Corning's warranty shall fail in its essential purpose, or for any other cause, shall in no event exceed the purchase price of the particular goods with respect to which losses or damages are claimed.

IN NO EVENT SHALL OWENS CORNING BE LIABLE FOR BUYER'S INCIDENTIAL, SPECIAL, CONSEQUENTIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, HOWEVER ARISING.

No statement or recommendation made or assistance given by Owens Corning, or its representatives, either oral or in its literature, to Buyer or to Buyer's representatives, or customers, in connection with the use or installation, by Buyer, its representatives or its customers, of any goods sold hereunder, shall constitute a waiver by Owens Corning of any provisions hereof or affect Owens Corning's liability herein defined.

Owens Corning assumes no responsibility for goods not manufactured by it. All such goods carry only the warranty, if any, of the manufacturer of the goods.

Jan 02 2007 SPECTRA CHARLOTTE

FROM :SPECTRA METAL SALES FAX NO. :4043446385 May. 16 2002 12:44PM

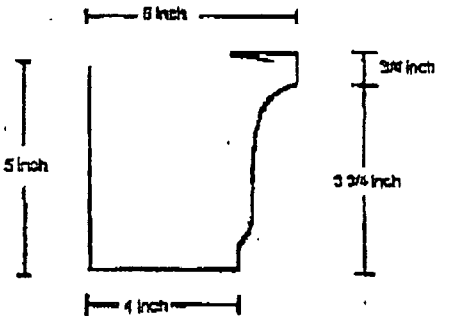
SPECIFICATION SHEET

.027 x 15" - Seamless Aluminum Gutter Coil
6K Seamless Aluminum Gutter

Listed below are the specifications on the paint, metal preparation, and finished coating for aluminum gutter coil.

- The aluminum used is alloy 3105-H14 which meets the specifications set forth in the "Aluminum Standards and Data 1988" published by the Aluminum Association. The gauge of the aluminum for the gutter is .027, plus or minus .002.
- The surface of the aluminum sheet is thoroughly cleaned and dried to remove impurities and coated with Betz Metchem Permatreat 1500/3000 non-cyanide chromate conversion coating.
- A thermo setting polyester enamel is roller coated and baked at high temperatures for the outside coating. The reverse side of the coil, or wash coat, is a thermo setting polyester enamel applied to help resist corrosion .
- The color range of the applied finish is .8 mils, plus or minus .1 mils. (.7-.9)
- Made in the USA
- The physical test used on our coated panels includes:

  > 180 degree - 2T tale, Scotch Brand® #610
  > Reverse Impact - 2 lbs/mil (positive) tape, Scotch Brand® #610
  > Pencil Hardness - F minimum, Eagle Turquoise Brand
  > M.E.K. - 100 double rubs using cheesecloth - mesh size 28 x 24



NOT TO SCALE

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SPECTRA™

SPECIFICATION SHEET

.019 x 13 3/4" - Aluminum Downpipe Coil
3" x 4" Aluminum Downpipe

Specifications on the paint, metal preparation, and finish coating for aluminum downpipe coil:

- The aluminum used is alloy 3105-H25 which meets the specifications set forth in the "Aluminum Standards and Data 1988" published by the Aluminum Association. The gauge of the aluminum for the pipe is .019, plus or minus .002.
- The surface of the aluminum sheet is thoroughly cleaned and dried to remove impurities and coated with Batz Metchem Permatreat 1500/3000 non-cyanide chromate conversion coating.
- A thermo setting polyester enamel is roller coated and baked at high temperatures for the outside coating. The reverse side of the coil, or wash coat, is a thermo setting polyester enamel applied to help resist corrosion .
- The color range of the applied finish is .8 mils, plus or minus .2 mils. (1.0)
- The physical test used on our coated panels includes;
  - 180 degree - 2T tale, Scotch Brand® #610
  - Reverse Impact - 2 lbs/mil (positive) tape, Scotch Brand® #610
  - Pencil Hardness - F minimum, Eagle Turquoise Brand
  - M.E.K. - 100 double rubs using cheesecloth - mesh size 28 x 24

Specifications & features of the finished product:

- The overall length is 8 or 10 feet, standard.
- The pipe's opening is 2 3/4 x 4 inches.
- The pipe is corner crimped on one end, for ease of assembly.
- The finish of this product is covered by a 20 year limited warranty.
- Made in the USA

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SPECTRA™

SPECIFICATION SHEET

.019 x 13 3/4" - Aluminum Elbow Coil
3" x 4" Aluminum Elbow

Specifications on the paint, metal preparation, and finish coating for aluminum elbow coil:

- The aluminum used is alloy 3105-H25 which meets the specifications set forth in the "Aluminum Standards and Data 1988" published by the Aluminum Association. The gauge of the aluminum for the elbow is .019, plus or minus .002.
- The surface of the aluminum sheet is thoroughly cleaned and dried to remove impurities and coated with Betz Metchem Permatreat 1500/3000 non-cyanide chromate conversion coating.
- A thermo setting polyester enamel is roller coated and baked at high temperatures for the outside coating. The reverse side of the coil, or wash coat, is a thermo setting polyester enamel applied to help resist corrosion.
- The color range of the applied finish is .8 mils, plus or minus .2 mils. (1.0)
- The physical test used on our coated panels includes:
  - 180 degree - 2T bite, Scotch Brand® #610
  - Reverse Impact - 2 lbs/mil (positive) tape, Scotch Brand® #610
  - Pencil Hardness - F minimum, Eagle Turquoise Brand
  - M.E.K. - 100 double rubs using cheesecloth - mesh size 28 x 24

Specifications & features of the finished product:

- The overall length is 12 inches.
- The elbow opening is 2 3/4 x 4 inches.
- The elbow has 7 crimps resulting in a 75 degree bend.
- The elbow is corner crimped for ease of assembly.
- The finish of this product is covered by a 20 year limited warranty.
- Made in the USA

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Manufacturer's Twenty (20) Year Limited Warranty

For

SPECTRA METAL SALES, INC.

Continuous Aluminum Gutter Coil & Aluminum Gutter Accessories

Pro-Rated/Non-Transferable

Spectra Metal Sales, Inc. a Florida corporation, (the "Manufacturer") hereby warrants that the finish on the Manufacturer's painted continuous aluminum gutter coil and painted aluminum gutter accessories specified herein (the "Material") will not crack, peel, blister, chip or flake under Normal Use & Normal Service for twenty (20) years from the date of the Material's installation. The Material is specifically intended to move only rainwater off the roofline and away from a dwelling ("Normal Use"). The purchaser is responsible for keeping the Material free of tree leaves and other debris that may accumulate in, on or around the Material ("Normal Service"). If, upon proper inspection by the Manufacturer or its authorized representative, a defect is identified and acknowledged, the Manufacturer will be responsible for the cost of refinishing, repairing, or replacing the defective Material, or where applicable, issue a refund. All remedies hereunder shall be based upon the Material's cost and be prorated from the installation date as follows: 100% for year one; 90% for year two; 80% for year three; 65% for year four; 50% for year five; 25% for the years six through ten, 20% for the years eleven through sixteen; 16% for year seventeen; 12% for year eighteen; 8% for year nineteen; 4% for year twenty; zero (0) percent for any claim made over 20 years. Any refinishing or replacement of defective Material or refund shall be approved in advance and be at the Manufacturer's sole option. The basis of determining the Material's cost under this warranty shall be, at the Manufacturer's sole option, one of the following alternatives: (i) for refinishing, the then prevailing area finishing costs; (ii) replacement of Material, the lesser of the price of the Manufacturer's Material at the time of replacement or the original purchase price of the Material.

This warranty is valid only when payment for the Material is made in full. This warranty covers the material only. The Manufacturer is in no way responsible for the forming, shaping, or the installation of the product, which is the responsibility of the distributor, dealer, contractor, or applicator. This warranty applies only to the finish applied to Manufacturer's continuous aluminum gutter coil and aluminum gutter accessories manufactured and sold by the Manufacturer, and excludes any products with a finish applied by another entity.

This warranty does not cover damage or deterioration caused by faulty installation, hail, fire, windstorms, foreign objects, fire, lightning, earthquakes, erosion, explosions, normal weathering (including chalking & fading), riots, vandalism, civil commotion, misuse, abuse, or other occurrences beyond the control of the Manufacturer.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES & REPRESENTATIONS, EXPRESSED OR IMPLIED, AND ALL OTHER OBLIGATIONS OR LIABILITIES ON THE PART OF THE MANUFACTURER AND IS LIMITED TO A DURATION OF TWENTY (20) YEARS. THE MANUFACTURER MAKES NO WARRANTY, EXPRESSED OR IMPLIED, OTHER THAN THAT SET FORTH HEREIN, OR REQUIRED BY LAW. The Manufacturer does not warrant that any of the Materials shall meet or comply with the requirements of any present or future safety code or regulation of any state, municipality or other jurisdiction.

Liability of the Manufacturer is limited to the purchase price. THE MANUFACTURER SHALL IN NO EVENT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND WHATSOEVER, WHETHER ALLEGED TO HAVE RESULTED FROM DELAY IN DELIVERY OF NON-CONFORMING MATERIAL, DEFICIENCIES IN MATERIAL, OR ANY OTHER CAUSE WHATSOEVER, AND WHETHER ARISING FROM BREACH OF CONTRACT, BREACH OF WARRANTY, TORT, INCLUDING NEGLIGENCE, STRICT LIABILITY OR OTHERWISE. The remedy set forth above shall be exclusive.

Some states do not allow limitations on how long an implied warranty lasts, or the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

All claims under this warranty must be made in writing within the warranty period, and within thirty (30) days after the appearance of any alleged defect. This warranty is not effective unless signed and dated by the installing dealer at the time of installation, countersigned by the Purchaser and the original form sent to the Manufacturer at P.O. Box 43167, Atlanta, GA 30336 USA, within thirty (30) days of installation. This warranty extends to the original Purchaser and installation address and cannot be assigned or otherwise transferred.

Manufacturer Authorized Dealer: Southern Specialties Inc Installation Date: 2006

Product(s) Installed: Gutter materials Purchaser: Teamwell Crow Corp

Installation Address: Bell Hall Condo

ROA_01228

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

ROOFING – GWC ROOFING

WARRANTY AGREEMENT

Project: Belle Hall Condominiums

Owner: Belle Hall Direct 101, LP
Contractor: TCR NC Construction I Limited Partnership

Subcontractor: GWC Booking

Subcontractor hereby expressly warrants and guarantees that all labor, materials, and equipment furnished and work performed in conjunction with the above referenced project are in accordance with the plans, specifications, the Subcontract Agreement and authorized modifications thereto. All labor, materials and equipment shall be free from defects, due to defective materials and/or workmanship, for a period of one (1) year from the date of Certificate of Occupancy for each building/structure, unless otherwise stated in the Subcontract Agreement.

Should any defects develop during the warranty period due to improper workmanship and/or arrangement, the same shall, upon notice, be made good by this Subcontractor at no expense to the Contractor, Owner, or Owner's Representative. Nothing in the above shall be deemed to apply to work or equipment which has been abused, neglected or altered by the Contractor, Owner, or Owner's Representative.

Unless otherwise stated in the Subcontract Agreement, warranty work shall be responded to within twenty-four (24) hours of notification by the Contractor, Owner, or Owner's Representative, including weekends and holidays. Warranty notices received before 10:00 am shall be responded to on the same day. Should Subcontractor fail to respond within twenty-four (24) hours of notification or correct the defective work or equipment within seventy-two (72) hours, the Contractor, Owner, or Owner's Representative shall proceed with the correction of the defective work. All costs associated with this corrective action shall be reimbursed by this Subcontractor or charged against its account. Subcontractor shall remit payment for such charges within five (5) calendar days of notification by the Contractor, Owner, or Owner's Representative.

Signature: James Kramer

Printed Name: JAMES KRAMER

Position/Title: Account Representative

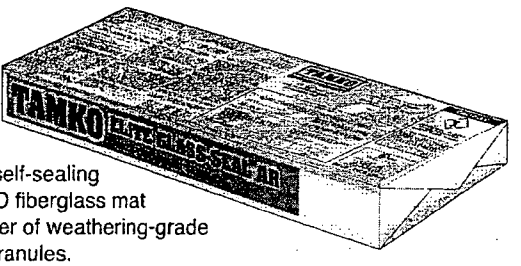
Date: 12/5/06

704-622-1014

TAMKO® Elite Glass-Seal® AR — PRODUCT DATA

THREE-TAB ASPHALT SHINGLES

Manufactured in Frederick, MD



TAMKO® ELITE GLASS-SEAL® AR self-sealing 3-tab shingles are made with TAMKO fiberglass mat coated on both sides with a thick layer of weathering-grade asphalt and surfaced with ceramic granules.

USES

For application to roof decks with inclines of not less than 2 inches per foot. For slopes between 2 inches and 4 inches per foot, refer to wrapper instructions.

ADVANTAGES

- 25-year limited warranty, 3-year FULL START, limited transferability, winds up to 60 MPH.
- Superior fire resistance compared to organic shingles.
- 10-year Algae-Relief (AR) limited warranty that provides for cleaning of discoloration caused by certain algae growth that may occur in areas with high humidity.

CERTIFICATIONS/REPORTS

Listed by UL for:	Tested in compliance with:
Class A Fire Rating	UL 790/ASTM D 3018, Type I; ASTM E 108, Class A
Wind Resistance	UL 997/ASTM D 3161, Type I, Class F (110 mph)
ASTM D 3462	TAS 100-95 Wind and Wind Driven Rain
Fed. Spec.: Exceeds SS-S-001534, Class A, Type I	Miami Dade County Florida NOA 05-0311.03, Expiration Date 04/11/2007

COLORS

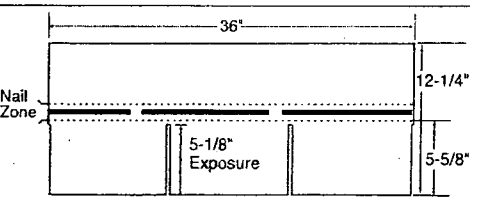
Colors:

- White
- Grey Blend
- Rustic Redwood
- Pastel Red
- Antique Slate
- Weathered Wood
- Tweed Blend
- Pastel Green
- Empire Green Blend
- Rustic Black
- Rustic Cedar
- Slatetone Grey
- Pastel Brown
- Tile Red Blend

PRODUCT DATA*

Shingle size	12-1/4" X 36"
Exposure	5-1/8"
Shingles per square	78
Bundles per square	3

*All values stated as nominal



CAUTION: The National Institute for Occupational Safety and Health (NIOSH) has concluded that fumes of heated asphalt are a potential occupational carcinogen. Do not heat or burn this product.

TAMKO® ROOFING PRODUCTS

For information regarding a copy of TAMKO's limited warranty, contact your local TAMKO representative, visit us online at www.tamko.com, or call us at 800-641-4691.

08/2005

TAMKO Logo, Roofer Logo, Elite Glass-Seal® and TAMKO® are registered trademarks of TAMKO® Roofing Products, Inc.

Central District	220 West 4th St., Joplin, MO	64801	800-641-4691
Northeast District	4500 Tamko Dr., Frederick, MD	21701	800-368-2055
Southeast District	2300 35th St., Tuscaloosa, AL	35401	800-228-2656
Southwest District	7910 S. Central Exp., Dallas, TX	75216	800-443-1834
Western District	5300 East 43rd Ave., Denver, CO	80216	800-530-8868

MANDATORY BINDING ARBITRATION FOR EVERY CLAIM, CONTROVERSY, OR DISPUTE OF ANY KIND WHATSOEVER (INCLUDING WHETHER ANY PARTICULAR MATTER IS SUBJECT TO ARBITRATION) (EACH AN "ACTION") BETWEEN YOU AND TAMKO (INCLUDING ANY OF TAMKO'S EMPLOYEES AND AGENTS) RELATING TO OR ARISING OUT OF THIS SHINGLES OR THIS LIMITED WARRANTY SHALL BE RESOLVED BY FINAL AND BINDING ARBITRATION, REGARDLESS OF WHETHER THE ACTION BELONGS IN WARRANTY, CONTRACT, STATUTE OR ANY OTHER LEGAL OR EQUITABLE THEORY. TO ARBITRATE AN ACTION AGAINST TAMKO, YOU MUST INITIATE THE ARBITRATION IN ACCORDANCE WITH THE APPLICABLE RULES OF ARBITRATION OF THE AMERICAN ARBITRATION ASSOCIATION (WHICH ARE AVAILABLE ONLINE AT www.adr.com OR BY CALLING THE AMERICAN ARBITRATION ASSOCIATION AT 1-800-778-7879) AND PROVIDE WRITTEN NOTICE TO TAMKO BY CERTIFIED MAIL AT P.O. BOX 1404, JOPLIN, MISSOURI 64802 WITHIN THE TIME PERIOD PRESCRIBED IMMEDIATELY BELOW.

Legal Remedies: EXCEPT WHERE PROHIBITED BY LAW, THE LIMITATION CONTAINED IN THIS LIMITED WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER OBLIGATIONS, GUARANTEES, WARRANTIES AND EXCEPTIONS EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND OF ANY OTHER OBLIGATIONS OR LIABILITY ON THE PART OF TAMKO BUILDING PRODUCTS, INC. IN NO EVENT SHALL TAMKO BE LIABLE FOR INCIDENTAL OR INCIDENTIAL DAMAGES OF ANY KIND. SOME STATES DO NOT ALLOW EXCLUSION OR LIMITATION OF IMPLIED WARRANTIES OR INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSIONS MAY NOT APPLY TO YOU. NO ACTION FOR BREACH OF THIS LIMITED WARRANTY OR ANY OTHER ACTION AGAINST TAMKO ALLEGING TO OR ARISING OUT OF THE SHINGLES OR THIS TRANSACTION SHALL BE BROUGHT LATER THAN ONE YEAR AFTER ANY CAUSE OF ACTION HAS ACCRUED. IN JURISDICTIONS WHERE STATUTORY CLAIMS DO BY REED WARRANTIES AND CONDITION CANNOT BE EXCLUDED, ALL SUCH STATUTORY CLAIMS, IMPLIED WARRANTIES AND CONDITIONS AND ALL RIGHTS TO BRING ACTIONS FOR BREACH THEREOF FREE ONE YEAR (OR SUCH LONGER PERIOD OF TIME IF MANDATED BY APPLICABLE LAW) AFTER THE DATE OF PURCHASE. SOME STATE AND PROVINCES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY OR CONDITION LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU. THIS LIMITED WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE AND PROVINCE TO PROVINCE. Invalidity or unenforceability of any provision herein shall not affect the validity or enforceability of any other provision which shall remain in full force and effect.

ANY ACTION BROUGHT BY YOU AGAINST TAMKO WILL BE ARBITRATED (OR, IF ARBITRATION OF THE ACTION IS NOT PERMITTED BY LAW, LITIGATED) INDIVIDUALLY AND YOU WILL NOT CONSOLIDATE OR SEEK CLASS TREATMENT FOR ANY ACTION UNLESS PREVIOUSLY AGREED TO IN WRITING BY BOTH TAMKO AND YOU.

NO REPRESENTATIVE, EMPLOYEE OR OTHER AGENT OF TAMKO, OR ANY PERSON OTHER THAN TAMKO'S PRESIDENT, HAS AUTHORITY TO ASSUME FOR TAMKO ANY ADDITIONAL LIABILITY OR RESPONSIBILITY IN CONNECTION WITH THE SHINGLES EXCEPT AS DESCRIBED ABOVE.

THIS FORM IS NOT TO BE COPIED OR REPRODUCED IN ANY MANNER. THIS LIMITED WARRANTY IS VALID ONLY IN THE UNITED STATES (EXCLUDING HAWAII AND ALASKA) AND CANADA (EXCLUDING QUEBEC AND NEW BRUNSWICK). ALL SALES INTO JURISDICTIONS WHERE THIS LIMITED WARRANTY DOES NOT APPLY ARE "AS IS" AND WITHOUT WARRANTY OF ANY KIND. THIS LIMITED WARRANTY APPLIES TO TAMKO FIBERGLASS SHINGLES SOLD ON OR AFTER NOVEMBER 16, 2006 AND SUPERSEDES ALL PREVIOUSLY PUBLISHED WARRANTIES.

PAGE 5

TAMKO BUILDING PRODUCTS

WARRANTY INFORMATION
(To be completed by Owner and Contractor)

Owner's Name _____

Address Where Applied _____

City _____

State _____ Zip _____

Type of TAMKO shingle applied:

☐ TAMKO Glass-Seal	240 Months (20 Year) Limited Warranty
☐ TAMKO Glass-Seal AR	240 Months (20 Year) Limited Warranty
☐ TAMKO Elite Glass-Seal AR	300 Months (25 Year) Limited Warranty
☐ TAMKO Heritage 30	360 Months (30 Year) Limited Warranty
☐ TAMKO Heritage 30 AR	360 Months (30 Year) Limited Warranty
☐ TAMKO Heritage XL AR	480 Months (40 Year) Limited Warranty
☐ TAMKO Heritage 50	600 Months (50 Year) Limited Warranty
☐ TAMKO Heritage 50 AR	600 Months (50 Year) Limited Warranty

Number of Squares 527.66

Color SLATE GRAY

Date of application of shingles 5/10/06 - 10/15/06

Total cost of shingles $ 18,451.00

Total cost of shingle application $ 15,000

Contractor's Name Buck Roofing Company

Contractor's Signature _____

Date 11/2/07

RETAIN THIS WARRANTY WITH CONTRACTOR'S RECEIPT FOR FUTURE REFERENCE.

BUILDING PRODUCTS FOR THE PROFESSIONAL.

Since 1944, building professionals and homeowners have looked to TAMKO for quality products that are built to perform. Our extensive line of residential products includes: Lamarite composite shingles, Metalworks steel shingles, Heritage series laminated asphalt shingles, 3-tab shingles, EverGrain and Elements composite decking & railing, Tam-Rail railing, rolled roofing products, waterproofing materials, ventilation products and asbestos-free cements and coatings. Each of these products delivers TAMKO quality, performance and durability.

TAMKO BUILDING PRODUCTS
P.O. Box 1404
Joplin, MO 64802 USA
www.tamko.com

837448

TAMKO BUILDING PRODUCTS

Heritage® 50
Heritage® 50 AR
Heritage® XL AR
Heritage® 30
Heritage® 30 AR

Elite Glass-Seal®
Elite Glass-Seal® AR

Glass-Seal
Glass-Seal AR

FIBERGLASS SHINGLES
LIMITED WARRANTY

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ROA_01232

ROA_01233

TAMKO®

BUILDING PRODUCTS

The Owner may transfer this limited warranty one time during the first two years of the Term to a Purchaser. No other transfers are permitted.

FIBERGLASS/ASPHALT SHINGLE LIMITED WARRANTY

In this limited warranty certain capitalized words have specific meanings:

"TAMKO" means TAMKO Building Products, Inc.

"Term" means the period of time this limited warranty lasts. The Term begins on the date of Purchase and continues; unless sooner terminated, for the number of months set forth in Table 1.

"Owner" means the owner of the building at the time the Shingles are installed on that building. If you purchase a new residence and are the first person to occupy the residence, TAMKO will consider you to be the Owner even though the Shingles were already installed.

"Shingles" means the TAMKO shingles identified in this limited warranty which were installed on a building owned by the Owner.

"Purchase" means the retail purchase of the Shingles.

"Full Start Period" means the initial period of the Term during which TAMKO's obligation is not prorated. The length of the Full Start Period is listed in Table 1.

"Maximum Liability" means the obligation of TAMKO described in the paragraphs titled "TAMKO Full Start Period" and "After the Full Start Period," whichever is applicable.

"Labor Payment Certificate" means a certificate issued by TAMKO that may be redeemed to pay some or all of the cost of labor for roof repairs.

"Material Certificate" means a certificate issued by TAMKO and redeemable at participating distributors for a stated quantity of replacement shingles of the same type and color as the Shingles which are to be replaced. If shingles of the same type or color are no longer available, the certificate will be for the closest TAMKO substitute available.

"AR" means Shingles which are covered by a warranty that provides for cleaning of discoloration caused by certain algae growth. "AR" appears as part of the name or description on the wrapper of AR designated shingles, such as "Glass Seal AR" or "Heritage 30 AR." Only AR designated shingles are covered by an Algae Cleaning Limited Warranty.

"Square" means 100 square feet for most shingles. For Heritage 50 and Heritage XL "Square" means 98.4 square feet.

"High Wind Application" means application of shingles in accordance with application instructions appearing on the shingle wrapper, with TAMKO Hip and Ridge shingles installed on all hips and ridges. Some local building codes may require additional fasteners and Heritage 30 and 30AR shingles qualify for High Wind Application only if the shingles are installed with six (6) fasteners in the locations specified for mansard applications. See local building codes for proper nailing application.

TABLE 1

SHINGLE	TERM	FULL START PERIOD	STD APPLICATION WIND WARRANTY MPH	HIGH WIND APPLICATION WARRANTY MPH	DOLLAR LIMIT PER SQUARE
Glass Seal	240 months	3 years	60	—	US $25.00
Glass Seal AR	240 months	3 years	60	—	US $25.00
Elite Glass Seal	300 months	3 years	60	—	US $30.00
Elite Glass Seal AR	300 months	3 years	60	—	US $30.00
Heritage 30	360 months	5 years	70	80	US $40.00
Heritage 30 AR	360 months	5 years	70	80	US $40.00
Heritage XL AR	480 months	7 years	80	90	US $45.00
Heritage 50	600 months	7 years	90	110	US $55.00
Heritage 50 AR	600 months	7 years	90	110	US $55.00

TAMKO Full Start Period: If, during the Full Start Period, Shingles that have been installed in strict accordance with the instructions printed on the wrapper are determined to have manufacturing defects which have directly caused leaks, TAMKO will provide the Owner with a Material Certificate for replacement shingles (or, at TAMKO's option, the Dollar Limit Per Square identified in Table 1) and a Labor Payment Certificate that may be used to pay the reasonable cost of installing replacement shingles, according to the terms of this limited warranty. This is TAMKO's Maximum Liability during the Full Start Period.

After the Full Start Period: If, after the end of the Full Start Period, Shingles that have been installed in strict accordance with the instructions printed on the wrapper are determined to have manufacturing defects which have directly caused leaks, TAMKO's obligation is limited to providing the Owner with a Material Certificate for replacement shingles or, at TAMKO's option, the Dollar Limit Per Square identified in Table 1. The Dollar Limit Per Square and the quantity of replacement shingles will be prorated over the life of this limited warranty. This is TAMKO's Maximum Liability after the Full Start Period. TAMKO is not responsible for the cost of labor for installing replacement shingles after the Full Start Period. Proration shall be determined by dividing the number of months remaining in the Term by the total number of months of the Term. For example, if TAMKO is notified of a warranty claim at a time when 100 months remain in a 300 month warranty Term, TAMKO's Maximum Liability is to provide a Certificate for one third of the replacement shingles or, at TAMKO's option, payment of one third of the Dollar Limit Per Square identified in Table 1. The remaining cost shall be the responsibility of the Owner.

Both during and after the Full Start Period, the extent of replacement is at the sole discretion of TAMKO. TAMKO is not responsible for the cost of flashings or metal work or for the cost of removing or disposing of Shingles which are to be replaced. Replacement shingles will be warranted only for the remainder of the original Term. Tender of payment of the prorated Dollar Limit Per Square shall extinguish all liability of TAMKO under this limited warranty and all applicable implied warranties and conditions.

Notification to TAMKO: The Owner must notify TAMKO by certified mail at P.O. Box 1404, Joplin, Missouri 64802 of any claims under this limited warranty within thirty (30) days following discovery of the problem with the Shingles. The notice must include documentary proof of Purchase. Failure of the Owner to notify TAMKO as provided herein shall extinguish all liability of TAMKO under this limited warranty and all applicable implied warranties and conditions.

Right of Inspection and Time for Payment: TAMKO shall have a reasonable time after notification to inspect the Shingles. The Owner shall provide TAMKO with reasonable access to the Shingles for purposes of inspection. If requested by TAMKO, the Owner must complete and deliver to TAMKO, at the Owner's expense, a warranty questionnaire, photographs of the roof and samples of the Shingles. If reasonable access is denied or made subject to unreasonable conditions by the Owner, or if the Owner fails or refuses to cooperate in TAMKO's investigation of the complaint (such as by failing to provide sample Shingles or photographs or a completed warranty questionnaire), TAMKO's obligation under this limited warranty shall immediately terminate. If TAMKO determines there are manufacturing defects covered by this limited warranty, TAMKO will have up to ninety (90) days after receipt of notification to process the Owner's claim.

120 Month Algae Cleaning Limited Warranty: If, during the initial 120 months of the Term, Shingles designated AR become stained by certain algae growth, including blue-green algae, TAMKO will issue to the Owner a Labor Payment certificate that may be used to pay the reasonable cost of cleaning the shingles (up to a maximum of $15 per square). TAMKO shall have no liability or responsibility for cleaning shingles with algae growth: (a) after the initial 120 months of the Term for Shingles which are designated AR, or (b) at any time for Shingles that are not designated AR.

60 Month Limited Wind Warranty: The Shingles are also covered by a 60 month limited warranty against damage from wind up to the designated wind velocity per product identified in Table 1. This Limited Wind Warranty applies only if: (a) the Shingles were installed according to the instructions printed on the wrapper and (b) the Shingles have had the opportunity to seal down. Shingles that are installed in cool seasons may not seal until weather conditions are adequate to allow the seal down strip to activate. If conditions (a) and (b) have been met and during the first 60 months of the Term the Shingles are damaged or blown off by wind up to the designated wind velocity for the product as a result of a manufacturing defect, TAMKO will process the Owner's claim in accordance with the sections titled "TAMKO Full Start Period" or "After the Full Start Period," whichever is applicable. Alternatively, TAMKO may, solely at its option, provide the Owner with a Labor Payment Certificate that may be used to pay the reasonable cost of manually sealing unsealed Shingles and replacing Shingles which have blown off and a Material Certificate for the number of shingles that have blown off. Shingles will be conclusively deemed to have been exposed to winds in excess of the designated wind velocity for the product if the National Weather Service or other reputable weather agency records winds in excess of the designated wind velocity for the product in the county, parish, regional district or municipality where the Shingles are installed or in any adjoining county, parish, regional district or municipality. Exposure of the shingles at any time to winds in excess of the designated wind velocity for the product shall extinguish all liability of TAMKO under this limited warranty and all applicable implied warranties and conditions.

Exclusions from Coverage: TAMKO shall not be liable under any circumstances for:

1. Faulty or improper application of the Shingles, inadequate ventilation of the Shingles or Shingles not installed or applied in accordance with TAMKO written instructions to the installer on the packaging or leaks or damages resulting from any one or more of such causes.
2. Damage to any building, either exterior or interior, or any property contained therein or for injuries or damages of any kind whatsoever.
3. Tear-off, removal, or disposal of any Shingles, or for any costs related to such tear-off, removal, or disposal.
4. Removal or abatement of any asbestos present in the roof to which the Shingles are applied, or for any costs related to such removal or abatement.
5. Shading or discoloration from any cause whatsoever, including, but not limited to algae, moss or staining from overhanging trees, except as provided in the Algae Cleaning Limited Warranty set forth above.
6. Damage caused by Algae, fungus, or other biological growth.
7. Leaks or damages resulting from Acts of God (including, but without limitation, lightning, wind (except as set forth in the Limited Wind Warranty), hurricane, tornado, hail, or other violent storm or casualty), impact of objects or damage to a roof due to settlement, distortion, failure or cracking of the roof deck, walls or foundation of a building, or for any defect in or failure of material used as a roof base over which the Shingles are applied, or for damage by traffic on the roof.
8. Chemical attack on the Shingles as a result of exposure to chemicals including, but not limited to, aliphatic or aromatic solvents, chlorinated hydrocarbons, turpentine, oils or organic or inorganic polar materials.
9. Leaks or damage to the Shingles from any cause other than inherent manufacturing defect in the Shingle.

Transferability: The Owner may transfer this limited warranty one (1) time during the first two (2) years of the Term to a purchaser of the building upon which the Shingles are installed (a "Purchaser"). The transfer must occur simultaneously with the sale of the building. To transfer this limited warranty, the Owner must provide TAMKO with written notice within thirty (30) days after the transfer. The written notice must include the names of the Owner and the Purchaser, the address of the building upon which the Shingles are installed, the date the Shingles were installed, and the date of the transfer. The Owner may transfer this limited warranty only one (1) time. Except for one transfer to a Purchaser during the first two (2) years of the Term, this limited warranty may not be sold, assigned or transferred in any manner whatsoever. Neither a Purchaser nor any other person may transfer this limited warranty. Except as set forth in this paragraph, any assignment, sale or transfer of this limited warranty or the building to which the TAMKO Shingles are applied shall immediately terminate all liability of TAMKO for the Shingles, all warranties contained herein or hereunder and any applicable implied warranties and conditions including warranties or conditions of merchantability and fitness for a particular purpose.

ELITE GLASS-SEAL AR

3-TAB AR FIBERGLASS ASPHALT SHINGLES

Heavier than our Glass-Seal product, Elite Glass-Seal AR shingles are our finest fiberglass 3-tabs. They are coated with asphalt and finished with ceramic mineral granules. A 10-year Algae-Relief (AR) limited warranty provides for cleaning of discoloration caused by certain algae growth that may occur in areas with high humidity.

- 25-year limited warranty, full start 3, limited transferability
- 10-year Algae-Relief (AR) limited warranty
- U.L. listed for Class A fire resistance
- U.L. listed for wind resistance
- Reinforced with strong fiberglass mat to conform to ASTM D 3462 at time of manufacture

GLASS-SEAL

3-TAB FIBERGLASS ASPHALT SHINGLES

These 3-tab shingles are constructed with a durable fiberglass mat and are coated with asphalt and finished with ceramic mineral granules.

- 20-year limited warranty, full start 3, limited transferability
- U.L. listed for Class A fire resistance
- U.L. listed for wind resistance
- Reinforced with strong fiberglass mat to conform to ASTM D 3462 at time of manufacture

Roofing products for the professional.

TAMKO has manufactured a full line of quality roofing products for over 60 years. Today, our dedication to roofing and relentless quality improvement continues to make our products the finest available.

In 1944, E.L. Craig founded TAMKO, a company dedicated to making the best roofing products available. Through three generations of leadership, TAMKO has never wavered from this corporate focus. It's helped TAMKO become the nation's premier independent roofing products manufacturer and the only company to produce a full line of organic, fiberglass, and modified bitumen products for both commercial and residential roofing applications. Our customers see the benefit of TAMKO's specialization in top-quality products, competitive prices, and outstanding service before and after the sale. At TAMKO, roofing is our business. And we do it better than anyone else.

AN INSIDE LOOK AT TAMKO 3-TAB QUALITY CONSTRUCTION

TAMKO

ROOFING PRODUCTS

www.tamko.com

FREDERICK

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997621

ELITE GLASS-SEAL® AR

GLASS-SEAL

Shingles by TAMKO®

ROA_01234

ANTIQUE SLATE ●◆

PASTEL RED ●

TILE RED BLEND ●

RUSTIC REDWOOD ●

SLATETONE GREY ●

PASTEL BROWN ●

PASTEL GREEN ●

WHITE ●◆

RUSTIC CEDAR ●◆

TWEED BLEND ●◆

GREY BLEND ●

WEATHERED WOOD ●◆

EMPIRE GREEN BLEND ●

RUSTIC BLACK ●◆

Elite Glass-Seal AR available in colors marked with a ●
Glass-Seal available in colors marked with a ◆

SOME REPRODUCTION OF THESE COLORS IS AS ACCURATE AS MODERN PRINTING WILL PERMIT. TAMKO RECOMMENDS VIEWING AN ACTUAL ROOF INSTALLATION OR SEVERAL FULL-SIZE SHINGLES PRIOR TO FINAL COLOR SELECTION FOR THE FULL IMPACT OF COLOR BLENDING AND PATTERNS.

Due to demand, certain products and colors may not be available in your area. Contact your local TAMKO representative for more information.

FREDERICK

ROA_01235

TAMKO ROOFING PRODUCTS

Application Instructions for
• Glass-Seal
• Elite Glass-Seal® AR
THREE-TAB ASPHALT SHINGLES

Instructions apply to shingles manufactured in Frederick, MD. ONLY!

THESE ARE THE MANUFACTURER'S APPLICATION INSTRUCTIONS FOR THE ROOFING CONDITIONS DESCRIBED. TAMKO ROOFING PRODUCTS, INC. ASSUMES NO RESPONSIBILITY FOR LEAKS OR OTHER ROOFING DEFECTS RESULTING FROM FAILURE TO FOLLOW THE MANUFACTURER'S INSTRUCTIONS.
THIS PRODUCT IS COVERED BY A LIMITED WARRANTY, THE TERMS OF WHICH ARE PRINTED ON THE WRAPPER. IN COLD WEATHER (BELOW 40°F), CARE MUST BE TAKEN TO AVOID DAMAGE TO THE EDGES AND CORNERS OF THE SHINGLES.

IMPORTANT: It is not necessary to remove the plastic strip from the back of the shingles.

1. ROOF DECK

These shingles are for application to roof decks capable of receiving and retaining fasteners, and to inclines of not less than 2 in. per foot. For roofs having pitches 2 in. per foot to less than 4 in. per foot, refer to special instructions titled "Low Slope Application". Shingles must be applied properly. TAMKO assumes no responsibility for leaks or defects resulting from improper application, or failure to properly prepare the surface to be roofed over.

NEW ROOF DECK CONSTRUCTION: Roof deck must be smooth, dry and free from warped surfaces. It is recommended that metal drip edges be installed at eaves and rakes.

PLYWOOD: All plywood shall be exterior grade as defined by the American Plywood Association. Plywood shall be a minimum of 3/8 in. thickness and applied in accordance with the recommendations of the American Plywood Association.

SHEATHING BOARDS: Boards shall be well-seasoned tongue-and-groove boards and not over 6 in. nominal width. Boards shall be a 1 in. nominal minimum thickness. Boards shall be properly spaced and nailed.

2. VENTILATION

Inadequate ventilation of attic spaces can cause accumulation of moisture in winter months and a build up of heat in the summer. These conditions can lead to:

1. Vapor Condensation
2. Buckling of shingles due to deck movement.
3. Rotting of wood members.
4. Premature failure of roof.

To insure adequate ventilation and circulation of air, place louvers of sufficient size high in the gable ends and/or install continuous ridge and soffit vents.
FHA minimum property standards require one square foot of net free ventilation area to each 150 square feet of space to be vented, or one square foot per 300 square feet if a vapor barrier is installed on the warm side of the ceiling or if at least one half of the ventilation is provided near the ridge. If the ventilation openings are screened, the total area should be doubled.

IT IS PARTICULARLY IMPORTANT TO PROVIDE ADEQUATE VENTILATION.

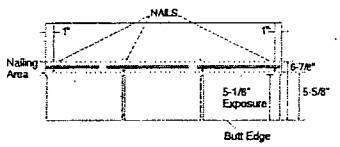
3. FASTENING

NAILS: TAMKO recommends the use of nails as the preferred method of application.
WIND CAUTION: Extreme wind velocities can damage these shingles after application when proper sealing of the shingles does not occur. This can especially be a problem if the shingles are applied in cooler months or in areas on the roof that do not receive direct sunlight. These conditions may impede the sealing of the adhesive strips on the shingles. The inability to seal down may be compounded by prolonged cold weather conditions and/or blowing dust. In these situations, hand sealing of the shingles is recommended. Shingles must also be fastened according to the fastening instructions described below.

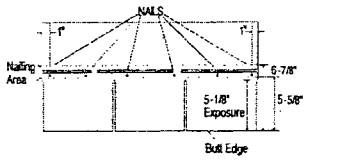
Correct placement of the fasteners is critical to the performance of the shingle. If the fasteners are not placed as shown in the diagram and described below, this will result in the termination of TAMKO's liabilities under the limited warranty. TAMKO will not be responsible for damage to shingles caused by winds in excess of the applicable mph as stated in the limited warranty. See limited warranty for details.

FASTENING PATTERNS: Fasteners must be placed above or below the factory applied sealant in an area between 5-5/8" and 6-7/8" from the butt edge of the shingle. Fasteners should be located horizontally according to the diagram below. Do not nail into the sealant. TAMKO recommends nailing below the sealant whenever possible for greater wind resistance.

1) Standard Fastening Pattern. (For use on decks with slopes 2 in. per foot to 21 in. per foot.) One fastener 1 in. back from each end and one 12 in. back from each end of the shingle for a total of 4 fasteners. (See standard fastening pattern illustrated below).



2) Mansard or High Wind Fastening Pattern. (For use on decks with slopes greater than 21 in. per foot.) One fastener 1 in. back from each end and one fastener 10-1/2 in. back from each end and one fastener 13-1/2 in. back from each end for a total of 6 fastener per shingle. (See Mansard fastening pattern illustrated below.)



NAILS: TAMKO recommends the use of nails as the preferred method of application. Standard type roofing nails should be used. Nail shanks should be made of minimum 12-gauge wire, and a minimum head diameter of 3/8 in. Nails should be long enough to penetrate 3/4 in.

(Continued)

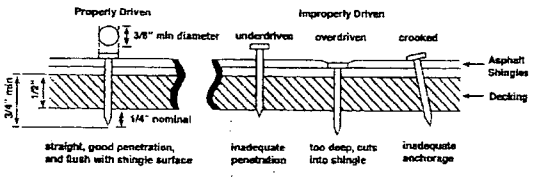
(CONTINUED from Pg. 1)

TAMKO ROOFING PRODUCTS

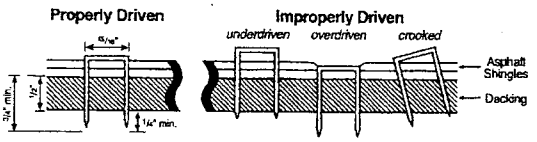
• Glass-Seal
• Elite Glass-Seal® AR
THREE-TAB ASPHALT SHINGLES

Instructions apply to shingles manufactured in Frederick, MD. ONLY!

into the roof deck. Where the deck is less than 3/4 in. thick, the nails should be long enough to penetrate completely through plywood decking and extend at least 1/8 in. through the roof deck. Drive nail head flush with the shingle surface.



STAPLES: If staples are used in the attaching process, follow the above instructions for placement. All staples must be driven with pneumatic staplers. The staple must meet the following minimum dimensional requirements. Staples must be made from a minimum 16 gauge galvanized wire. Crown width must be at least 15/16 in. (staple crown width is measured outside the legs). Leg length should be a minimum of 1-1/4 in. for new construction and 1-1/2 in. for reroofing thus allowing a minimum deck penetration of 3/4 in. The crown of the staple must be parallel to the length of the shingle. The staple crown should be driven flush with the shingle surface. Staples that are crooked, underdriven or overdriven are considered improperly applied.



CAUTION: DO NOT FASTEN INTO THE FACTORY APPLIED ADHESIVE.

4. UNDERLAYMENT

UNDERLAYMENT: An underlayment consisting of asphalt saturated felt must be applied over the entire deck before the installation of TAMKO shingles. Failure to add underlayment can cause premature failure of the shingles which is not covered by TAMKO's limited warranty. Apply the felt when the deck is dry. On roof decks 4 in. per foot and greater apply the felt parallel to the eaves lapping each course of the felt over the lower course at least 2 in. Where ends join, lap the felt 4 in. If left exposed, the underlayment felt may be adversely affected by moisture and weathering. Laying of the underlayment and the shingle application must be done together.

Products which are acceptable for use as underlayment are:

- TAMKO No. 15 Asphalt Saturated Organic Felt
- A non-perforated asphalt saturated organic felt which meets ASTM: D226, Type I or ASTM D4869, Type I
- Any TAMKO non-perforated asphalt saturated organic felt

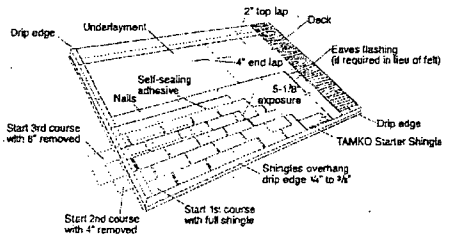
In areas where ice builds up along the eaves or a back-up of water from frozen or clogged gutters is a potential problem, TAMKO's Moisture Guard Plus® waterproofing underlayment (or any specialty eaves flashing product) may be applied to eaves, rakes, ridges, valleys, around chimneys, skylights or dormers to help prevent water damage. Contact TAMKO's Technical Services Department for more information.

TAMKO does not recommend the use of any substitute products as shingle underlayment.

5. APPLICATION INSTRUCTIONS

STARTER COURSE: A starter course may consist of TAMKO Shingle Starter, self-sealing type shingles or a 9 inch wide strip of mineral surface roll roofing. If self-sealing shingles are used, remove the exposed tab portion and install with the factory applied adhesive adjacent to the eaves. Attach the starter course with approved fasteners along a line parallel to and 3 in. to 4 in. above the eaves edge. The starter course should overhang both the eaves and rake edges 1/4 in. to 3/8 in. If a roll roofing is used, seal down the shingles in the first course by applying adhesive cement in four spots equally spaced to the surface of the starter strip and press the shingle down on the spots of cement. Plastic cement should be used sparingly, as excessive amounts may cause blistering.

SHINGLE APPLICATION: There are three different offset methods for applying strip shingles: the 4-inch method, the 5-inch method and the 6-inch method. By removing different lengths from the first shingle, cutouts in one course of shingles do not line up directly with those of the course below. It is recommended that the shingles be laid according to one of these methods consistent with procedures outlined in ARMA's Residential Asphalt Roofing Manual. This panel will feature the 4-inch method. For information regarding the other methods, please refer to the ARMA Residential Asphalt Roofing Manual.
CAUTION: Never use an alignment system where shingle joints are closer than 4 in. to one another.



6. LOW SLOPE APPLICATION

On pitches 2 in. per foot to 4 in. per foot cover the deck with two layers of asphalt saturated felt. Begin by applying the felt in a 19 in. wide strip along the eaves and overhanging the drip edge by 1/4 to 3/4 in. Place a full 36 in. wide sheet over the 19 in. wide starter piece, completely overlapping it. All succeeding courses will be positioned to overlap the preceding course by 19 in. If winter temperatures average 25°F or less, thoroughly cement the felts to each other with plastic cement from eaves and rakes to a point of a least 24 in. inside the interior wall line of the building. As an alternative, TAMKO's Moisture Guard Plus® self-adhering waterproofing underlayment may be used in lieu of the cemented felts.

7. MANSARD ROOF OR STEEP SLOPE ROOF

(Continued)

(CONTINUED from Pg. 2)

TAMKO ROOFING PRODUCTS

• Glass-Seal
• Elite Glass-Seal® AR
THREE-TAB ASPHALT SHINGLES

Instructions apply to shingles manufactured in Frederick, MD. ONLY!

If the slope exceeds 21 in. per foot (60°), each shingle must be sealed with quick setting asphalt adhesive cement immediately upon installation. Spots of cement must be equivalent in size to a $.25 piece and applied to shingles with a 5-1/8 in. exposure, use 6 fasteners per shingle. See Section 3 for the Mansard Fastening Pattern.

8. RE-ROOFING

Before re-roofing, be certain to inspect the roof decks. All plywood shall meet the requirements listed in Section 1.

Nail down or remove curled or broken shingles from the existing roof. Replace all missing shingles with new ones to provide a smooth base. Shingles that are buckled usually indicate warped decking or protruding nails. Hammer down all protruding nails or remove them and refasten in a new location. Remove all drip edge metal and replace with new.

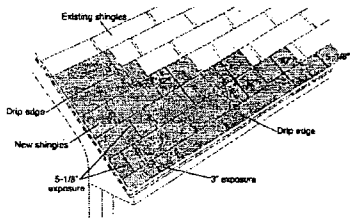
If re-roofing over an existing roof where new flashing is required to protect against ice dams (freeze/thaw cycle of water and/or the backup of water in frozen or clogged gutters), remove the old roofing to a point at least 24 in. beyond the interior wall line and apply TAMKO's Moisture Guard Plus® waterproofing underlayment. Contact TAMKO's Technical Services Department for more information.

The nesting procedure described below is the preferred method for re-roofing over square tab strip shingles with a 5-1/8 in. exposure.

Starter Course: Begin by using TAMKO Shingle Starter or by cutting shingles into 5-1/8 x 36 inch strips. This is done by removing the 5-1/8 in. tabs from the bottom and approximately 2 in. from the top of the shingles so that the remaining portion is the same width as the exposure of the old shingles. Apply the starter piece so that the self-sealing adhesive lies along the eaves and is even with the existing roof. The starter strip should be wide enough to overhang the eaves and carry water into the gutter. Remove 3 in. from the length of the first starter shingle to ensure that the joints from the old roof do not align with the new.

First Course: Cut off approximately 2 in. from the bottom edge of the shingles so that the shingles fit beneath the existing third course and align with the edge of the starter strip. Start the first course with a full 36 in. long shingle and fasten according to the instructions printed in Section 3.

Second and Succeeding Courses: According to the off-set application method you choose to use, remove the appropriate length from the rake end of the first shingle in each succeeding course. Place the top edge of the new shingle against the butt edge of the old shingles in the courses above. The full width shingle used on the second course will reduce the exposure of the first course to 3 in. The remaining courses will automatically have a 5-1/8 in. exposure.



9. VALLEY APPLICATION

Over the shingle underlayment, center a 36 in. wide sheet of TAMKO Nail-Fast® or a minimum 50 lb. roll roofing in the valley. Nail the felt only where necessary to hold it in place and then only nail the outside edges.

IMPORTANT: PRIOR TO INSTALLATION WARM SHINGLES TO PREVENT DAMAGE WHICH CAN OCCUR WHILE BENDING SHINGLES TO FORM VALLEY.

- Apply the first course of shingles along the eaves of one of the intersecting roof planes and across the valley.

Note: For proper flow of water over the trimmed shingle, always start applying the shingles on the roof plane that has the lower slope or less height.

- Extend the end shingle at least 12 in. onto the adjoining roof. Apply succeeding courses in the same manner, extending them across the valley and onto the adjoining roof.
- Do not trim if the shingle length exceeds 12 in. Lengths should vary.
- Press the shingles tightly into the valley.
- Use normal shingle fastening methods.

Note: No fastener should be within 6 in. of the valley centerline, and two fasteners should be placed at the end of each shingle crossing the valley.

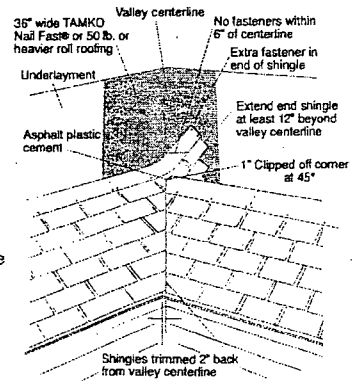
- To the adjoining roof plane, apply one row of shingles extending it over previously applied shingles and trim a minimum of 2 in. back from the centerline of the valley.

Note: For a neater installation, snap a chalkline over the shingles for guidance.

- Clip the upper corner of each shingle at a 45-degree angle and embed the end of the shingle in a 3 in. wide strip of asphalt plastic cement. This will prevent water from penetrating between the courses by directing it into the valley.

- **CAUTION:** Adhesive must be applied in smooth, thin, even layers.

Excessive use of adhesive will cause blistering to this product.



(Continued)

(CONTINUED from Pg. 3)

TAMKO ROOFING PRODUCTS

• Glass-Seal
• Elite Glass-Seal® AR

THREE-TAB ASPHALT SHINGLES

Instructions apply to shingles manufactured in Frederick, MD. ONLY!

TAMKO assumes no responsibility for blistering.

FOR ALTERNATE VALLEY APPLICATION METHODS, PLEASE CONTACT TAMKO'S TECHNICAL SERVICES DEPARTMENT.

10. HIP AND RIDGE FASTENING DETAIL

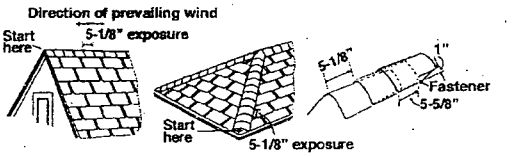
Apply the shingles with a 5-1/8 in. exposure beginning at the bottom of the hip or from the end of the ridge opposite the direction of the prevailing winds. Secure each shingle with one fastener 5-5/8 in. back from the exposed end and 1 in. up from the edge. Do not nail directly into the sealant.

TAMKO recommends the use of TAMKO Hip & Ridge shingle products. Where matching colors are available, it is acceptable to use TAMKO's Glass-Seal or Elite Glass-Seal shingles cut down to 12 in. pieces.

NOTE: AR type shingle products should be used as Hip & Ridge on Glass-Seal AR and Elite Glass-Seal AR shingles.

Fasteners should be 1/4 in. longer than the one used for shingles.

IMPORTANT: PRIOR TO INSTALLATION, CARE NEEDS TO BE TAKEN TO PREVENT DAMAGE WHICH CAN OCCUR WHILE BENDING SHINGLES IN COOL WEATHER.



THESE ARE THE MANUFACTURER'S APPLICATION INSTRUCTIONS FOR THE ROOFING CONDITIONS DESCRIBED. TAMKO ROOFING PRODUCTS, INC. ASSUMES NO RESPONSIBILITY FOR LEAKS OR OTHER ROOFING DEFECTS RESULTING FROM FAILURE TO FOLLOW THE MANUFACTURER'S INSTRUCTIONS.

THIS PRODUCT IS COVERED BY A LIMITED WARRANTY. THE TERMS OF WHICH ARE PRINTED ON THE WRAPPER.

IMPORTANT - READ CAREFULLY BEFORE OPENING BUNDLE

In this paragraph "You" and Your" refer to the installer of the shingles and the owner of the building on which these shingles will be installed. This is a legally binding agreement between You and TAMKO Roofing Products, Inc. ("TAMKO"). By opening this bundle You agree: (a) to install the shingles strictly in accordance with the instructions printed on this wrapper; and (b) leaks and other roofing defects resulting from failure to follow the manufacturers installation instructions printed on this wrapper are not covered by the limited warranty that is also printed on this wrapper, or any other warranty, including, but not limited to (except where prohibited by law) implied warranties of MERCHANTABILITY and FITNESS FOR USE.

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

CAULKING – ABG CAULKING

ABG Caulking Contractors, Inc.

COMMERCIAL CAULKING, WATERPROOFING & DAMPPROOFING

3407 W. ANDREW JOHNSON HWY. (37814) • P.O. BOX 1757 • MORRISTOWN, TN 37816 • (423) 587-0638 • FAX (423) 587-3921

E-MAIL: abgmtwn@charternet.com

WARRANTY AGREEMENT

Project: Belle Hall Condominiums

Owner: Belle Hall Direct 101, LP

Contractor: TCR NC Construction I Limited Partnership

Subcontractor: ABG Caulking & Waterproofing

Subcontractor hereby expressly warrants and guarantees that all labor, materials, and equipment furnished and work performed in conjunction with the above referenced project are in accordance with the plans, specifications, the Subcontract Agreement and authorized modifications thereto. All labor, materials and equipment shall be free from defects, due to defective materials and/or workmanship, for a period of one (1) year from the date of Certificate of Occupancy for each building/structure, unless otherwise stated in the Subcontract Agreement.

Should any defects develop during the warranty period due to improper workmanship and/or arrangement, the same shall, upon notice, be made good by this Subcontractor at no expense to the Contractor, Owner, or Owner's Representative. Nothing in the above shall be deemed to apply to work or equipment which has been abused, neglected or altered by the Contractor, Owner, or Owner's Representative.

Unless otherwise stated in the Subcontract Agreement, warranty work shall be responded to within twenty-four (24) hours of notification by the Contractor, Owner, or Owner's Representative, including weekends and holidays. Warranty notices received before 10:00 am shall be responded to on the same day. Should Subcontractor fail to respond within twenty-four (24) hours of notification or correct the defective work or equipment within seventy-two (72) hours, the Contractor, Owner, or Owner's Representative shall proceed with the correction of the defective work. All costs associated with this corrective action shall be reimbursed by this Subcontractor or charged against its account. Subcontractor shall remit payment for such charges within five (5) calendar days of notification by the Contractor, Owner, or Owner's Representative.

Signature: _____

Printed Name: L. Samuel Mullins

Position/Title: AVP

Date: December 15, 2006

Dymeric 240/240FC

Multi-Component Polyurethane Sealants

Product Description:

Dymeric 240/Dymeric 240FC are three component, chemically curing, epoxidized polyurethane sealants specially formulated for dynamically moving building joints.

Basic Uses:

Dymeric 240/Dymeric 240FC are non-sag general purpose sealants providing flexible, long life, durable, weathertight seal for both new construction and renovation projects in many types of buildings. Uses will include: precast, masonry, EIFS, metal curtain wall and perimeter joints of doors and window frames.

Dymeric 240FC is a faster curing formulation with easier mixing and handling properties. Dymeric 240FC is also solvent free, exhibiting a low odor.

Limitations:

- Do not apply over damp or contaminated surfaces.

Packaging:

1-1/2 gallon (5.7 L) and 3 gallon (11.36 L) kits with pre-measured cans of Curing Agent and color pack (pigment).

Standard Colors:

Dymeric 240/Dymeric 240FC are available in 53 standard colors and can be custom matched to virtually any color upon request.

Applicable Standards:

Dymeric 240 meets U.S. Federal Specification TT- S-00227E, Class A, Type II; Canadian Standard CAN/CGSB-19.24-M90, Type II, Class B; and ASTM C920, Type M, Grade NS, Class 50, Use T, M, A and O. Dymeric 240FC meets U.S. Federal Specification TT- S-00227E, Class A, Type II; Canadian Standard CAN/CGSB-19.24-M90, Type II, Class B; and ASTM C920, Type M, Grade NS, Class 50, Use T, I, M, A and O.

INSTALLATION

Joint Design:

May be used in any vertical or horizontal joint design in accordance with accepted architectural/engineering practice. Joint width should be 4-times anticipated movement, but not less than 1/4 inch (6.4mm) wide.

Dimensions:

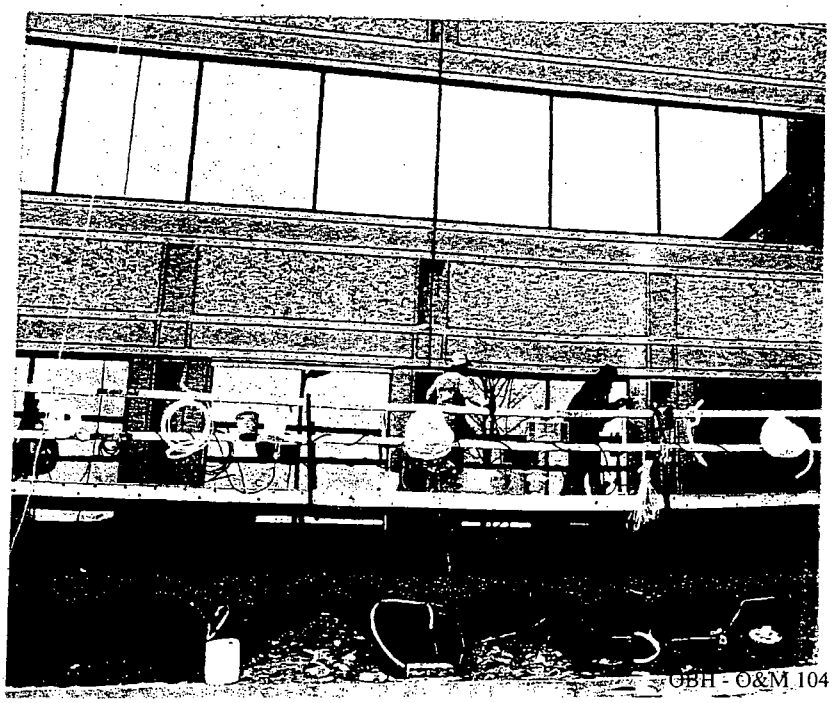
For joints 1/4 inch (6.4mm) to 1/2 inch (12.7mm) wide, the width-to-depth ratio should be equal. Joints 1/2 inch (12.7mm) wide or greater should have a sealant depth of 1/2 inch (12.7mm). Minimum joint size is 1/4 inch by 1/4 inch (6.4mm by 6.4mm).

Surface Preparation:

For good adhesion, the joint interface must be sound, clean and dry. Depending on the substrate, or presence of form release agents, masonry waterproofings, dust, loose mortar or laitance, architectural paints or finishes, the joint surface may require a thorough wire brushing, grinding, sandblasting, solvent washing and/or primer.

Tooling & Cleaning:

Tooling is recommended immediately after application to insure firm, intimate contact with the joint interface. Dry tooling is preferred, although tooling agents can be utilized. Excess sealant and smears adjacent to the joint can be removed with Xylol or Toluol before sealant cures.



OBH - O&M 104

ROA_01242

Joint Backing Bond Breaking Tape:

Closed cell polyethylene backer rods are preferred as joint backing to control depth of sealant bead. Where depth of joint will prevent use of joint backing, an adhesive backed polyethylene tape should be installed to prevent three-sided adhesion. Joint backing must be dry at time of sealant application.

Application:

Mix in accordance with directions on product container label. Minimum mixing time is 6 minutes. Apply with conventional caulking equipment, filling the joint completely and tool.

Maintenance:

Damaged sealant can be repaired. Consult your Tremco Distributor or Representative for repair procedures.

Availability:

Immediately available from your local Tremco Field Representative, Tremco Distributor or Tremco Warehouse.

Warranty:

Tremco warrants its Sealants to be free of defects in materials, but makes no warranty as to appearance or color. Since methods of application and on-site conditions are beyond our control and can affect performance, Tremco makes no other warranty, expressed or implied, including warranties of MERCHANTABILITY and FITNESS FOR A PARTICULAR PURPOSE, with respect to Tremco Sealants. Tremco's sole obligation shall be, at its option, to replace, or refund the purchase of the quantity of Tremco Sealant proven to be defective and Tremco shall not be liable for any loss or damage.

TYPICAL PHYSICAL PROPERTIES

ASTM C920 TT-S-00227E	Requirement	Dymeric 240/240FC Results
Low Temperature Flexibility	ASTM-C-793	-65°F (-54°C)
Hardness Properties	15-50	25-35
Weight Loss	Less than 10%	Passes
Tack Free Time	Tack Free 72 Hours Maximum	240: < 72 Hours 240FC: < 24 Hours
Stain & Color Change	No Visible Change No Stain	None None
Durability-Cyclic Movement Adhesion & Cohesion	1-1/2 sq. in. (9.7cm²) Max Total Bond Loss	Passes
Adhesion-in-Peel	Not less than 5 pli (22N) (85N) for Aluminum, Concrete & Brick	Greater than 10 pli
Effects of Accelerated Weathering	No cracks greater than #2 on U.V. and Cold Temperature Bond Test	Passes
Movement Capability	N/A	+50%/-50%

For MSDS and Spec Data Sheets visit our website:
www.tremcosealants.com

TREMCO
Sealant/Weatherproofing Division
3735 Green Road • Beachwood, Ohio • 44122 • Phone: (216) 292-5000 • (800) 321-7906
220 Wicksteed Avenue • Toronto, ON M4H 1G7 • Phone: (416) 421-3300 • (800) 363-3213

DIVISION 8 – DOORS AND WI NDOWS

WINDOWS – BUILDERS FIRST SOURCE/ESP

WARRANTY AGREEMENT

Project: Belle Hall Condominiums

Owner: Belle Hall Direct 101, LP
Contractor: TCR NC Construction I Limited Partnership

Subcontractor: Builders First Source

Subcontractor hereby expressly warrants and guarantees that all labor, materials, and equipment furnished and work performed in conjunction with the above referenced project are in accordance with the plans, specifications, the Subcontract Agreement and authorized modifications thereto. All labor, materials and equipment shall be free from defects, due to defective materials and/or workmanship, for a period of one (1) year from the date of Certificate of Occupancy for each building/structure, unless otherwise stated in the Subcontract Agreement.

Should any defects develop during the warranty period due to improper workmanship and/or arrangement, the same shall, upon notice, be made good by this Subcontractor at no expense to the Contractor, Owner, or Owner's Representative. Nothing in the above shall be deemed to apply to work or equipment which has been abused, neglected or altered by the Contractor, Owner, or Owner's Representative.

Unless otherwise stated in the Subcontract Agreement, warranty work shall be responded to within twenty-four (24) hours of notification by the Contractor, Owner, or Owner's Representative, including weekends and holidays. Warranty notices received before 10:00 am shall be responded to on the same day. Should Subcontractor fail to respond within twenty-four (24) hours of notification or correct the defective work or equipment within seventy-two (72) hours, the Contractor, Owner, or Owner's Representative shall proceed with the correction of the defective work. All costs associated with this corrective action shall be reimbursed by this Subcontractor or charged against its account. Subcontractor shall remit payment for such charges within five (5) calendar days of notification by the Contractor, Owner, or Owner's Representative.

Signature: William E. DeHass

Printed Name: William E. DeHass

Position/Title: General Manager

Date: 12/15/06

Energy Saving Products of Florida, Inc.

P. O. Box 1119 • Jasper, Florida 32052

SINGLE HUNG INSTALLATION

ROUGH OPENING

1. Check to be sure the opening is proper size.

2. Sill plate must be level.

3. Provide ¼ to ½ inch of clearance on both height and width.

4. In wood frame installations. Cover the outside face of the opening with strips of asphalted building paper or other material as specified by local building code.. Overlap sides over bottom strip. Top strip is applied over nailing fin after window is installed.

UNIT

1. Open and operate sash and check that the unit operates properly before installing.

2. Close and lock sash.

INSTALLATION PROCEDURE

1a. In wood frame construction, apply a continuous bead of sealant (bedding joint) around the full perimeter of the backside of the mounting fin. Apply the sealant in line with any pre-punched holes on the mounting fin.

1b. In masonry construction, sealant may be applied around the entire buck at the point where the backside (interior surface) of the mounting flange will make contact with the seal.

2. Center unit in opening.

3. Select and apply shims

4. Adjust the shims and check the window for level, plumb, and true. Make sure the window is not bowed in or out. Distance between jambs at Meeting Rail should measure the same as Head and Sill.

5a. For wood frame installations fasten the upper corner in place through the nail fin. Do not drive the fastener all the way in.

5b. For concrete/masonry wall installations fasten the upper corner in place through the balance channel. Do not drive the fastener all the way in.

6. Make sure the window is square, operates smoothly, and operable sash are sitting square in their openings.

7. Fasten the corner diagonally opposite the upper corner that was fastened first.

8. Continue to fasten sides, top, and bottom through the mounting fin; rechecking the unit to ensure it is set plumb, level, square, and true. Fastener heads should not compress the nail fin when put in place.

9. If applying additional insulation behind jambs and under sill be careful not to bow frame in.

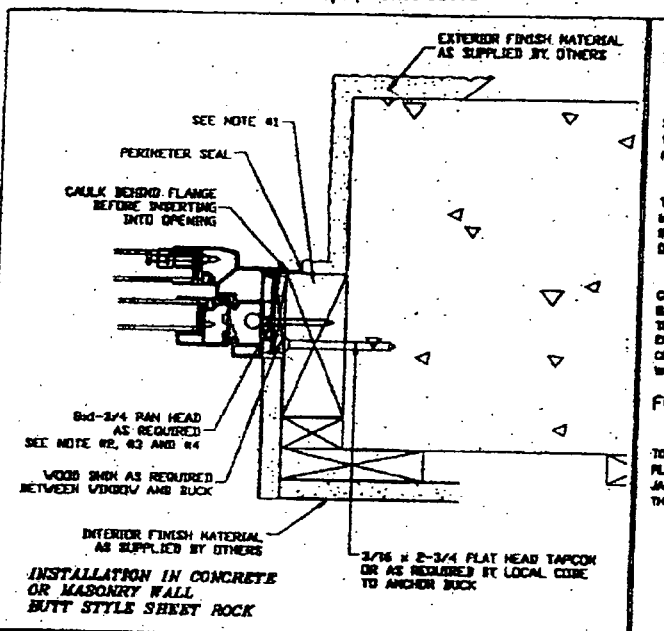
10. In wood frame installations the top flashing strip is applied over nailing fin after window is installed at this time.

6/17/02

Energy Saving Products of Florida, Inc.

Our Name Says It All!

P. O. Box 1119 • Jasper, Florida 32052



INSTALLATION IN CONCRETE OR MASONRY WALL BUTT STYLE SHEET ROCK

NOTE:

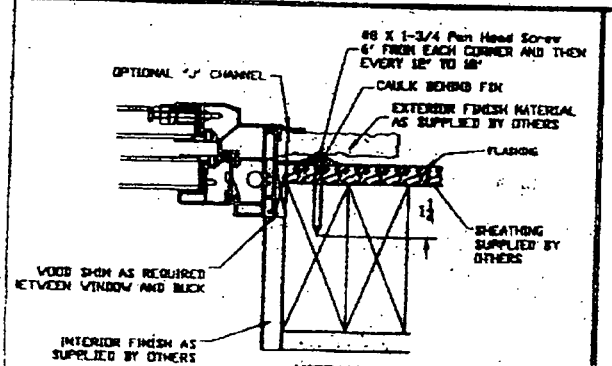
1.) IT IS RECOMMENDED THAT A BUCK 1-1/2" THICK OR GREATER BE SECURED TO THE OPENING WITH 3/16" TAPCONS OF A LENGTH TO HAVE 1 1/4" PENETRATION INTO MASONRY OR CONCRETE. THE SCREWS SHOULD BE PLACED 6" FROM EACH CORNER AND 24" ON CENTER.

2.) ANCHOR/MOUNTING SCREWS PLACED IN THE BALANCE CHANNELS NEED TO HAVE 3/8" DIAMETER HOLES PRE DRILLED SO THAT THE SCREW HEADS DO NOT INTERFERE WITH BALANCE SHOE OPERATION. THE 3/8" HOLES IN THE INNER BALANCE CHANNEL GO THROUGH ONE WALL ONLY. CAUTION DO NOT DRILL THROUGH THE OUTER WALL OF THE WINDOW FRAME.

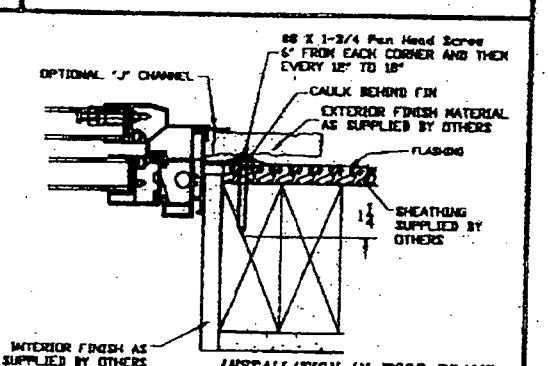
3.) ANCHOR/MOUNTING SCREWS ARE APPLIED THROUGH THE BALANCE CHANNEL IN THE JAMBS. SCREWS ARE LOCATED AT THE HEAD (ABOVE THE BALANCE) AND AT THE MEETING RAIL JUST BELOW THE BALANCE AND ABOVE THE BALANCE SHOE AT ITS UPPER MOST POSITION. THE SCREW AT THE SILL END OF THE JAMB SHOULD BE LOCATED AT THE BOTTOM OF THE BALANCE CHANNEL. WHEN THE BUCK IS LESS THAN 1-1/2" THICK USE A 3/16" TAPCON WITH A LENGTH TO HAVE 1-1/4" PENETRATION INTO THE CONCRETE/MASONRY

FOR WINDOWS REQUIRED TO MEET IMPACT

4.) THE WINDOW IS SECURED TO THE BUCK WITH #8 SCREWS OF A LENGTH TO HAVE 1-1/4 PENETRATION INTO THE BUCK. THOSE SCREWS SHOULD BE PLACED 3" TO 6" FROM EACH CORNER AND 12" TO 18" ON CENTER IN THE JAMB. THE SCREW SPACING IN THE HEAD AND SILL WOULD BE 3" TO 6" FROM THE CORNER AND 16" TO 24" ON CENTER.



INSTALLATION IN WOOD FRAME BUTT STYLE SHEET ROCK



INSTALLATION IN WOOD FRAME SHEET ROCK RECESSED BEHIND WINDOW FRAME

Robert J. Brady 6/17/02

WARRANTY
ALUMINUM AND VINYL NEW CONSTUCTION PRODUCTS

Energy Saving Products of Florida, a division of Raymond Building Supply Corp (hereinafter,"ESP") manufacturer of aluminum and vinyl window and door products, warrants to the original resident purchaser/property owner (the Warranty is non-transferable) that any product purchased is free of manufacturing and/or material defects. This warranty applies as long as the original purchaser/owner resides in the home in which ESP'S products were installed as is subject to the conditions and limitations herein listed. If ESP'S products are installed in multi-family, commercial, or rental properties, refer to the "Commercial Applications"section of this Warranty.

The Warranty covers only those manufacturing and material defects, as specified herein and does not include defects or damages attributable to faulty or improper installation and or application of product, the application of reflective film to glass surfaces, normal weathering; defects caused by accidents, fire, flood, acts of vandalism, riot or civil disorder; misuse; abuse by harmful fumes, vapors, solvents, chemicals or chemical pollutants in the atmosphere; exterior mildew; building settlement or structural failures of walls or foundations, stress resulting from localized heat which causes excessive temperature differentials over the glass surface edges or occurrences beyond ESP'S control.

Aluminum Windows and Doors – 3 years

ESP warrants that its aluminum windows and doors when installed according to manufacturer's specifications will be free of defects in material and workmanship for a period of three (3) years. If a defect in material or workmanship occurs, ESP will provide replacement parts at not charge.

Vinyl Windows and Doors – Limited Lifetime

ESP warrants that the vinyl components of its windows and doors against defects such as, peeling, flaking, chipping, blistering and corrosion, when installed according to manufacturer's specifications, will be free of defects in material for the life of the product. If a defect in material occurs, ESP will provide replacement parts at no charge. Warranty becomes void is the vinyl is painted, stained or if the surface is altered in any way.

Hardware – 1 Year

ESP warrants its hardware, which includes balances, sash and door locks, wheels and roller assemblies, sliding door tracks, hinges, seals, fasteners, etc. for a period of one (1) year. If a defect occurs, ESP will provide replacement parts at no charge.

Screen – 3 years

ESP Warrants its aluminum screen frame against defects in material for a period of three (3) years. If a defect occurs, ESP will provide replacement parts at no charge.

Glass – 10 Years

Glass has prevalent characteristics such as bubbles, slight discolorations, blurs, and hairline scratches. These are expected, as they are inherent qualities that meet or exceed federal specifications DD-G-451D. Heat strengthened, tempered or ESP Glass may have slight distortions as an inherent quality.

ESP warrants that its insulated glass units (ESP Glass and non-impact) when installed within the continental United States, will not materially obstruct vision as a result of dust collection, or film or moisture collection on the interior surfaces of the glass for a period of ten (10) years from the date of manufacture.

This Warranty is void and does not apply to units which were not installed in accordance with ESP written instruction; to units which are damaged in handling, transportation or installation; to units which are subjected to stress resulting from localized application of heat causing excessive temperature differentials over the glass surfaces or edges of units; to units to which any form of tinting, film, reflective glass or other heat reflecting process has been applied; stress cracks resulting from natural settlement or strain of buildings; to units where provisions have not been made in accordance with sound practice for adequate expansion or contraction of framing members; to units which have been subjected to abnormal operating condition; to units where water or moisture has been accumulated, or has otherwise been introduced, in or onto the edges of the unit; to units which have been cleaned with or exposed to any petroleum based or acidic substance; and to units exposed to protective materials used on stucco construction.

Commercial Application

If ESP products are installed in a building operated as a multi-family dwelling or used for other commercial purposes or rental properties such as schools, churches, apartment complexes, government owned structures, office buildings, etc., the Warranty if for ten (10) years on glass, two (2) years for all components other than hardware which one (1) year.

WARRANTY
ALUMINUM AND VINYL NEW CONSTUCTION PRODUCTS

Repair Procedure

The Warranty is limited to ESP, at its option, repairing and/or replacing defective parts (color matching not guaranteed) free of charge to the Warranty holder. If, after inspection by an ESP representative, it is determined that the claim is valid in accordance with the provisions of this Warranty, ESP agrees, at its options, to repair or replace any defective part or component as warranted when said defective part or component is returned to ESP. Purchaser/property owner shall pay for returned transportation charges.

Labor

Labor costs are not included under this Warranty and neither ESP nor its distributors will be responsible for any costs incurred in the removal, replacement or installation of ESP'S products or any part thereof, furnished by ESP under this Warranty.

Product Changes

ESP reserves the right to discontinue or change any and all products it manufactures. If the part or component of the product originally installed is not available and ESP determines to make replacement, ESP shall have the right to substitute such part or component designated by ESP to be equal quality and value.

Warranty Extension

The original Warranty period shall not be extended by any such repair or replacement, but any remaining Warranty period shall continue in effect and be applicable under the terms and conditions of this Warranty to the repaired part or component of the product.

Other Warranty Considerations

On some installations, caulking is used to seal the frames or trim package against water or air penetration. Caulking is not considered part of the ESP's product, and therefore, is not covered under this Warranty. Caulking is normally considered a maintenance responsibility of homeowner/property owner. Condensation problems are related to excessive humidity levels in a structure and is not covered under this Warranty.

The Warranty statement contained in the certificate set forth the only express warranties extended by *Energy Saving Products of Florida* and the provisions hereof shall constitute the purchase's exclusive remedy for breach of this Warranty given under this certificate. ESP shall not be liable to property owner for incidental or consequential damages for breach of any written or implied warranty on the ESP products.

Claims

Any claim or defect under this warranty must be submitted promptly after discovery to the dealer from whom the products was purchased and within the warranty period specified above. If you cannot locate your ESP dealer , you may write to ESP for assistance.

Energy Saving Products

Attn: Service Department

P.O. Box 119

Jasper, FL 32052

Some state do not allow the exclusion or limitation of incidental consequential damages or the limitation of remedies for a breach of warranty, so the above limitations or exclusions may not apply to you. The warranty give you specific legal rights, and you may also have other rights that vary from state to state. No distributor, dealer or representative of ESP has the authority to change or modify this warranty in any respect, either orally or in writing.

DIVISION 8 – DOORS AND WINDOWS

SHOWER DOORS AND GARAGE DOORS - GALE

WARRANTY AGREEMENT

Project: Belle Hall Condominiums

Owner: Belle Hall Direct 101, LP
Contractor: TCR NC Construction I Limited Partnership

Subcontractor: Gale Contractor Services

Subcontractor hereby expressly warrants and guarantees that all labor, materials, and equipment furnished and work performed in conjunction with the above referenced project are in accordance with the plans, specifications, the Subcontract Agreement and authorized modifications thereto. All labor, materials and equipment shall be free from defects, due to defective materials and/or workmanship, for a period of one (1) year from the date of Certificate of Occupancy for each building/structure, unless otherwise stated in the Subcontract Agreement.

Should any defects develop during the warranty period due to improper workmanship and/or arrangement, the same shall, upon notice, be made good by this Subcontractor at no expense to the Contractor, Owner, or Owner's Representative. Nothing in the above shall be deemed to apply to work or equipment which has been abused, neglected or altered by the Contractor, Owner, or Owner's Representative.

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Signature: Charles E Henderson

Printed Name: CHARLES E. HENDERSON

Position/Title: Division Manager

Date: 15 JAN 07

Southeastern Aluminum Products, Inc.

Technical Pamphlets

Cleaning Tips

Measuring Tips

Caulking Tips

By-Pass Installation Tips

Stand-Alone Swing Door Installation Tips

Bath Enclosure Cleaning Guide

We at Southeastern Aluminum Products want our customers to experience years of enjoyment using our quality bath enclosures. In order to answer the inevitable questions concerning the care and cleaning of our enclosures, we have developed this owner's Bath Enclosure Cleaning Guide.

The surest way to insure that your bath enclosure stays looking new and spotless is through adopting a daily regimen of rinsing the enclosure with clean water and then wiping the metal and glass after use with a non-abrasive cloth or squeegee. By doing this, you will not only remove soap scum and body oils from the enclosure but water spots will be kept to a minimum. (Often, the tap water we use is so "hard" that mineral deposits remain on the glass and metal after the water dries.)

Many people have found that water repellant treatments, such as Rain-X or Invisible Shield or wax on the glass portion of their enclosures aid in keeping the glass looking " spotless."

Through independent testing conducted by the Bath Enclosure Manufacturers Association, it has been found that Lysol Bathroom Cleaner works best at removing built-up soap scum and hard water film without damaging the glass and metal surfaces. Many other common household products can be extremely harmful to the anodized aluminum on your enclosure and should be avoided.

Tests have shown that:

- **Some of the cleaners completely destroy the metal finish within 5 minutes of application!**
- Some popular glass cleaners contain Vinegar or Ammonia and can *severely* damage anodized finishes.
- Abrasive cleaners and scouring pads, cleansers containing bleach, and acid-based cleaners should never be used on your enclosure as they, too, will damage the metal and glass components.
- Many so-called "leave on" or "misting" cleaners can damage the plastic parts on your enclosure and should also be avoided.

With the right cleaner and a minimal amount of daily maintenance, your

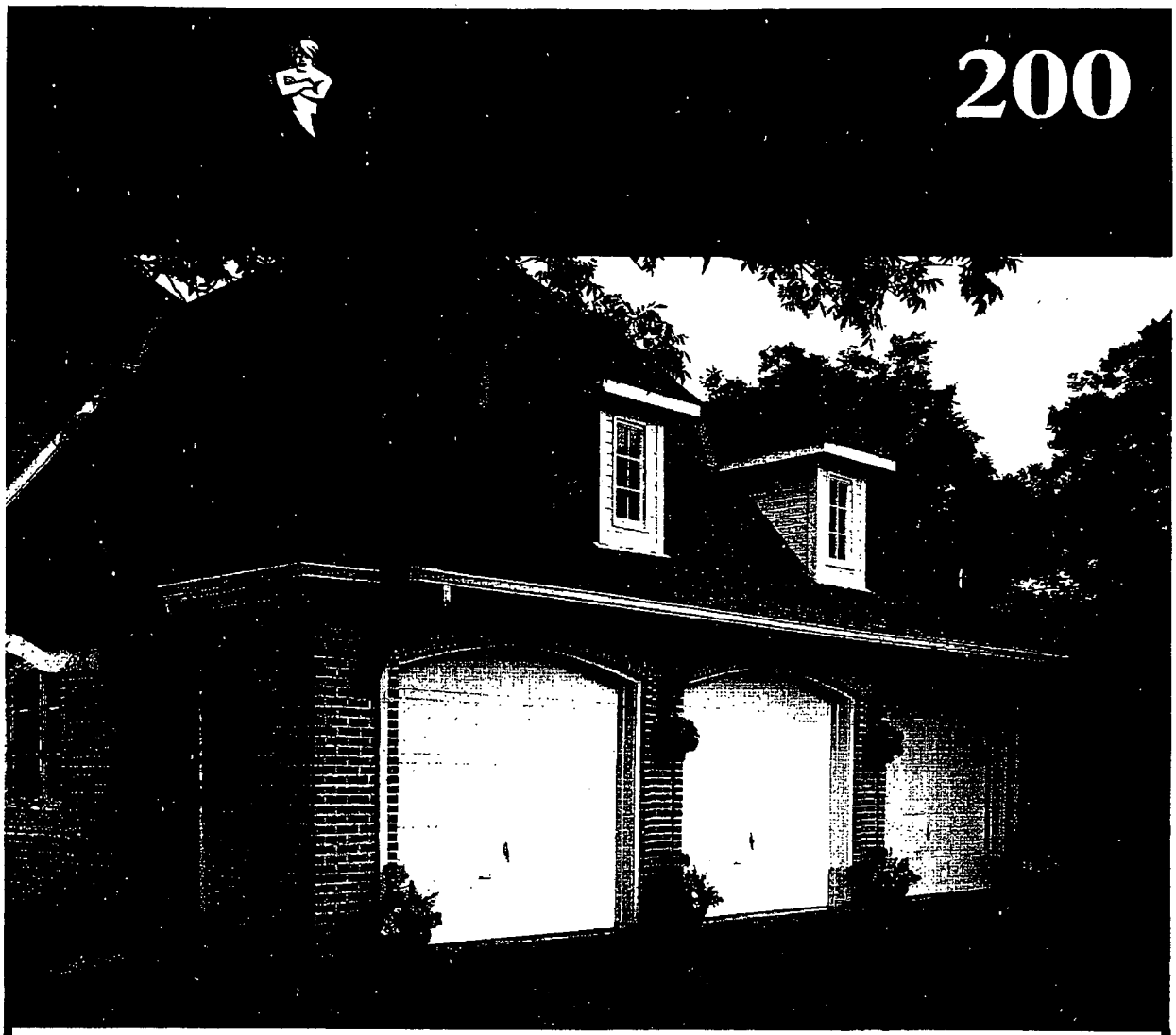
Southeastern Aluminum Products, Inc.

Bath Enclosures

Mirror Doors

Limited Warranty

Southeastern Aluminum Products, Inc. warrants all of its products for a period of one year from date of purchase against defects in material or workmanship. This warranty is limited to repair or replacement of defective units at the option of Southeastern Aluminum Products, Inc. This warranty is void if the unit shows any signs of physical abuse or neglect or there is evidence of improper installation. Southeastern Aluminum Products, Inc. is not responsible for any damage or injury to person or property except for replacement or repair of defective units.

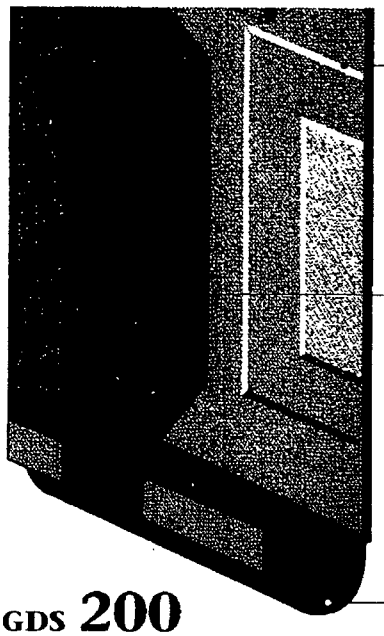


Exceptional strength, minimum weight

- Durable, non-insulated steel construction
- Classic raised panels with woodgrain texture
- Polyester topcoat requires no painting and protects against rust
- Bottom weather-stripping shuts out the elements
- Available in white, almond, brown or sandstone color options

10 YEAR LIMITED WARRANTY

GENIE
Garage Doors



Construction
25 gauge galvanized steel

Construction
Sturdy, galvanized steel center stiles

Protection
Bulb-type weather strip

GDS 200 SERIES

Panel Colors Available

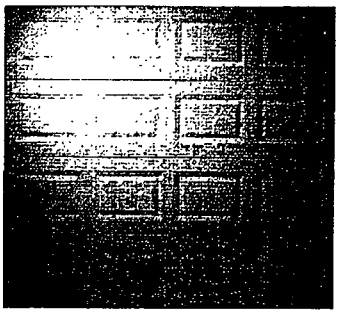
200 White

200 Almond

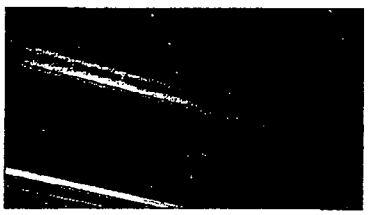
200 Brown

200 Sandstone

Door View



REVOLUTION™
Optional Counterbalance System



Add a cleaner, more finished look to your garage with the Genie® Revolution™ counterbalance system. The aluminum spring barrel and galvanized torsion tube give the Revolution a polished, high quality appearance. And its all-metal construction is made for durability and low maintenance.

Window Options Available

Madison I

Wiuston I

Cathedral I

Stockton I

Williamsburg 4

Sherwood I

Williamsburg 8

Ruston I

Full Vision

*Genie® provides a ten-year limited warranty against section rust-through and a limited one-year warranty for workmanship and material.

© 2004 The Genie Company. Consistent with our policy of continuing product improvement, we reserve the right to change product specifications without notice or obligation.

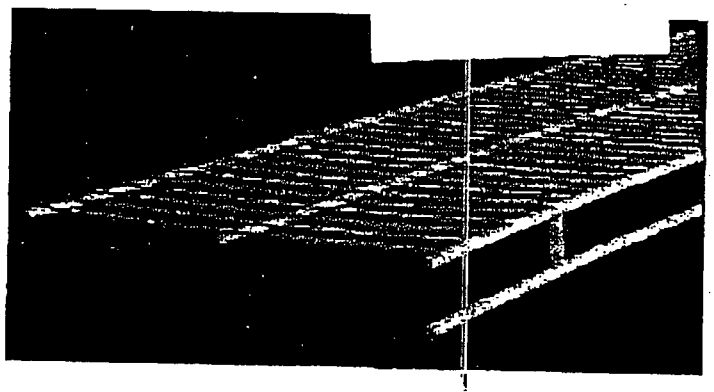
D900-251 12/04 7.5M HC SP Printed in U.S.A.

Rubbermaid Advantage
Epoxy vs. Vinyl

Epoxy Coated Steel

- Resistant to chipping, abrasions, impact, corrosion and chemicals
- Similar to finish on household appliances
- Can be cleaned with a damp cloth
- Never needs to be painted
- Smooth, glass-like finish
- Will not collect dust

Attn: Summer



Vinyl Coated Steel

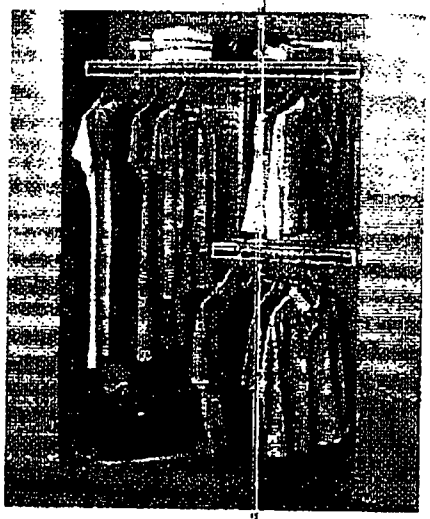
- Hangers do not glide easily due to stickiness
- Discolors, gets sticky
- Can peel, allowing rust to develop in one spot and run under all the vinyl coated parts
- Coats the shelving, but does not fuse to the metal
- No effective way to clean

Rubbermaid®

3B

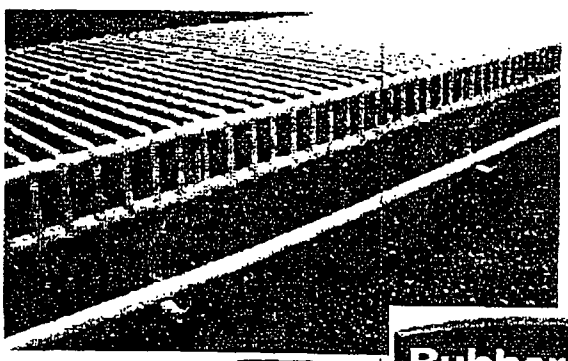
Rubbermaid Advantage
FreeSlide Shelving

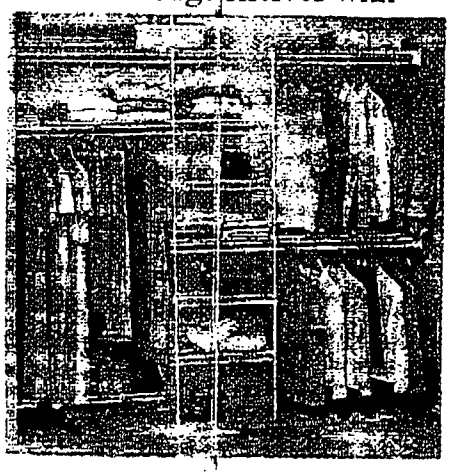
- Rubbermaid Exclusive
- Most widely sold continuous shelf in industry
  - ✓ upsell opportunity
- Often Imitated, Never Duplicated
  - ✓ Patented one piece welded design
  - ✓ 12" Hook spacing



Rubbermaid Advantage
Ultra FreeSlide Shelving

- Rubbermaid exclusive
  -No Competitive imitations
- Eliminates top 2 homeowner objections:
  –Tight Mesh deck with spacing ½" apart prevents small items from tipping
  –Free Slide rod allows for continuous movement of hanging clothes
- Aesthetics
  –Offers a uniform look when combining Tight Mesh storage shelves with Free Slide





3C

Shelving Load Capacities

Load Capacities for Linen & Tight Mesh Shelves

SHELF LENGTH	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1 Foot	80	80	100	100	120	120
2 Feet	140	70	160	80	180	90
3 Feet	150	50	180	60	225	75
4 Feet	180	45	220	55	260	65
5 Feet	200	40	250	50	300	60
6 Feet	210	35	240	40	300	50
OVER 6 FEET	SAME AS 6 FEET		SAME AS 6 FEET		SAME AS 6 FEET	

Load Capacities for Wardrobe & Free Slide Shelves

SHELF LENGTH	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1 Foot	75	75	90	90	105	105
2 Feet	130	65	140	70	150	75
3 Feet	135	45	150	50	180	60
4 Feet	160	40	180	45	220	55
5 Feet	175	35	200	40	250	50
6 Feet	180	30	210	35	252	42
OVER 6 FEET	SAME AS 6 FEET		SAME AS 6 FEET		SAME AS 6 FEET	

Load Capacities for Fast Track

100 lbs. * per bracket (any size)
300 lbs.** per upright (any size)

* When mounting rail properly is installed into studs.

** Additional weight holding capacity can be gained by attaching uprights to studs with #57005 upright screws.

Rubbermaid®

3J

005/009

OBH - O&M 121

Rubbermaid®

RUBBERMAID LIMITED LIFETIME WARRANTY

Rubbermaid makes durable, high quality merchandise. We warrant that our ventilated wire shelving, wood melamine shelving and installation hardware are free of defects in materials or workmanship for the life of the product.

Rubbermaid will replace any defective shelving or installation hardware at no charge. Rubbermaid is not responsible for any labor charges associated with uninstalling or reinstalling the shelving or hardware.

This warranty is valid only if the product has been assembled and maintained per the instructions or standard industry practices. This warranty does not cover abuse, accident, cosmetic issues such as fading or scratches from normal wear, or any other cause not arising from defects in material and workmanship. Also, consequential and incidental damages are not recoverable under this warranty.

This warranty gives you specific legal rights, and you may also have other rights, which vary from state to state. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

Consumer Toll Free Help Line: 1-888-895-2110
Worldwide Internet On-Line Service: www.rubbermaid.com

Item # FG3J1000

11/29/2006 11:13 FAX

ROA_01259

DIVISION 9 – FINISHES

STUCCO – FIRST EXTERIORS

First Exteriors, LLC
3285 Associate Drive
N. Charleston, SC 29418
Phone: (843) 207-1244
Fax:(843) 207-1242
E-mail:
EIFSMART Contractor

WARRANTY AGREEMENT

Project: Belle Hall Condominiums

Owner: Belle Hall Direct 101, LP
Contractor: TCR NC Construction I Limited Partnership

Subcontractor: First Exteriors

Subcontractor hereby expressly warrants and guarantees that all labor, materials, and equipment furnished and work performed in conjunction with the above referenced project are in accordance with the plans, specifications, the Subcontract Agreement and authorized modifications thereto. All labor, materials and equipment shall be free from defects, due to defective materials and/or workmanship, for a period of one (1) year from the date of Certificate of Occupancy for each building/structure, unless otherwise stated in the Subcontract Agreement.

Should any defects develop during the warranty period due to improper workmanship and/or arrangement, the same shall, upon notice, be made good by this Subcontractor at no expense to the Contractor, Owner, or Owner's Representative. Nothing in the above shall be deemed to apply to work or equipment which has been abused, neglected or altered by the Contractor, Owner, or Owner's Representative.

Unless otherwise stated in the Subcontract Agreement, warranty work shall be responded to within twenty-four (24) hours of notification by the Contractor, Owner, or Owner's Representative, including weekends and holidays. Warranty notices received before 10:00 am shall be responded to on the same day. Should Subcontractor fail to respond within twenty-four (24) hours of notification or correct the defective work or equipment within seventy-two (72) hours, the Contractor, Owner, or Owner's Representative shall proceed with the correction of the defective work. All costs associated with this corrective action shall be reimbursed by this Subcontractor or charged against its account. Subcontractor shall remit payment for such charges within five (5) calendar days of notification by the Contractor, Owner, or Owner's Representative.

Signature:

Printed Name: Carl A. Ulm

Position/Title: Manager

Date: 12-7-2006

RECEIVED
DEC 28 2006
By

Acrocrete
ARCHITECTURAL FINISHES

SERIAL NO.: 2006-A0042-CP3

DATE: 9/1/2006

MANUFACTURER'S ACROWALL-CP SYSTEM WARRANTY

ISSUED TO: BELLE HALL DIRECT 101 LP

PROJECT NAME: BELLE HALL CONDO'S

PROJECT LOCATION: MT. PLEASANT, SC

INSTALLED BY: First Exteriors, LLC

BASF Wall Systems, Inc. hereby warrants that its Stucco Wall System, when applied in strict accordance with written specifications, incorporated herein and made a part hereof and when applied to approved surfaces, will not within a period of three (3) years after application under normal weather conditions, prove to be defective. This warranty applies only to Acrocrete products and is void if the Acrocrete products are intermixed with other materials unless BASF Wall Systems, Inc. specifically approves those materials. BASF Wall Systems, Inc. makes no warranties whatsoever with respect to the finish coat supplied by others applied over Acrocrete materials. Furthermore BASF Wall Systems, Inc. makes no warranties whatsoever with respect to the workmanship involved in the application of any Acrocrete products warranted hereunder.

This warranty applies only to application on approved substrates and does not include cracking, failures caused by improper design, defective substrate, acts of God, falling objects, explosions, structural movement, fire, floods, chemical fumes or foreign substances in the atmosphere or insufficient or defective waterproofing between the Acrocrete products and non-Acrocrete products. No other warranties are made except those expressly described herein.

The exclusive and sole remedy under this warranty shall be that BASF Wall Systems, Inc. by way of damages will supply replacement materials without expense to the buyer.

Any claims under this warranty shall be made in writing addressed to BASF Wall Systems, Inc., within thirty (30) days from the date of the alleged failure. A representative of BASF Wall Systems, Inc. shall be given reasonable opportunity to inspect the alleged failure.

THIS WARRANTY IS EXCLUSIVE AND IS IN LIEU OF ANY IMPLIED WARRANTIES INCLUDING OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, WHETHER EXPRESS OR IMPLIED. BASF WALL SYSTEMS, INC. SHALL NOT BE LIABLE UNDER ANY CIRCUMSTANCES FOR ANY INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES TO ANY PARTY WHATSOEVER, INCLUDING, BUT NOT LIMITED TO, LOSS OF PROFITS OR DAMAGE TO THE BUILDING OR ITS CONTENTS. BASF Wall Systems, Inc. shall have no further obligation or liability of any kind regardless of the theory of liability, whether arising in contract, tort or strict liability, and it is further agreed and understood that the price stated for the Acrocrete materials is consideration for the limitation of BASF Wall Systems, Inc.'s liability hereunder. The sales personnel of BASF Wall Systems, Inc. are not authorized to make warranties about the merchandise described in this contract. THE ENTIRE CONTRACT IS EMBODIED IN THIS WRITING AND NO OTHER WARRANTIES ARE GIVEN BEYOND THOSE SET FORTH IN THIS WRITTEN CONTRACT. This writing constitutes the final expression of the parties' agreement, and it is a complete and exclusive statement of the terms of that agreement and supercedes all prior agreements, warranties, or statements regarding the project. This warranty shall become effective when all bills for the components of the system and application of the system have been paid. All materials included in the warranty must be purchased through an authorized BASF Wall Systems, Inc. representative.

BASF Wall Systems, Inc.

BY: Randall Donova

Director of Distribution and Technical Services

SQUARE FEET: 40,000

BASF Wall Systems, Inc. 3550 St. Johns Bluff, Jacksonville, Florida 32224
Tel. 800-221-9255 Fax 904-996-6041

BASF
The Chemical Company

DIVISION 9 – FINISHES

DRYWALL – DRY-TECH

WARRANTY AGREEMENT

Project: Belle Hall Condominiums

Owner: Belle Hall Direct 101, LP
Contractor: TCR NC Construction I Limited Partnership

Subcontractor: Dry-Tech

Subcontractor hereby expressly warrants and guarantees that all labor, materials, and equipment furnished and work performed in conjunction with the above referenced project are in accordance with the plans, specifications, the Subcontract Agreement and authorized modifications thereto. All labor, materials and equipment shall be free from defects, due to defective materials and/or workmanship, for a period of one (1) year from the date of Certificate of Occupancy for each building/structure, unless otherwise stated in the Subcontract Agreement.

Should any defects develop during the warranty period due to improper workmanship and/or arrangement, the same shall, upon notice, be made good by this Subcontractor at no expense to the Contractor, Owner, or Owner's Representative. Nothing in the above shall be deemed to apply to work or equipment which has been abused, neglected or altered by the Contractor, Owner, or Owner's Representative.

Unless otherwise stated in the Subcontract Agreement, warranty work shall be responded to within twenty-four (24) hours of notification by the Contractor, Owner, or Owner's Representative, including weekends and holidays. Warranty notices received before 10:00 am shall be responded to on the same day. Should Subcontractor fail to respond within twenty-four (24) hours of notification or correct the defective work or equipment within seventy-two (72) hours, the Contractor, Owner, or Owner's Representative shall proceed with the correction of the defective work. All costs associated with this corrective action shall be reimbursed by this Subcontractor or charged against its account. Subcontractor shall remit payment for such charges within five (5) calendar days of notification by the Contractor, Owner, or Owner's Representative.

Signature: Edward G. Clarke

Printed Name: EDWARD G. CLARKE

Position/Title: OWNER

Date: 12-12-06

VOL I

DIVISION 9 – FINISHES

TILE/HARDWOOD FLOORING – FLOORING SERVICES

WARRANTY AGREEMENT

Project: Belle Hall Condominiums

Owner: Belle Hall Direct 101, LP
Contractor: TCR NC Construction I Limited Partnership

Subcontractor: Flooring Services

Subcontractor hereby expressly warrants and guarantees that all labor, materials, and equipment furnished and work performed in conjunction with the above referenced project are in accordance with the plans, specifications, the Subcontract Agreement and authorized modifications thereto. All labor, materials and equipment shall be free from defects, due to defective materials and/or workmanship, for a period of one (1) year from the date of Certificate of Occupancy for each building/structure, unless otherwise stated in the Subcontract Agreement.

Should any defects develop during the warranty period due to improper workmanship and/or arrangement, the same shall, upon notice, be made good by this Subcontractor at no expense to the Contractor, Owner, or Owner's Representative. Nothing in the above shall be deemed to apply to work or equipment which has been abused, neglected or altered by the Contractor, Owner, or Owner's Representative.

Unless otherwise stated in the Subcontract Agreement, warranty work shall be responded to within twenty-four (24) hours of notification by the Contractor, Owner, or Owner's Representative, including weekends and holidays. Warranty notices received before 10:00 am shall be responded to on the same day. Should Subcontractor fail to respond within twenty-four (24) hours of notification or correct the defective work or equipment within seventy-two (72) hours, the Contractor, Owner, or Owner's Representative shall proceed with the correction of the defective work. All costs associated with this corrective action shall be reimbursed by this Subcontractor or charged against its account. Subcontractor shall remit payment for such charges within five (5) calendar days of notification by the Contractor, Owner, or Owner's Representative.

Signature:

Printed Name: Jackie Blackmon

Position/Title: Treasurer

Date: 12/06/06

HOME FOUNDATIONS

SPECIFICATION DATA

Style Name:	RECORD BREAKER (S)
Style Number:	HF712
Construction:	TEXTURED CUT PILE
Fiber Content:	100% EVERTOUCH CONTINUOUS FILAMENT NYLON
Face Weight ozs/yd2:	31.20
Finished Pile Thickness inches:	0.5
Gauge:	5/32
Tufts per inch:	8
Primary Backing:	POLYPROPYLENE
Secondary Backing:	POLYPROPYLENE
Total Weight ozs/yd2:	66.0
Density ozs/yd3:	2246
Twist Information:	7.65
Width:	12' 0"
Number of Colors:	12
Dye Method:	CONTINUOUS DYED
Applications:	
Pattern Repeat:	
Star Rating:	
Special Features:	...FOR STAIN REMOVAL ASSISTANCE CALL 1-800-441-7429 .....R2X

PRODUCT DATA

Flammability:	
Pill Test(CPSC FF1-70):	PASS
NBS Smoke Density (ASTM-E662):	
Flaming Mode:	
Non Flaming Mode:	
Static:	
Type Static Control:	TOPICAL
FHA DATA UM44D:	MEA 51247
Type:	I
Class:	1
Texture:	F
Warranties:	10 YEAR R2X STAIN AND SOIL 10 YEAR QUALITY ASSURANCE
CRI Certification:	15488878
Durability Rating:	3.5

HOME FOUNDATIONS

SPECIFICATION DATA

Style Name:	VILLAGE CREST (S)
Style Number:	HGT62
Construction:	BERBER PATTERN LOOP
Fiber Content:	100% ANSO CARESS BCF NYLON W/R2X
Face Weight oz/yd2:	46.80
Finished Pile Thickness inches:	0.4
Gauge:	5/32
Tufts per inch:	10
Primary Backing:	POLYPROPYLENE
Secondary Backing:	SOFTBAC PLATINUM
Total Weight oz/yd2:	87.0
Density oz/yd3:	4212
Twist Information:	9.0
Width:	12' 0"
Number of Colors:	16
Dye Method:	CONTINUOUS DYED
Applications:	
Pattern Repeat:	3/4"W X 3/4"L
Star Rating:	
Special Features:	FOR STAIN REMOVAL ASSISTANCE CALL HONEYWELL 1-800-441-8185

PRODUCT DATA

Flammability:	
Pill Test(CPSC FF1-70):	PASS
NBS Smoke Density (ASTM-E662):	
Flaming Mode:	
Non Flaming Mode:	
Static:	
Type Static Control:	TOPICAL
FHA DATA UM44D:	MEA 51135
Type:	I
Class:	1&2
Texture:	B
Warranties:	ANSO CARESS:10 YEAR SOIL & STAIN, 5 YEAR TEXTURE SOFTBAC PLATINUM NO RESTRETCH 10 YEAR QUALITY ASSURANCE CALL 1-800-441-7429
CRI Certification:	
Durability Rating:	4.25

HOME FOUNDATIONS

SPECIFICATION DATA

Style Name:	BEST BET I 12'
Style Number:	HF727
Construction:	TEXTURED CUT PILE
Fiber Content:	100% STAPLE NYLON
Face Weight oz/yd2:	38.00
Finished Pile Thickness Inches:	0.6
Gauge:	1/8
Tufts per Inch:	6
Primary Backing:	POLYPROPYLENE
Secondary Backing:	POLYPROPYLENE
Total Weight oz/yd2:	74.0
Density oz/yd3:	2736
Twist Information:	4.5
Width:	12' 0"
Number of Colors:	36
Dye Method:	CONTINUOUS DYED
Applications:	
Pattern Repeat:	
Star Rating:	
Special Features:	...FOR STAIN REMOVAL ASSISTANCE CALL 1-800-441-7429 ...R2X

PRODUCT DATA

Flammability:	
Pill Test(CPSC FF1-70):	PASS
NBS Smoke Density (ASTM-E662):	
Flaming Mode:	
Non Flaming Mode:	
Static:	
Type Static Control:	TOPICAL
FHA DATA UM44D:	MEA 51271
Type:	I
Class:	1&2
Texture:	F
Warranties:	10 YEAR RZX STAIN AND SOIL 10 YEAR QUALITY ASSURANCE
CRI Certification:	1488878
Durability Rating:	3

HOME FOUNDATIONS

SPECIFICATION DATA

Style Name:	WALDEN PARK
Style Number:	HF718
Construction:	BERBER LOOP
Fiber Content:	100% EVERTOUCH BCF NYLON
Face Weight ozs/yd2:	32.00
Finished Pile Thickness inches:	0.26
Gauge:	5/32
Tufts per inch:	8
Primary Backing:	POLYPROPYLENE
Secondary Backing:	POLYPROPYLENE
Total Weight ozs/yd2:	68.0
Density ozs/yd3:	4431
Twist Information:	3.2
Width:	12' 0"
Number of Colors:	20
Dye Method:	CONTINUOUS DYED
Applications:	
Pattern Repeat:	5/8"W X 1 1/4"L HD
Star Rating:	
Special Features:	...FOR STAIN REMOVAL ASSISTANCE CALL 1-800-441-7429. .....R2X

PRODUCT DATA

Flammability:	
Pill Test(CP SC FF1-70):	PASS
NBS Smoke Density (ASTM-E662):	
Flaming Mode:	
Non Flaming Mode:	
Static:	
Type Static Control:	TOPICAL
FHA DATA UM44D:	MEA 51295
Type:	I
Class:	1
Texture:	B
Warranties:	10 YEAR R2X STAIN AND SOIL 10 YEAR QUALITY ASSURANCE 5 YEAR TEXTUREGARD CALL 1-800-441-7429
CRI Certification:	
Durability Rating:	3.75

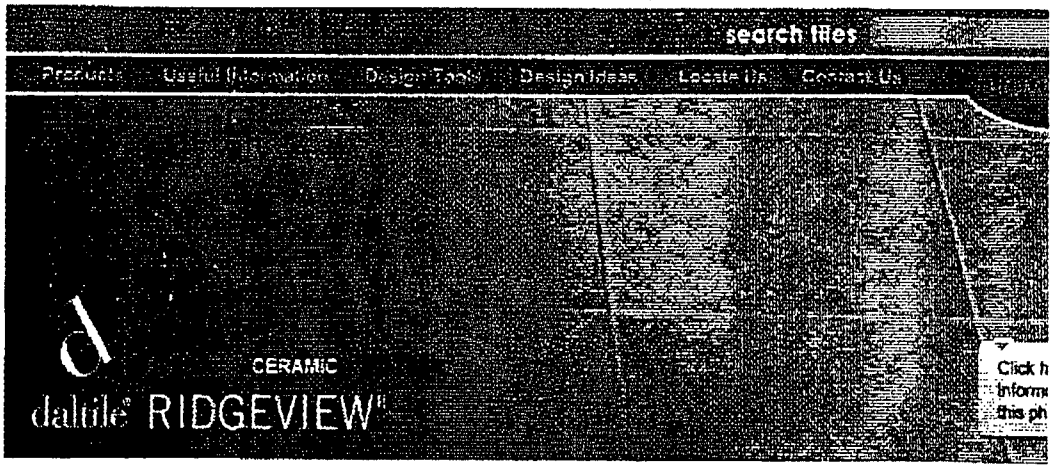
HOME FOUNDATIONS

SPECIFICATION DATA

Style Name:	VIPER
Style Number:	HF255
Construction:	"STAIN SAFETY" SAXONY CUT PILE
Fiber Content:	100% CONTINUOUS FILAMENT NYLON
Face Weight ozs/yd2:	24.40
Finished Pile Thickness inches:	0.52
Gauge:	5/32
Tufts per inch:	9
Primary Backing:	POLYPROPYLENE
Secondary Backing:	POLYPROPYLENE
Total Weight ozs/yd2:	56.0
Density ozs/yd3:	1689
Twist Information:	9.7
Width:	12' 0"
Number of Colors:	30
Dye Method:	CONTINUOUS DYED
Applications:	
Pattern Repeat:	
Star Rating:	
Special Features:	...FOR STAIN REMOVAL ASSISTANCE CALL 1-800-441-7429

PRODUCT DATA

Flammability:	
Pill Test(CP SC FF1-70):	PASS
NBS Smoke Density (ASTM-E662):	
Flaming Mode:	
Non Flaming Mode:	
Static:	
Type Static Control:	TOPICAL
FHA DATA UM44D:	MEA 30776
Type:	I
Class:	1
Texture:	F
Warranties:	10 YR QUALITY ASSURANCE 5 YEAR STAIN SAFETY
CRI Certification:	15488678
Durability Rating:	2.75



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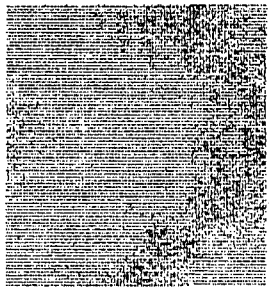
Products » Tile Catalog » Ridgeview™

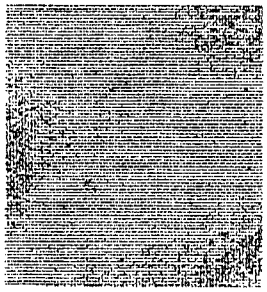
PRINTER

Field Tile

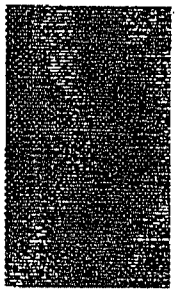
Cream
RD01
Zoom
Add to Favorites
Order Sample



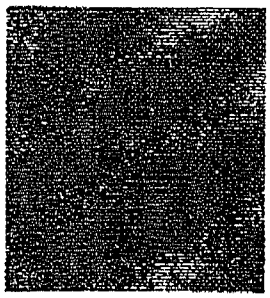
Beige
RD02
Zoom
Add to Favorites
Order Sample



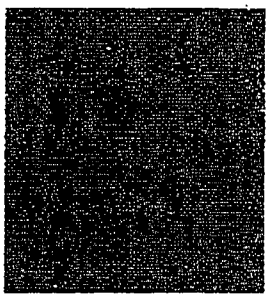
Light Gold
RD03
Zoom
Add to Favorites
Order Sample



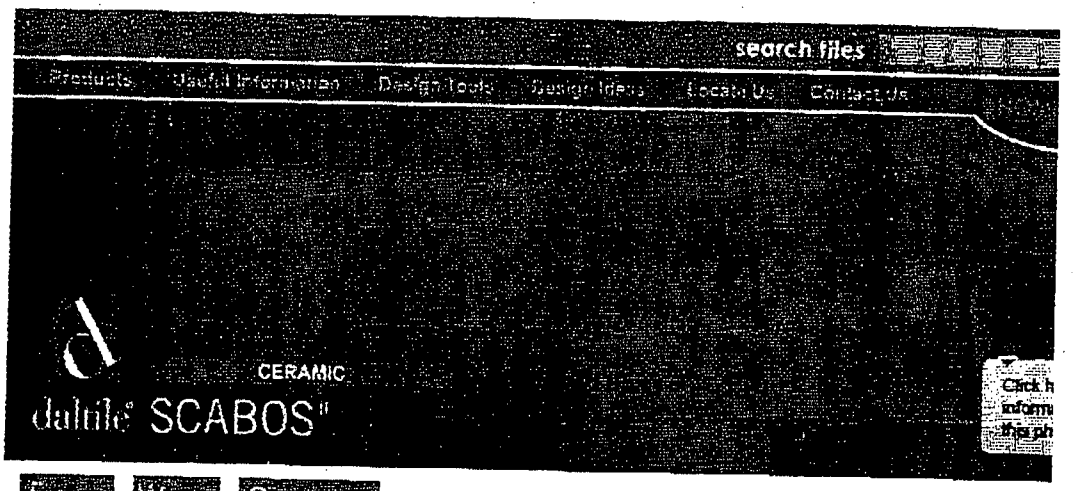
Warm Green
RD04
Zoom
Add to Favorites
Order Sample



Rust
RD05
Zoom
Add to Favorites
Order Sample



Blue/Gray
RD06
Zoom
Add to Favorites
Order Sample



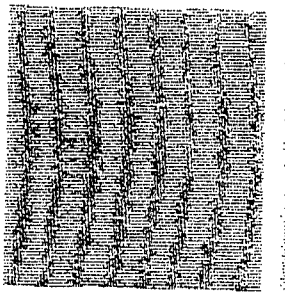
Back to Search Results Start a l

Products » Tile Catalog » Scabos™

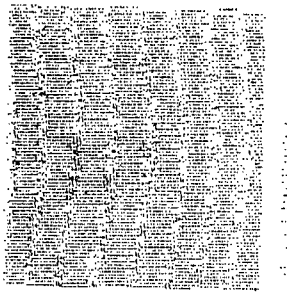
PRINTER

Floor & Wall Field Tile

Cream
SC40
Zoom
Add to Favorites
Order Sample



Walnut
SC42
Zoom
Add to Favorites
Order Sample



Beige
SC41
Zoom
Add to Favorites
Order Sample

Warm Gray
SC43
Zoom
Add to Favorites
Order Sample

Floor Decorative Accents

Cream Floral Border
SC40

Cream Floral Corner
SC40

Beige Floral Border
SC41

Beige Floral Co
SC41

Dec. 5. 2006 7:53AM Flooring Services Inc. No. 9348 P. 9
Saltillo Tile Care & Maintenance

care and maintenance

Routine Tile Care
Wipe glazed wall tiles periodically using a cloth or sponge dampened with a non oil-based household cleaner. Vacuum glazed floor tiles regularly to remove dirt and other gritty particles, then damp mop or sponge with an all-purpose non oil-based cleaner. Do not to use ammonia, it will discolor grout.

Clean unglazed wall and floor tiles in a similar manner using a solution of water and soapless detergent instead of an all-purpose cleaner.

Saltillo Tile: See Care and Maintenance Brochure or Daltile website for important product information.

Grout Care
Once the tile has been cleaned and dried (shortly after installation), grout joints should be treated with a silicone sealer. Grout, is porous and sealing it will simplify future maintenance (Epoxy grouts do not require a sealer). We recommend you apply a sealer at least twice a year for maximum stain protection.

Heavy-Duty Cleaning
Clean glazed wall tiles with a scouring powder or all-purpose cleaner applied to a non-metallic pad. Rinse and wipe dry.

For glazed floor tiles, use a commercial tile cleaner, or apply a strong solution of an all-purpose non oil-based cleaner or scouring powder paste. Let stand for five minutes, brush, rinse with clean water and wipe dry.

For heavy-duty cleaning of unglazed wall tiles, make a paste of scouring powder. Apply to surface and let stand for five minutes. Scour with brush, rinse, and wipe dry.

Unglazed floor tiles can also be cleaned with a scouring powder paste. Let stand for five minutes before scouring with a brush. Rinse and wipe dry. A small brush is suitable for most floors. You may want to use a scrubbing machine for large areas. To clean badly soiled countertops, apply a solution of scouring powder and very hot water. Let stand for five minutes, scrub with a stiff brush and rinse.

Commonly available tile cleaning products can be used to remove soap scum, hard-water deposits and mildew stains. These products are available at local supermarkets or home service centers.

For soft water, use an all-purpose non oil-based cleaner. Allow cleaner to stand for five minutes before lightly scrubbing with a sponge. Rinse well.

Purchasing Maintenance Products
Tile cleaning products and sealers may be purchased at your local home center or floor covering store. Consult the manufacturer of the cleaner for usage instructions and more detailed information for the impact of their cleaning solution on your tile product.

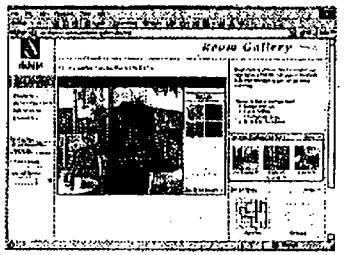
Do's and Don'ts

- Do not use cleansers containing acid or bleach for routine maintenance.
- Do not use wax cleaners, oil-based detergents or sealants to maintain your tile (sealants may be used on grout joints).
- Do not use harsh cleaning aids like steel wool pads or any scouring pads containing metal.
- Do not use a cleaning agent that contains color (unglazed tile only).
- Do test scouring powders on a small area first.
- Do use a sealer on grout joints.
- Do have a damaged or broken tile removed and replaced only by a qualified tile contractor.

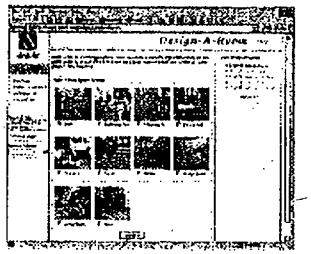
For more information on slip resistance, care and maintenance or technical data, methods and measurements, see Daltile's Website.

DALTILE on the Web – www.daltile.com

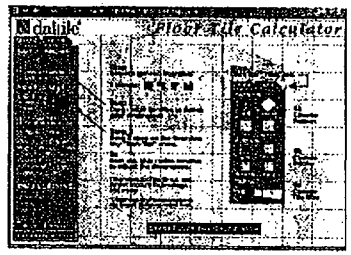
The Daltile line of products is constantly evolving. To see the latest Daltile products and what's new in the world of design, we invite you to visit www.daltile.com. Our easy-to-navigate and informative website contains complete information about hundreds of product choices and is filled with interactive innovations that make selecting the right tile an enjoyable process.



The **Room Gallery** will inspire you by simply pointing and clicking. You'll move from room to room with ease, finding new ways to design with tile. You will have the ability to visit a more detailed page of the stylish tiles used for each room you visit.



The **Design-A-Room** feature creates a 3-D representation of your selections in a room scene — enabling you to better see the interplay of size, shape, hue, pattern and texture. It's just what you would expect from the people who know tile better than anyone.



The **Floor Tile Calculator** helps you determine specifications for any project, large or small. Simply identify your room shape and tile size,then select your pattern. We'll tabulate your total square footage plus the amount of grout and thin-set needed. Sounds easy? It is.

important product information

ceramic tile s

The **Ceramic Tile Studio** is an easy experience a wide range of Daltile pro a "real life" grouted manner to help you will look in your home. You'll find it at ot Studio Dealers — knowledgeable floor can help you define your style. For the Dealer nearest you, call 1.800.933.TIL www.daltile.com.

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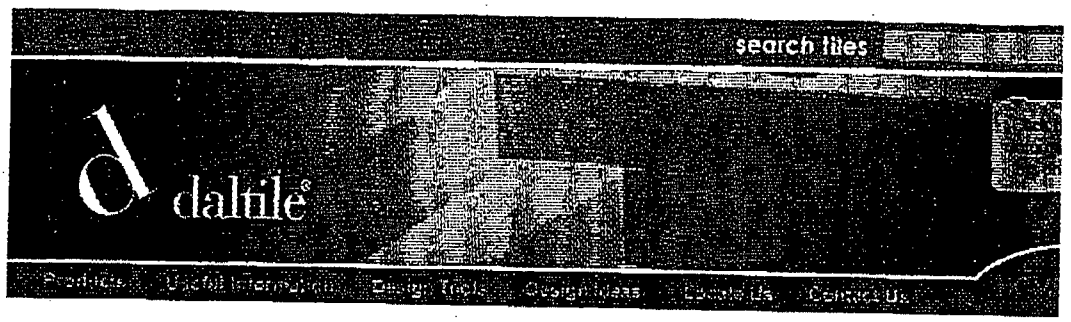

TILE CARE

Useful Information » Tile Care

Ceramic Tile:
» Routine Care
» Grout Care
» New Installation

Natural Stone:
» Routine Stone Care
» New Installation

Saltillo Tile:
» Routine Care

Ceramic Tile - Routine Care

Contaminants and spills on a glazed ceramic tile are, generally, easier to clean then other, more impervious surfaces. ***Glazed tile products should be cleaned routinely with an all-purpose, non oil-based household or commercial cleaner.*** The product chosen should also be grout joint cleaning compatible. The type of product may vary depending on the tile application and use. A multipurpose spray cleaner, which removes soap scum, hard water deposits, and mildew designed for every day use, can be used on wall tile areas in residential baths and showers.

The entire area should be cleaned and scrubbed with cleaner solution through the use of a cotton mop, cloth, sponge, or non-metallic brush. The entire area should be rinsed with clean water to remove any cleaning solution residue. Remember that you should sweep or vacuum floor areas prior to cleaning to remove any dust or debris. Routine cleaners should never contain acids or ammonia. Acids can damage the grout and the glazed surface of the tile, and ammonia can discolor the grout.

Unglazed tile should be cleaned routinely with concentrated tile cleaners that have a neutral pH for safe regular use. These cleaners are better suited at removing grease, oils and normal spills from unglazed products. Again these products will vary depending on the application, amount of traffic and the use. The product chosen should also be compatible with cleaning the grout joints at the same time.

Removal of Sealers/Waxes/Floor Finishes:
If you need to remove a topical sealer or floor wax from a ceramic tile you should use a Tile Sealer & Adhesive remover. Always test a small area first. Apply a liberal amount of undiluted sealer & adhesive remover to a manageable area. Allow setting without drying until coating or residue softens. Reapply if necessary until sealer softens and can be removed. If necessary, agitate with white nylon scrub pad. Wipe up the residue with a cotton towel or sponge. Rinse thoroughly with clean water. Do not use on natural stone products.

» Disclaimer

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important product legal information

Purchaser understands that all tile is subject to variations in technical specifications, including coefficient of friction, as represented in this catalog due to inherent variables in the raw materials and production process. Purchaser further understands that test results on a particular product may vary slightly from tile to tile, and from test to test. Test results disclosed in this catalog are not guarantees of minimum or maximum thresholds of performance. Tile containing abrasives create a "rough" surface. While this condition enhances slip resistance, it creates cleaning challenges because dirt and other contaminants become lodged in the surface. Extra attention is necessary to assure contaminants are removed promptly. Purchaser understands that natural stone products, such as marble and granite, are inherently subject to variations in shading, markings and coefficient of friction. Purchasers acknowledge that they will inspect and accept shipments with the full knowledge and understanding that any claims concerning the acceptability of the product must be presented to Dal-Tile Corporation and resolved prior to installation. Unless specifically stated otherwise, tile that Dal-Tile Corporation recommends for floor or wall applications refers to interior applications only. Dal-Tile does not recommend its products for use on ceilings or roofs. Check local building codes prior to specification or installation to verify that the specified technical characteristics comply with all required parameters. Color samples as shown may not be an exact product match. Dal-Tile Corporation explicitly disclaims any liability resulting from product selections that rely solely upon the color samples reprinted in product literature. Contact your Daltile® representative for actual product samples prior to selection. Use constitutes acceptance.

Legal Notice: Warning Tile and installation products contain chemicals known to the state of California to cause cancer, birth defects, reproductive harm, respiratory harm or other health problems. For more product-specific information on chemical content, obtain an MSDS at www.daltileproducts.com/msds or contact Daltile at 800.833.TILE.

limited warranty

Dal-Tile Corporation warrants only to the original purchaser that for a period of one year after the date of purchase, Dal-Tile Corporation will replace any of its manufactured products which are proven to be defective.

TO MAKE A CLAIM:

1. The original purchaser must notify a Dal-Tile Sales Service Center or an authorized representative in writing within 60 days of the occurrence of any defect.
2. After notification, Dal-Tile or an authorized representative will inspect and/or test the product for defect and complete a Product Claim Action form. No claim will be honored without product inspection by Dal-Tile or an authorized representative.
3. Upon determination that product defect claim is valid, Dal-Tile will notify the purchaser in writing. Dal-Tile reserves the right to repair, replace or refund the originally-purchased product.

factors to consider prior to installation

1. Absent an exception below indicating otherwise, glazed floor tiles and porcelain tiles should not be used in floor applications where there is a consistent surface presence of water, oil, or grease. This includes outdoor areas.
2. Proper Maintenance is critical. Improper maintenance and improper maintenance products can result in a build-up on the surface of the tile causing the tile to be slippery. See maintenance recommendations on page 91.
3. Professional restaurateurs use special floor cleaning machines and cleaners to assure removal of contaminants, which are critical to maintain slip resistance in dining areas. Restaurant and commercial kitchen applications are considered high-risk areas subject to floor contamination by substances that increase slipping. Dal-Tile does not recommend the use of glazed floor tile or porcelain tile in a commercial kitchen unless the COF exceeds .80 wet. The use of a glazed floor tile in a dining room of a restaurant is subject to the same risk factors. A glazed floor tile or porcelain tile may be suitable for the dining area if: (a) the COF meets or exceeds .60 wet, AND (b) the utmost care is taken to properly clean the floor and minimize the presence of water.
4. Pool decking has a continuous exposure to standing water and Dal-Tile does not recommend glazed floor tile or porcelain tile on pool decks unless the surface (1) has minimal glaze, (2) COF meets or exceeds .60 wet, (3) has a textured surface, and (4) is not polished or semi-polished. Proper drainage is a necessary pre-requisite for all pool decking tile applications.
5. Exterior applications, excluding pool deckings, are considered to have a continuous exposure to standing water due to weather conditions. Glazed and unglazed ceramic and porcelain tiles are not recommended for exterior floor applications unless the tile surface: (1) COF meets or exceeds 0.60 wet, (2) is textured, (3) is not polished or semi-polished. NOTE: Exterior areas require extra attention to minimize slippery conditions including proper drainage, systematic clean up of wet or contaminated conditions, and regular inspection of tiled floor surface to assure immediate correction of wet or contaminated conditions.
6. Slippery conditions can be minimized by (1) limiting foot traffic in wet conditions, (2) prompt removal of contaminants, (3) effective drainage, and (4) proper maintenance.
7. Polished and semi polished surfaces create a very smooth surface. Dal-Tile does not recommend polished surfaces in any areas subject to water, oil, or grease exposures.
8. Ramped surfaces, irrespective of the degree of incline, requires a more slip resistant surface for safety purposes. Dal-Tile recommends a minimum of COF .80 wet on all ramps or inclined flooring.
9. Test Methods - there are many different test methods for slip resistance. The tile industry uses ASTM C1028. Dal-Tile recommends that customers have tile independently tested to determine if the Dal-Tile product meets the requirements of the customer's preferred test method (if other than ASTM C1028) prior to product selection. Be sure to test competitor's products under any preferred alternative method for comparison purposes. Dal-Tile does not warrant that any of its products will meet any testing parameter other than that measured by ASTM C1028.
10. No floor tile is "slip proof."

ENGINEERED HARDWOOD FLOORS
Glue, Staple Or Nail Down Installation

Floating Installations
Only the following Engineered floors can be floated:
5/16" African Village, 3/8", ¾" and ½" that is 3" or wider

Columbia Engineered Hardwood Floors can be installed over most subfloors, and are engineered to be dimensionally stable, making them suitable for installation over all grade levels. See all information and installation guidelines below.

ATTENTION – INSTALLER/OWNER RESPONSIBILITY

Inspect **ALL** materials carefully **BEFORE** installation. Wood is a natural product containing natural characteristics such as natural variations in color, tone and graining. Some variation in color is to be expected in a natural wood floor. Even though our product goes through many inspections before it leaves the plant, it is the customer's and the installer's responsibility for final inspection prior to installation. **Warranties DO NOT cover materials with visible defects once they are installed.** There may be some regional differences used by your installer that may be correct, yet vary slightly from these instructions. (ie.use of felt, rosin paper or polyethylene film).

TOOLS

Basic tools and accessories: broom or vacuum, chalk line, tapping block, Columbia Flooring Cleaner, hand or electric jam saw, miter saw, moisture meter, safety glasses, dust mask, straight edge, table saw, tape measure, 3M Blue Tape, square, utility knife, pry bar, wedges, mineral spirits. Use Columbia's Urethane Wood Flooring Adhesive with our Columbia Flooring Urethane Remover, and the appropriate Columbia trowel. See trowel recommendation under step 2 of glue down installation. Use a Bostitch Floor Runner (S97125- LHF or S3297- LHF) with 20 gauge 1" or 1 ¼" staple) or a Power Nailer #200 or #250 for nailing with a 1", 1-1/4"or 1-1/2" power cleat. (Note: you must use a 3/8" or ½" adapter as appropriate with the Power Nailer.

Caution: Improper use of a power nailer can mark the surface of the flooring.

WOOD DUST

Sawing, sanding or machining wood products can produce wood dust, which can cause a flammable or explosive hazard. Wood dust may cause lung, upper respiratory tract, and eye and skin irritation. Some wood species may cause dermatitis and/or allergic respiratory effects. The International Agency for Research on Cancer (IARC) has classified wood dust as a nasal carcinogen in humans. The National Toxicology Program (NTP) has also classified wood dust as a known human carcinogen.

- Avoid dust contact with ignition source.
- Sweep or vacuum dust for recovery or disposal.
- Avoid prolonged or repeated breathing wood dust in air. Approved respirators may be needed depending upon dust conditions.
- Avoid dust contact with eyes and skin. Wear gloves and safety glasses when handling and machining the product.
- FIRST AID: If inhaled, remove to fresh air. If irritation persists, contact a physician.

JONSITE CONDITIONS

Hardwood flooring is designed to perform in an environmentally controlled structure. It is the responsibility of the installer/owner to determine if the job site subfloor and job site conditions are environmentally and structurally acceptable for wood floor installation at "normal living conditions". The manufacturer

declines any responsibility for wood failure resulting from or connected with subfloor, subsurface, job site damage or deficiencies after hardwood flooring has been installed. All substrates must be **clean, dry, structurally sound and flat.**

HUMIDITY

"Normal living conditions" are defined as having the relative humidity (air) being monitored and maintained at 35% to 55%, and the moisture content of the flooring at 6% to 9%, with a tolerance of +/- 1%. The proper use of a humidifier/de-humidifier is recommended. Wood that is too dry may "crack" or "check". Wood that is too damp will increase in width, causing "cupping" or crowing". A moisture content that is too high may also lead to mildew in extreme conditions. These situations are job site related and not considered a manufacturing defect.

SUBFLOOR PREPARATION AND RECOMMENDATIONS FOR ALL INSTALLATIONS

Concrete Subfloors

New concrete slabs require a minimum of 60 days drying time before covering them with a wood floor. (Must be fully cured)

Lightweight concrete

Lightweight concrete that has a dry density of 100 pounds or less per cubic foot is not suitable for engineered wood floors. Many products have been developed as self-leveling toppings or floor underlayments. These include cellular concrete, resin-reinforced cement underlayments, and gypsum-based materials. Although some of these products may have the necessary qualifications of underlayment for wood flooring installations, others do not.

To test for lightweight concrete, scrape a coin or key across the surface of the subfloor. If the surface powders easily or has a dry density of 100 pounds or less per cubic foot, do not install this Engineered Wood floor.

Concrete subfloors must be dry, smooth (level within 3/16 "in a 10 foot. Radius – 1/8 "in 6 ') and free of structural defects. Hand scrape or sand with a 20-grit #3-1/2 open face paper to remove loose, flaky concrete. Grinding high spots in concrete is recommended over using filling compounds. However if a filling/leveling compound is used, it must be of a Portland base compound (min. 3,000 p.s.i.) with a high compressive strength. Concrete must be free of paint, oil, existing adhesives, wax, grease, dirt, sealers, and curing compounds. These may be removed chemically or mechanically, but do not use solvent-based strippers under any circumstances. The use of residual solvents can prohibit the satisfactory bond of flooring adhesives.

It is important to ensure a proper bond between the adhesive and the concrete, and planks or strips. Columbia hardwood flooring may be installed on grade, above grade, as well as below grade where moisture conditions do not exist.

To ensure a long lasting bond, make sure that the perimeter of the foundation has adequate drainage and vapor barrier.

Wood subfloors

Wood subfloors need to be well nailed or secured with screws. Nails should be ring shanks and screws need to be counter sunk. The wood subfloor needs to be structurally sound (meaning subfloors without loose boards, vinyl or tile). They should not exceed 14% moisture prior to installation. If the sub-floor is single layer, less than ¾" thick, add a single cross layer for strength and stability (minimum 3/8" thick for a total 11/8" thickness). This is to reduce the possibility of squeaking. Wood sub-floors must be free of paint, oil, existing adhesives, wax, grease, dirt and urethane, varnish etc. Underlayment grade OSB (performance rated) is also a suitable subfloor. **Particleboard is not an acceptable subfloor for staple or nail down installation,** but can be used as a subfloor in glue down installations. When installing over existing wood flooring, install at right angles to the existing floor.

Subfloor moisture check

The recommended wood flooring adhesive may be used for above, on, and below grade applications and on all common substrates. On and below grade applications are susceptible to moisture and should be tested for moisture prior to installation in several locations within the installation area. Acceptable conditions for above, on, and below grade applications are:

- Less than 3lbs./1000 sq. ft./24 hrs. on a calcium chloride test.
- No greater than a reading of 5 on a Tramex Concrete Moisture Encounter (moisture meter).
- Wood Substrates must have a moisture reading of less than 14% when using a moisture meter.

To correct any subfloor problems concerning moisture, either wait until the subfloor dries to meet specifications or use an appropriate moisture barrier. For more information concerning moisture conditions, contact Columbia's technical service department.

Subfloors other than wood or concrete

Note: Perimeter glued resilient vinyl and rubber tiles are unacceptable underlayments and must be removed.

Terrazzo, tile and any other hard surfaces that are dry, structurally sound and level, as described above, are suitable as a subfloor for this Engineered hardwood flooring installation. As above, the surface must be sound, tight and free of paint, oil, existing adhesives, wax, grease and dirt. Terrazzo and ceramic tile must be scuffed to assure adhesion.

WARNING! Do not sand existing resilient tile, sheet flooring backing, or felt linings. These products may contain asbestos fibers that are not readily identifiable. Inhalation of Asbestos dust can cause Asbestosis or other serious bodily harm. Check with local, state and federal laws for handling hazardous material before attempting the removal of these floors.

Radiant Heated Subfloors

Before installing over a radiant heated floor turn off heat and wait until the floor has reached room temperature (70°F-75°F). After installing the floor, gradually return the heat to the previous setting.

Note: When radiant heat is installed in concrete, mortar beds, or gypsum cement, it is very important to operate the heating system until these are completely dry before you install your wood flooring on top. (This can take several weeks. Be patient.) Operate the heating system until the humidity in the structure stabilizes to the average level expected for the area in which the wood floor will be installed. Then allow wood to acclimate to this humidity level before installation. This will minimize dimensional changes due to moisture.

For more information on Radiant Heated Subfloors go to www.NOFMA.org

Caution: The subfloor surface must never exceed 85° F. in temperature.

PREPARATION

Remove all moldings and wall-base and undercut all door casings with a hand or power jam saw using a scrap piece of flooring as a guide.

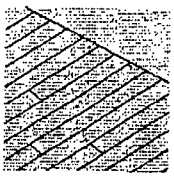


Figure 1A

"Racking the Floor"

Whether you choose to install the floor with glue, nails, or staples start by using random length planks from the carton or by cutting four to five planks in random lengths, differing by at least 6". As you continue working across the floor be sure to maintain the 6" minimum between end joints on all adjacent rows. (See Figures 1A & 1B). Never waste material; use the left over pieces from the fill cuts to start the next row or to complete a row.

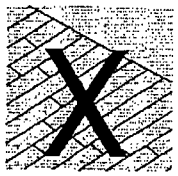


Figure 1B

Note: When installing a pre-finished wood floor be sure to blend the wood from several cartons to ensure a good grain and shading mixture throughout the installation.

GLUE DOWN INSTALLATION GUIDELINES

There are two ways to install when using Columbia's Urethane Adhesive (wet lay, meaning to lay directly into wet adhesive, which is the quickest method for installing, and dry-lay, meaning to allow the adhesive to flash or to tack up, which provides a green grab and less opportunity for floor movement prior to curing.) When using the Columbia Urethane Adhesive either method is acceptable.

Caution: Whether you choose to install using the dry or wet method follow all guidelines. By not adhering to the guidelines, you can void your flooring warranties.

Wet Lay Method

Step 1 – Getting Started

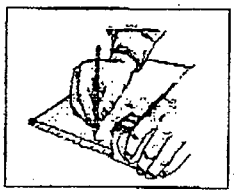


Figure 2

Select a starter wall. It is recommended to start the installation along an exterior wall; it's more likely to be straight and square with the room. Measure out from the wall the width of two planks (See Figure 2) and mark each end of the room and snap your chalk line. Secure a straight edge on the chalk line before you spread your adhesive to ensure alignment, which is a critical part of the installation. This prevents movement of the planks that can cause misalignment.

Step 2 – Spreading The Adhesive

Using the recommended trowel (See Chart 1) at a 45° angle (See Figure 3) to get the proper spread of adhesive applied to the subfloor is important, by doing so will produce a proper and permanent bond. Improper bonding can cause loose or hollow spots.

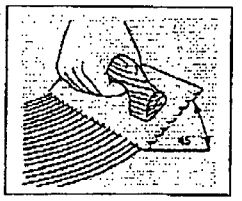


Figure 3

Spread adhesive from the straight edge out about 2 ½' (30 in.). Working in small sections is helpful for this method as it will allow you to reach across the adhesive to install the wood flooring without putting any weight on it and will ensure proper transfer of the adhesive to the wood flooring.

Chart 1

Trowel Recommendation				
Maximum thickness 9/16 engineered				
Width	Trowel	Adhesive		Spread Rate
			CF Urethane	
3" or less	3/16" x 5/16" x 1/4"		•	App. 45 -50 sq. ft. p/gal.
Greater than 3"	3/16" x 3/16" x 1/4"		•	App. 45-50 sq. ft. p/gal.
Greater than 5"	3/16" x 3/16" x 3/16" square notch			App. 40 sq ft. p/gal.

Note: Change the trowel every 2000 to 3000 square feet due to wear down of the notches. This assures you always get the proper spread of adhesive.

Step 3 – Install Your Starter Rows

Install the first row of starter planks with the tongue side of the plank facing the straight edge and secure into position. Pull in tight together at seams and tape with 3M Blue Mask Tape to prevent movement and continue with installation. Do not leave the tape on the floor over 24 hours.

Note: The planks along the wall may have to be cut to fit since most walls are not straight and recommend leaving a 1/2" expansion space.

Step 4 – Job Completion

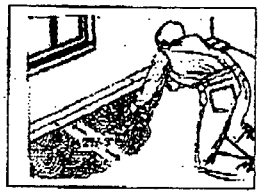


Figure 4

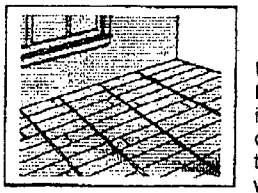
Once the starter rows are secure spread 2-1/2 feet of adhesive the length of the room (See Figure 4). Never spread more adhesive than can be covered using the open time recommendation listed in the instructions on the adhesive label, with Columbia Flooring Urethane Adhesive. Never lay planks and strips further than you can comfortably reach.

Place tongue into groove of Planks and press firmly into Adhesive. Never slide planks through adhesive.

Note: The use of laminate strips on hardwood flooring may cause damage to the floor.

Test for proper bond by occasionally lifting a board and looking for good coverage (90%), and then replace it into the adhesive.

Clean any adhesive off the surface before it cures. If cured use Columbia's Urethane Adhesive Remover.



Use 3M Blue Mask Tape (See Figure 5) to hold planks securely in place as you are installing and continue the process throughout the installation. Use caution when using a rubber mallet to butt material together, as it can burnish the finish and cause marring.

Note: Never work on top of the flooring when installing with the wet lay method.

Dry Lay Method

Step 1 – Getting Started

Start by selecting your starter wall and measure out from the wall 27" when installing 2-1/4" strip flooring and 30" when installing 3" or 5" planks (See Figure 6). This will allow adequate working space. Snap chalk line.

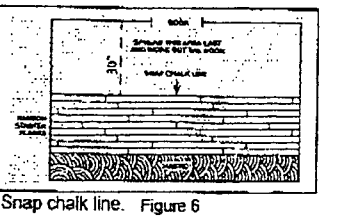


Figure 6

Step 2 – Spreading The Adhesive

Apply adhesive from the chalk line out 2½ feet. When using the Columbia Flooring Urethane Adhesive allow adhesive to flash as per the instructions. (See Chart 2 below) Secure your starter rows with a straight edge (2'x 4's). See step 3 in the wet lay method. Install planks and secure with 3M Blue Mask Tape as you continue throughout your installation. If you must work on top of newly laid flooring, use a kneeling board.

Chart 2

SUBSTRATE	CONDITIONS					
Plywood/OSB	Hot & Dry	Ambient & Dry	Cold & Dry	Hot & Humid	Ambient & Humid	Cold & Humid
Flash Time	40 min.	35 min.	35 min.	20 min.	25 min.	25 min.
Open Time	180 min.	180 min.	180 min.	85 min.	100 min.	100 min.
Vinyl/Non-Porous						
Flash Time	45 min.	45 min.	40 min.	30 min.	30 min.	30 min.
Open Time	200 min.	210 min.	210 min.	110 min.	120 min.	130 min.
Concrete						
Flash Time	30 min.	30 min.	30 min.	20 min.	20 min.	20 min.
Open Time	160 min.	160 min.	165 min.	75 min.	80 min.	85 min.

This chart is for the Columbia Flooring Urethane Adhesive only. The humidity chart will aid in allowing the appropriate flash time based on the temperature and humidity.

Once the remainder of the floor has been installed, go back to the beginning and remove straight edges and spread adhesive on the remainder of the open subfloor. Allow the adhesive to flash for the appropriate time and lay flooring as instructed. Remember that the planks closest to the wall may need to be cut to fit, due to irregularities along the wall. When using the Columbia adhesive it is not necessary to roll the floor.

Clean Up

When using the Columbia Flooring Urethane Adhesive clean as you go along. Urethane Adhesive that has cured on the surface of the flooring can be difficult to remove and will require the use of Columbia Urethane Remover. The Columbia Urethane Remover has been recommended and is safe for the finish of your pre-finished wood floor. Once the floor is completed, clean the flooring with Columbia Flooring Cleaner.

When the Columbia Flooring Urethane Adhesive is used, light foot traffic is allowed after 12 hours but you can wait up to 24 hours after installation to remove the 3M Blue Masking Tape. Once the tape is removed, clean any adhesive residue left from the tape with Columbia's Urethane Adhesive Remover. Look for any adhesive on the surface of the flooring. Try to prevent the adhesive from curing on the surface of the pre-finished floor. Also, ensure sides and ends of the flooring are fit together snugly. While these tasks are being completed the floor is considered "rolled" and proper contact is achieved. However after installation it is still best not to allow light foot traffic until 12 hours after installation.

After completing the installation, wedge the flooring so that it remains tight during the drying process (due to irregularities in the walls). Once the adhesive has cured, remove and discard the wedges.

STAPLE OR NAIL DOWN INSTALLATIONS

These Engineered hardwood floors may be installed over wood subfloors using staples or nailing cleats.

When installing Columbia engineered wood planks by nailing or stapling method, it is necessary to use the proper type of flooring stapler or nailer made for Columbia Engineered Wood Floors.

Recommended Staplers and Nailers

We have tested and recommend the Bostitch Floor Runner (S3297-LHF or S97125-LHF) The recommended staple for the Bostitch Floor Runner is their 1" or 11/4". We have tested and recommend the Power Nailer – #200 and #250 nailer using a 1", 1-1/4"or 1½" power cleat. You must use the 3/8" or ½" adapter, as appropriate with the Power Nailer.

Caution: We have tested the above recommended tools. Other staplers, staples, nailers and cleats may work as well, however since they are not currently recommended, if their use damages or fails to properly secure the flooring, the responsibility is the installer's and not the manufacturers.

Step 1

You must staple or nail 1" – 2" from the ends and every 4" – 6" along the edges. This will help insure a satisfactory installation. It is best to set the compressor PSI at 80 - 85lbs. to keep the staples from going through or breaking the tongues. Improper stapling techniques can cause squeaks in the floor.

Adjustments may be necessary to provide adequate penetration of the nail or staple into the nail bed. You want it flush in the nail pocket. Use a scrap piece of flooring material to set tools properly before installation.

Before installation of the engineered flooring begins, install a 6-mil polyethylene layer over the subfloor. This will retard moisture from below and may help prevent squeaks. Keep in mind there is no complete moisture barrier system for staple or nail down installations.

Note: 15 lb roofing felt or kraft paper may be substituted for the polyethylene and installed as below.

Installing 6 mil Polyethylene

Install the polyethylene parallel to the direction of the flooring and allow a 3" over run at the perimeter. Make sure each run of polyethylene overlaps the previous run by 6" or more. **Do not overlap the felt if it is used.**

Layout the job

Measure out from the ends of your starting wall, 2¾" when installing 2¼" strip flooring, 3½" when installing 3" planks 51/2" when installing 5" planks and mark both ends. Where possible, lay the flooring at 90° angles to the floor joists. Make a chalk line along the starting wall using the marks you made (See Figure 7).

Beginning installation

Place the planks with the tongue facing away from the wall and along your chalk line. Use brads or small finishing nails (4d – 6d) to secure the first starter row along the wall edge 1" – 2" from the ends and every 4" – 6" along the side. Counter sink the nails and fill with the filler that blends with the flooring installed. Place the nails in a dark grain spot in the board. The base or shoe molding will cover the nails when installed, after completion of the installation.

Blind nail at a 45° angle through the tongue (See Figure 8). It will

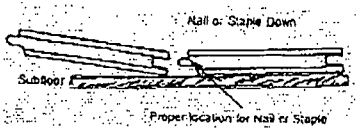


Figure 8

be easier IF YOU PRE-DRILL THE HOLES IN THE TONGUE. Nail 1" – 2" from the ends and every 4" – 6" along the sides. It will be necessary to blind nail the next 2 rows. A brad nailer with 1"-1-/38" brads can also be used to blind nail and no pre-drilling is needed.

Continue the installation using the recommended engineered wood flooring stapler or nailer, using staples or nailer cleats recommended by Columbia Flooring. Nail or staple the flooring 1" – 2" from the end and every 4" – 6" along the edge tongue.

Final Touches

Install the proper trim molding at the doorways to achieve the transition and along the walls to cover the edges of any gaps along the wall due to irregularity.

Complete the job by using filler that blends with the installed flooring to fill any gapping along the joints and clean the finished floor with Columbia Flooring Cleaner.

Floating Installation

Only the following engineered floors can be floated: 5/16" African Village Collection ¼", ⅜" and 3/8" flooring that are 3" or wider.

Subfloor Preparation

The subfloor preparation for a floating engineered floor is much more critical than a glue or staple down wood floor installation. For a standard engineered hardwood floor using either glue, staple or nail down installation method, the subfloor must be leveled (flat) within 3/16" in a 10' radius. With a floating engineered hardwood floor, the level (flatness) in a 10' radius is 1/8". The flatness is critical to a successful installation when floating engineered floors.

Installation

The installation of an engineered wood floor requires the use of Columbia Flooring 3 in 1 Foam, as would any of Columbia's Dales Collection or laminate floating systems. The use of a moisture barrier is always required over a concrete subfloor or on a 1st floor installation over a crawl space. Because of the dispersion of weight by a 3" or 5" board, a standard high compression or compaction rated foam is required to eliminate risk of a seam malfunction. For other acceptable foam's or sound insulation products contact Technical Services at Columbia Flooring.

Because this is a floating floor system the glue placement is very important. The glue should be placed along the top side of the groove and the full length of the groove (sides and ends). This can be accomplished by inverting the plank and applying bead of glue (3/32") on the upper side of the groove. When the plank is turned back over the glue will run down the back to create total coverage. If the groove is totally filled with glue, it could hinder the closing of the seams because of excessive glue, thus not allowing a tight fit.

The glue to be used for floating Columbia engineered flooring should be a laminate adhesive (type D3), any floating floor adhesive or wood glue such as Franklin's Titebond II or Titebond for floating floors.

Installation should begin with 3 rows of flooring glued together and held tight with green or blue painters tape, insuring a tight, straight and precise start to the installation. If the starter rows are not tight and straight the remainder of the flooring installation will not be straight either. Start the installation with the tongue facing out (away) from the starter wall. With the tongue facing out, the planks can be tapped together with a tapping block on the tongue to make a snug fit, minimizing damage to the edges of the planks. To help insure a successful start to the installation, allow the starter rows to sit 15 minutes or until the glue sets.

After installation of 8 to 10 rows of flooring, stand back and check for crowning or heaving due to tension from tapping or any damage caused by improper tapping on the edges. Continue with the installation cleaning any glue at the seams with a clean white cotton cloth, barely damp with water.

Finish the job by using Columbia Wood Repair kits or Fillers to fill any small chipped corners, voids or gaps along seams and then clean the floor with Columbia Flooring Cleaner. Install the needed molding or trims and the job is complete.

Notice: Restrict foot traffic on the newly installed floor for minimum of 12 hours.

The warranty of separation on the planks is the responsibility of the flooring mechanic, provided there is no glue failure. Glue failure would be the responsibility of the adhesive manufacturer.

MAINTENANCE

Columbia Engineered Hardwood Floors are very easily maintained. No wax, no mess. Use Columbia's Hardwood Floor Cleaner and specialty terry cloth flooring mop available from flooring retailers.

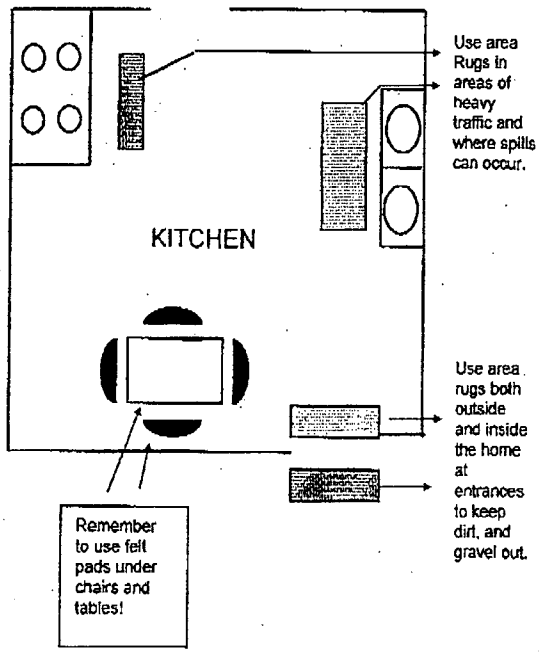
STEP ONE: Vacuum or sweep your floor to remove any particles that could scratch your floor.

Warning: Vacuums with a beater bar or power rotary brush head can damage a wood floor and never should be used.

STEP TWO: Apply the cleaner directly to the terry cloth flooring mop. **not** to the floor!

STEP THREE: Use a back and forth motion with the mop. When the terry cloth cover becomes soiled, simply replace it with a clean one. Cleaning the floor with a soiled cover could cause streaking. The covers are re-usable so simply throw the cover in the wash and dry it, as you would any towel.

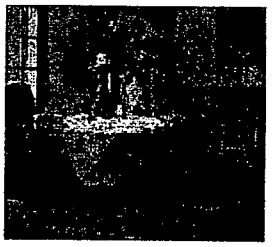
FLOOR CARE DIAGRAM



Available at your local retailer.

13 easy steps to ensure satisfaction with your New Columbia Hardwood Floor.

- Vacuum or sweep regularly.
- Remove spills promptly using Columbia Floor Cleaner and a clean white cloth.
- Use felt protectors under heavy pieces of furniture and chairs.
- Use protective mats at all exterior entrances. (Do not use black rubber back mats.)
- Spiked heels or shoes in need of repair can severely damage your floor.
- Never wet or damp mop your wood floors. Water can cause damage to wood flooring.
- Never use oil soaps, wax, liquid or other household products to clean your floor.
- Columbia Flooring recommends the Columbia Flooring Cleaner specifically made for our floors.
- The sun's UV rays can change the color of your floor. Rearrange furniture and rugs periodically so that your floor will age evenly.
- Keep animal nails trimmed.
- Protect your floor by using a dolly for moving furniture or appliances. **Never slide or roll heavy furniture or appliances across the floor.**
- Never use steam cleaners on your wood floors. This will force moisture into the wood and can cause damage to your flooring.
- Use Columbia Performance Molding.



Products Home

Installation, Maintenance and Warranty

Engineered and Solid Hardwood Warranty

Congratulations on purchasing Columbia hardwood flooring. We make every effort to ensure your complete satisfaction, with the strongest guarantees in the industry on all of our engineered and solid hardwood flo

Your protection doesn't end here. Columbia offers a complete floor-care s help you maintain your hardwood floor. Read this information carefully. I warranty and care information you need to keep your Columbia hardwood beautiful for years.

Columbia Pre-Installation Warranty
Columbia hardwood floors are crafted to the highest quality standards. Ev through numerous quality inspections. However, we urge you and your in each plank for color, finish, and quality BEFORE installation. If you are n with any hardwood plank prior to cutting it, just return the carton to your retailer. Columbia will replace it at no charge. Note: All hardwood floors l cutting waste allowance. Builder grade products (Adams and Taylor) are e warranty.

Columbia Full Lifetime Structural Warranty
Columbia's engineered cross-grained constructed products resist expansio due to climate. Each ply is fused under heat and pressure. In the unlikely e plies should separate, Columbia will replace the defective planks and inst cost to you for as long as you own your home.

Columbia Loss-of-Bond Warranty
Columbia Flooring offers two adhesive choices, Gator Glue™ and Colum Urethane Adhesive, for the installation of your hardwood flooring. Gator the loss-of-bond warranty and provides easy troweling and clean up as we for an easy installation. Columbia Flooring Urethane Adhesive is covered warranty and also offers a lifetime moisture warranty. This Columbia Flo offers a high grab and is recommended for areas susceptible to subfloor m

Columbia Full Lifetime Moisture Warranty
Columbia engineered hardwood flooring installed with our Columbia Flo Adhesive is specifically designed to withstand the effects of subfloor mois is visually dry, has no history of moisture problems and is installed accord installation instructions, Columbia will warrant the floor not to release fro due to subfloor moisture for as long as you own your home. Columbia wil the floor if it releases from the subfloor due to subfloor moisture (provide approved by Columbia indicates that the moisture came through the subfl a moisture failure a second time, we must conclude that the problem is sp installation and would happen again. Therefore, we will replace a floor du moisture one time only. Specifically, you the purchaser are protected from

- Unsightly cupping of the plank
- Buckling due to expansion
- Warping or twisting

Radiant Heat
In-Floor radiant heating systems can alter product performance due to surf
the proper installation guidelines are not followed. Please keep surface ten
85°F for best results. Please see more information pertaining to radiant hea
installation instructions. Note: Do not install solid hardwood floors over ra

Columbia 25-Year DiamondPlate Finish Warranty
Your Columbia hardwood flooring is protected by DiamondPlate™, our e
the-art, clear, aluminum oxide finish. This means that your floor, when ma
to Columbia's care and maintenance recommendations, will not wear throu
DiamondPlate aluminum oxide finish during the specified warranty perioc
chart below for all products.

**Understanding Wood and its Installation will Help You Understand Y
Warranties**
Wood is a natural product, containing natural variations in color, shade an
cannot guarantee against natural variations in each plank, nor against minc
between samples and the color of the floor once the floor has been installe

In all cases, Columbia reserves the right to inspect any problem and to ren
required, for technical analysis.

Clearly, Columbia cannot be responsible for improper installation. To ensu
protection under Columbia's written warranties, be sure your floor is insta
Columbia's published installation guidelines for both engineered and solid

Warranties

PRODUCT	PRE-INSTALL	STRUCTURAL	MOI
Independence Collection			
Braxton Oak	Yes	Lifetime	Life
Livingston Oak	Yes	Lifetime	Life
Rodney Oak	Yes	Lifetime	Life
Rutledge Oak	Yes	Lifetime	Life
Ellery Oak	Yes	Lifetime	Life
Hopkins Oak	Yes	Lifetime	Life
Sherman Oak	Yes	Lifetime	Life
Stockton Oak	Yes	Lifetime	Life
Bartlett Oak	Yes	Lifetime	Life
Harrison Oak	Yes	Lifetime	Life
Middleton Oak	Yes	Lifetime	Life
Species Collection			
Chase Pecan	Yes	Lifetime	Life
Gwinnett Pecan	Yes	Lifetime	Life

Hayward Pecan	Yes	Lifetime	Life
Morton Cherry	Yes	Lifetime	Life
Revere Cherry	Yes	Lifetime	Life
Williams Maple	Yes	Lifetime	Life
Wilson Maple	Yes	Lifetime	Life
Witherspoon Maple	Yes	Lifetime	Life
3/4" Solid Collection			
Carrolton Oak	Yes	n/a	n/a
Thornton Oak	Yes	n/a	n/a
Adams Oak	No	n/a	n/a
Taylor Oak	No	n/a	n/a
Out of Africa Collection™			
Steamed Cedar-Engineered	Yes	Lifetime	Life
Cherry-Engineered	Yes	Lifetime	Life
Pearwood-Engineered	Yes	Lifetime	Life
Rosewood-Engineered	Yes	Lifetime	Life
Walnut-Engineered	Yes	Lifetime	Life
Cedar-Solid	Yes	n/a	n/a
Cherry-Solid	Yes	n/a	n/a
Pearwood-Solid	Yes	n/a	n/a
Rosewood-Solid	Yes	n/a	n/a
Walnut-Solid	Yes	n/a	n/a
Out of Africa Village Collection™			
Steamed Cedar-Engineered	Yes	Lifetime	Life
Cherry-Engineered	Yes	Lifetime	Life
Pearwood-Engineered	Yes	Lifetime	Life
Rosewood-Engineered	Yes	Lifetime	Life
Walnut-Engineered	Yes	Lifetime	Life
The Dales Collection Longstrip Clic™ Hardwood Flooring			
Appleby Oak	Yes	Lifetime	Life
Barnard Oak	Yes	Lifetime	Life
Bowbank Oak	Yes	Lifetime	Life
Carlisle Maple	Yes	Lifetime	Life
Cotherstone Merbau	Yes	Lifetime	Life
Darley Oak	Yes	Lifetime	Life
Denby Oak	Yes	Lifetime	Life
Greta Oak	Yes	Lifetime	Life
Settle Oak	Yes	Lifetime	Life
Wensley Oak	Yes	Lifetime	Life
Hardwood Essence Sculpted Collection™			
Augustine Walnut	Yes	Lifetime	Life
El Dorado Maple	Yes	Lifetime	Life
Santiago Hickory	Yes	Lifetime	Life

EXCLUSIONS
Not Covered By Your Warranty

- Improper storage, handling or installation of flooring. Squeaking and/or cracking the mis-manufacture of the flooring.
- Man-made or natural disasters including, but not limited to, leaking or broken plu earthquake, or standing water during or after construction.
- Improper preparation of, or deficiencies in, the subfloor/floor joist assembly inclu to, subfloor material, fasteners, patching or leveling compounds, adhesives other products. These situations are considered to be part of the installation inspection installing the flooring. Do not install flooring if these situations exist.
- Insect infestation after shipment from the factory.
- Neglect or abuse including, but not limited to, not taking proper precautions to pr feet with felt protectors, dirty or improper casters, moving heavy objects without plywood beneath.
- Spiked and/or damaged heels and pet claws.
- Dents or scratches in the flooring caused by furniture, appliances, casters, or unus
- Falling or dropped objects which can dent or fracture the flooring and finish.
- Moisture infiltration from sidewalls or from any surface other than through the su
- Construction traffic abuse to the surface of the flooring.
- Non-factory applied finish (by the owner or installer) including, but not limited tc recoating.
- Normal color variations and natural characteristics of real wood products discove flooring is installed.
- The normal wearing of the finish in high traffic areas, pivot points, and seating ar not considered wearthrough, and therefore is not covered under the finish warrant

Additional Terms of the Warranties
These warranties apply only to the original purchaser and to flooring in its original instal transferable. Responsibility for final inspection and approval falls upon the consumer anc permanent installation. Prior to actual installation, dry-lay the floor, blending the planks determine optimum appearance.

Columbia is not responsible for labor costs associated with the repair or replacement of v after the floor is installed.

Seasonal Checking:
In order to maintain the recommended relative humidity of (35% - 55%) inside the home humidifer, or dehumidifer maybe necessary. Hardwood flooring is designed to perform i controlled structure. Seasonal checking may occur when your environment falls outside areas.

Incidental or consequential damages are excluded under all Columbia warranties.

Some states do not allow the exclusion or limitation of incidental or consequential damag limitation may not apply to you. The Columbia warranties give you specific legal rights. which vary from state to state.

These warranties do not apply to any product designated as other than first quality, incluc economy grade, cabin grade, specials, non-standard items, or any items or products sold

Columbia will, at its option, repair, refinish, or replace defective flooring, including adhe This does not include the removal or replacement of cabinets, appliances or other fixture

These warranties are effective for all Columbia engineered and solid hardwood flooring s acceptance."

DISCLAIMER OF UNSTATED WARRANTIES

The limited warranty described in this section is in lieu of all other warran and Columbia disclaims all other warranties concerning the flooring, expr including but not limited to, any implied warranty of merchantability, fitn any particular purpose, use, or quality.

WHAT TO DO IF YOU HAVE A PROBLEM

Columbia takes every possible precaution to ensure that our wood floors p warranted. In the unlikely event our product fails to meet your expectation contact your retailer or builder within 30 days of experiencing a problem. source of information and should be able to rectify the situation to your sa

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We always welcome your comments and suggestions. Please click here to email us.

Jan. 2. 2007 10:55AM Flooring Services Inc. No. 0660 P. 2/5

SHAW INDUSTRIES LIMITED TEN-YEAR CARPET QUALITY ASSURANCE WARRANTY

We at Shaw Industries are so confident of the quality of our Home Foundations carpets that we provide you with this Limited Ten-Year Quality Assurance Warranty. This assurance of quality comes to you from the world's largest producer of carpet.

What is covered?

This warranty covers manufacturing defects that could occur in your Shaw Home Foundations carpet. By manufacturing defect, we mean any defect in material or workmanship.

Who is covered?

This warranty protects you, the original purchaser, if you have purchased Shaw Home Foundations carpet for your own residential use in an owner-occupied residence. It applies only to Shaw Home Foundations carpet graded "first quality." It does not apply to nonresidential or commercial installations. This warranty applies to the original purchaser only.

Exclusions

Matting and crushing, or any change in appearance retention, are not manufacturing defects and are excluded from this warranty. For the purpose of this warranty, matting is defined as the loss of twist from the tips of the pile tufts and entanglement of the fibers. Crushing is defined as the loss of pile thickness due to foot traffic only. Crushing caused by furniture, including impressions left by legs of furniture, is not covered by this warranty.

How long is the coverage period?

This warranty coverage runs for ten years from the date your carpet is installed.

What Will Shaw Industries do?

If your carpet proves defective during:	*Shaw Industries will arrange a credit equal to the cost of the carpet material only:*
the 1st year	100%
the 2nd year	100%
the 3rd year	80%
the 4th year	70%
the 5th year	60%
the 6th year	50%
the 7th year	40%
the 8th year	30%
the 9th year	20%
the 10th year	10%

The credit will apply only to the affected area or room. The credit will be issued to your dealer as a percentage of the replacement cost of new carpet of the same or comparable quality. The credit will be good only toward the purchase of new Shaw Home Foundations carpet. There will be no cash payment. Shaw reserves the right to repair the defective area in question if restoration is practical. In such cases, repair will be effected in lieu of carpet replacement, at the sole discretion of Shaw.

Labor Charges

During the first year of coverage under this warranty, Shaw Industries will arrange for a credit to your retailer for reasonable labor charges to repair or replace defective areas when any of the following specific manufacturing defects are involved: excessive fuzzing, carpet tufts pulling out, crocking, fading, or delamination.

Shaw Industries will not provide credit for labor charges for appearance-related manufacturing defects that should have been detected before or during installation, such as missing tufts, dye spots, tears, loose backing, etc.

LIMITATIONS ON YOUR SHAW INDUSTRIES WARRANTIES

Non-transferability

These Shaw warranties are extended only to the original purchaser and are not transferable.

First quality products

Warranties are not applicable to carpet sold as second quality, irregular, used, or as mill ends.

Improper Installation

Improper installation can cause problems with your carpet. The Carpet and Rug Institute Residential Installation Standard (CRI-105) conforms to proper installation procedures and should be followed. We are not responsible for any defects caused by improper installation. Examples are wrinkling due to insufficient stretch and loss of tufts due to improper seaming.

Improper maintenance or inadequate care

Your carpet requires routine maintenance. Please follow the recommendations described in this booklet. We are not responsible for damage to your carpet caused by improper maintenance or inadequate care, which could void all or part of your warranty coverage.

Accidents or abuse

Your Shaw warranties do not cover damage resulting from accidents or abuse such as staining, soiling, burning, flooding, cutting, and damage caused by pets. Staining from common household food and beverage substances is covered under the Shaw stain warranties or similar stain warranties from fiber or chemical manufacturers.

Carpets on stair nosings

Your Shaw warranties do not cover damage or appearance problems resulting from the opening of rows of tufts caused by wrapping the carpet around nosings of stairs.

Pad failure

Deterioration of the padding can cause problems with your carpet. We are not responsible for any defects caused by failure of the carpet pad. Please see the pad manufacturer's warranty statement for more information.

Problems with moisture

Your Shaw warranties do not cover problems caused by wetting or the persistence of excessive moisture. For immediate assistance, contact a certified water damage restoration specialist. The Institute of Inspection, Cleaning and Restoration Certification (IICRC) maintains a registry of trained, certified specialists; call 1-800-835-4624.

Changes in carpet color

Your Shaw warranties do not cover changes in carpet color resulting from external causes, such as fading due to sunlight or spills of household chemicals and other non-food and non-beverage substances.

Difference from samples

Your Shaw warranties do not cover minor and normal differences between the color of the retail store sample and the color of the actual carpet.

MAY-26-2004 WED 23:18 TEL:8437644676 NAME:FLOORING SERVICES P. 2
OBH - O&M 150
ROA_01288

Replacement of discontinued carpet

If your carpet has been discontinued and replacement is necessary under the terms of your Shaw warranty, Shaw Home Foundations carpet of comparable quality will be substituted.

Geographic locale

These warranties apply only in the United States and Canada.

Consequential or incidental damages

WE EXCLUDE AND WILL NOT PAY CONSEQUENTIAL OR INCIDENTAL DAMAGES UNDER THESE WARRANTIES. By this we mean any loss, expense, or damage other than to the carpet itself that may result from a defect in the carpet.

IMPLIED WARRANTIES

NO IMPLIED WARRANTIES, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, EXTEND BEYOND THE FIVE-, SEVEN- OR TEN-YEAR TERMS OF THE WRITTEN SHAW INDUSTRIES WARRANTIES. By implied warranties we mean ones that the law presumes to have been given by the seller even though they aren't set out in writing.

PLEASE NOTE: Some states do not allow the exclusion or limitation of incidental or consequential damages, or limitations on how long an implied warranty lasts, so the above limitation or exclusion may not apply to you.

YOU HAVE LEGAL RIGHTS UNDER THIS WARRANTY. These warranties give you specific legal rights, and you may also have other rights which vary from state to state. Except for these rights, the remedies provided under these warranties state the limit of Shaw Industries' responsibilities.

HOW TO MAKE A CLAIM

Shaw Industries warranty service

If you think there is a defect in your carpet that is covered by one of the Shaw warranties, you must notify, in writing, the dealer who sold you the carpet. Include a copy of the invoice or receipt for the carpet and describe the problem as fully as possible. If you are unable to contact your dealer or do not receive satisfaction, write:

Shaw Industries, Inc.
Financial Services
P.O. Box 40
Mail Drop 026-04
Dalton, GA 30722-0040.

Shaw Industries R2X® Limited Stain and Soil Warranty

Who is covered
This warranty protects you, the original purchaser, if you have purchased a Shaw Industries *R2X®* carpet for your own residential use in an owner-occupied residence.

Time of coverage
This warranty is valid for 10 years.

What is covered
Shaw Industries warrants that the surface pile of any *R2X®* carpet will remain stain resistant to most household food and beverage substances for the above-listed coverage period in an owner-occupied residence in a proper indoor installation. This Limited Residential Warranty specifically excludes stains from substances such as hot beverages, bleaches (including acne medication), caustic chemicals, insecticides, paints, plant food, iodine, very strong dyes, acids, feces, urine, and vomit.
R2X® minimizes the retention of common dirt normally associated with carpet soiling. Proper maintenance and regular vacuuming will reduce soiling, and less residue will remain in the carpet. Note that light-colored carpets will show soiling more readily than darker colors and require more frequent maintenance to keep them looking their best.

What Shaw Industries will do if your carpet fails to perform
If your carpet shows signs of permanent staining from covered substances, or does not resist soiling more effectively than a comparable untreated carpet, within the designated coverage period after the date of original installation, Shaw Industries will arrange a credit equal to the cost of the carpet material only. The credit will apply only to the affected area. The credit will be issued to your retailer as a percentage of the replacement cost of new carpet of the same or comparable quality. The credit will be good only toward the purchase of new Shaw carpet. There will be no cash payment.

PLEASE NOTE: NO CARPET IS ABSOLUTELY STAIN PROOF. While carpet bearing the *R2X®* designation is made with stain release agents, some staining may still occur, especially over time and in high-traffic areas. *R2X®* is warranted to provide additional stain resistant properties to your carpet when compared to conventional nylon carpet. *R2X®* will increase your ability to clean up stains, not prevent stains. Depending on the type of substance causing the stain, removal may require substantial repeated cleanings, and some stains may not be removeable.

JAN 2 2 2002

Further exclusions

This Limited Residential Warranty also specifically excludes: any carpet which has been treated with any protective material other than DuPont's Teflon® or 3M's Scotchgard™, especially those which may contain silicone; any carpet in any non-residential use; any carpet installed on stairs; any carpet subjected to abnormal abuse; any carpet exposed to very hot substances or other abusive conditions; damage due to the application of improper cleaning agents; deterioration in appearance not related to staining of pile fibers. This warranty is voided if you fail to follow recommended carpet care and cleaning instructions described in the Shaw Industries' brochure, "Carpet Care & Maintenance."

Treatment of the affected area should begin immediately upon discovery. The more time that elapses before treatment, the more difficult a stain will be to remove. Further assistance is available through the Shaw Industries Information Center, 1-800-441-7429.

HOMEOWNER OBLIGATIONS UNDER THE SHAW WARRANTIES

What you must do

In order to maintain and protect your coverage under the terms of these warranties, you must do the following:

1. Keep proof of purchase in the form of a bill, invoice, statement, or this completed warranty brochure from your Shaw retailer, showing the price you paid for the carpet, excluding pad and labor.

2. Install your carpet according to the guidelines outlined in the Carpet and Rug Institute Residential Installation Standard CRI-105, and maintain your carpet according to the recommendations described in the "Shaw Carpet Care" booklet.

3. Be able to show proof of periodic steam cleaning by either a professional cleaning service or do-it-yourself steam cleaning. A bill, invoice, or statement showing cleaning service or equipment rental charges with descriptions will serve as proof. A minimum of one cleaning every two years is required. Depending on the level of traffic, family size, soil conditions adjacent to the home, and other circumstances, more frequent cleaning may be advisable. Please refer to the cleaning recommendations contained in the "Shaw Carpet Care" booklet.

JAN 2 2 2007

DIVISION 9 – FINISHES

PAINTING – J & D PAINTING

ROA_01292

WARRANTY AGREEMENT

Project: Belle Hall Condominiums

Owner: Belle Hall Direct 101, LP
Contractor: TCR NC Construction I Limited Partnership

Subcontractor: J.D Painting

Subcontractor hereby expressly warrants and guarantees that all labor, materials, and equipment furnished and work performed in conjunction with the above referenced project are in accordance with the plans, specifications, the Subcontract Agreement and authorized modifications thereto. All labor, materials and equipment shall be free from defects, due to defective materials and/or workmanship, for a period of one (1) year from the date of Certificate of Occupancy for each building/structure, unless otherwise stated in the Subcontract Agreement.

Should any defects develop during the warranty period due to improper workmanship and/or arrangement, the same shall, upon notice, be made good by this Subcontractor at no expense to the Contractor, Owner, or Owner's Representative. Nothing in the above shall be deemed to apply to work or equipment which has been abused, neglected or altered by the Contractor, Owner, or Owner's Representative.

Unless otherwise stated in the Subcontract Agreement, warranty work shall be responded to within twenty-four (24) hours of notification by the Contractor, Owner, or Owner's Representative, including weekends and holidays. Warranty notices received before 10:00 am shall be responded to on the same day. Should Subcontractor fail to respond within twenty-four (24) hours of notification or correct the defective work or equipment within seventy-two (72) hours, the Contractor, Owner, or Owner's Representative shall proceed with the correction of the defective work. All costs associated with this corrective action shall be reimbursed by this Subcontractor or charged against its account. Subcontractor shall remit payment for such charges within five (5) calendar days of notification by the Contractor, Owner, or Owner's Representative.

Signature: Daniel Espitia

Printed Name: Daniel Espitia

Position/Title: Manager

Date: 12-06-06

SHERWIN WILLIAMS

Technical Data Sheet

Optimus Plus™ Interior Latex Flat B30 Series

Optimus Plus Interior Latex Flat is an economical flat wall paint designed to meet the demanding expectations of the new residential construction market. This product is recommended for new construction and repaints on interior drywall, wood and concrete block. Optimus Plus provides a smooth uniform flat finish with good hiding and touch-up characteristics.

PRODUCT CHARACTERISTICS

Color:	Pure White, Soft Shell, Off White, Aria Ivory, Antique Linen, Canvas Tan	
Sheen:	0 - 2 units @ 85°	
Coverage:	350-400 sq ft/gal 4.5 mils wet; 1.4 mils dry	
Drying Time @ 77°F, 50% RH	To touch: To recoat:	1 hour 4 hours
Flash Point:	N/A	

Tinting Information:	oz/gal	Strength
Pure White	0-3	100%

B30WW6101

Volume Solids	22% ± 2%
Weight Solids:	37% ± 2%
Weight Per Gallon	11.0 lb
VOC: (less exempt solvents)	53 g/L; 0.45 lb/gal

APPLICATION

Brush:	No reduction necessary. Use quality nylon brush.
Roller:	No reduction necessary. Use a 3/8" to 1/2" woven cover.
Spray - Airless	
Reduction:	Not recommended
Pressure:	2000 psi
Tip:	.017" to .021"

Rev 5/2003

APPLICATION SPECIFICATIONS

WARNING! Removal of old paint by sanding, scraping or other means may generate dust or fumes that contain lead. Exposure to lead dust or fumes may cause brain damage or other adverse health effects, especially in children or pregnant women. Controlling exposure to lead or other hazardous substances requires the use of proper protective equipment, such as a properly fitted respirator (NIOSH approved) and proper containment and cleanup. For more information, call the National Lead Information Center at 1-800-424-LEAD (in US) or contact your local health authority.

Remove all surface contamination by washing with ProClean Professional® Prep Wash Concentrated Cleaner or other appropriate cleaner, rinse thoroughly and allow to dry. Existing peeled or checked paint should be scraped and sanded to a sound surface. Glossy surfaces should be sanded dull. Stains from water, smoke, ink, pencil, grease, etc. should be sealed with PrepRite ProBlock Primer Sealer.

Previously Painted Surfaces: Remove all loose coatings and corrosion by scraping or sanding. Remove all surface contaminants by washing with appropriate cleaner. Fill nail holes and cracks in drywall with spackling paste and sand smooth. Dull glossy and non-porous surfaces with sandpaper or abrasive deglosser. Spot prime patches with PrepRite High Build Interior Latex Primer/Surfacer, B28W601. Finish with one or two coats of Optimus Plus Latex Flat Wall Paint.

Unpainted Wood:
Prime with one coat of PrepRite Wall and Wood Primer, B49W2 and finish with one or two coats of Optimus Plus Latex Flat Wall Paint.

Unpainted Drywall:
Remove all surface contaminants. Joint compound must be cured and sanded smooth. Prime with one coat of PrepRite High Build Interior Latex Primer/Surfacer, B28W601 and finish with one or two coats of Optimus Plus Latex Flat Wall Paint.

Unpainted Concrete Block:
Surfaces must be thoroughly cured according to supplier's recommendations. Remove all surface contaminants and prime with one coat of PrepRite Classic, B28W101 or where a smoother finish is desired, fill block with one coat of PrepRite Interior/Exterior Block Filler, B25W25. Finish with two coats of Optimus Plus Latex Flat Wall Paint.

Mildew
Remove before painting by washing with ProClean Professional® Mildew Eliminator or a solution of 1 part liquid bleach and 3 parts water. Apply the solution and scrub the mildewed area. Allow the solution to remain on the surface for 10 minutes. Rinse thoroughly with water and allow the surface to dry before painting. Wear protective eyewear, waterproof gloves, and protective clothing. Quickly wash off any of the mixture that comes in contact with your skin. Do not add detergents or ammonia to the bleach/water solution.

Caulking
Gaps between walls, ceilings, crown moldings, and other interior trim can be filled with ProSelect® Premium Siliconized Acrylic Latex Caulk 1100A after priming the surface.

CLEANUP INFORMATION

Clean spills and spatters immediately with soap and warm water. Clean hands and tools immediately after use with soap and warm water. Flush spray equipment after cleaning with mineral spirits to prevent rusting of the equipment. Follow manufacturer's safety recommendations when using mineral spirits.

CAUTIONS

Interior use only.
Protect from freezing.
Do not apply at temperature below 50°F
This product meets all current ecological and lead hazard regulations.
Non-Photochemically reactive.
Use only with adequate ventilation.
Avoid contact with eyes and skin.
See label for additional cautions.
DO NOT TAKE INTERNALLY
KEEP OUT OF THE REACH OF CHILDREN
16 00 B30WW6101 4/23/2003

PRODUCTS

Color	Rex	SMIS	Size
Pure White	B30WW6101	6011-21304	5's
Soft Shell	B30HV6411	6011-36393	5's
Off White	B30HV6436	6011-36385	5's
Aria Ivory	B30HV6456	6011-36351	5's
Antique Linen	B30HV6425	6011-36377	5's
Canvas Tan	B30HV6450	6011-36369	5's

SHERWIN WILLIAMS

Technical Data Sheet

Dura-Craft™ Exterior 100% Acrylic Gloss B21 Series

Dura-Craft Exterior 100% Acrylic Gloss is designed to meet the demands of the New Multi-Family and New Residential Home construction markets. This product is recommended for use on new wood, brick, stucco, metal, as well as properly prepared previously painted surfaces.

PRODUCT CHARACTERISTICS

Color	Most Colors	
Sheen:	35-45 units @ 60°	
Coverage:	350-400 sq. ft./gal 4.0 mils wet; 1.0 mils dry	
Drying Time: @ 77°F, 50% RH	To Touch: To Recoat:	1 hour 4 hours
Flash Point:	N/A	

Tinting Information:	oz/gal	Strength
Extra White	0-4	100%
Deep Base	4-8	100%

B21WW5075

Volume Solids:	41% ± 2%
Weight Solids:	51% ± 2%
Weight per Gallon:	10.0 lb
VOC: (less exempt solvents)	134 g/L; 1.12 lb/gal

APPLICATION

Brush:	No reduction necessary. Use a nylon polyester brush.
Roller:	No reduction necessary. Use a 3/8" to ¾" synthetic cover
Spray—Airless	
Reduction:	Not recommended
Pressure:	2000 psi
Tip:	.015'' to .019''

Rev 4/2003

APPLICATION SPECIFICATIONS

WARNING! Removal of old paint by sanding, scraping or other means may generate dust or fumes that contain lead. Exposure to lead dust or fumes may cause brain damage or other adverse health effects, especially in children or pregnant women. Controlling exposure to lead or other hazardous substances requires the use of proper protective equipment, such as a properly fitted respirator (NIOSH approved) and proper containment and cleanup. For more information, call the National Lead Information Center at 1-800-424-LEAD (in US) or contact your local health authority.

Aluminum and Galvanized Steel:
Wash with a ProClean Professional® Prep Wash Concentrated Cleaner to remove any oil, grease, or other surface contamination. All corrosion must be removed with sandpaper, steel wool, or other abrading method.

Masonry, Concrete, Cement, Block:
All new surfaces must be cured according to the supplier's recommendations—usually about 30 days. Remove all form release and curing agents. Rough surfaces can be filled to provide a smooth surface. If painting cannot wait 30 days, allow the surface to cure 7 days and prime the surface with Loxon® Masonry Primer. Repair cracks, voids, and other holes with ConSeal® Patches and Sealants.

Steel:
Rust and mill scale must be removed using sandpaper, steel wool, or other abrading method. Bare steel must be primed the same day as cleaned.

Stucco:
Remove any loose stucco, efflorescence, or laitance. Allow new stucco to cure at least 30 days before painting. If painting cannot wait 30 days, allow the surface to dry 5-7 days and prime with Loxon Masonry Primer.

Wood:
Sand any exposed wood to a fresh surface. Patch all holes and imperfections with a wood filler or putty and sand smooth.

Vinyl:
Clean the surface thoroughly by scrubbing with warm, soapy water. Rinse thoroughly.

Mildew:
Remove before painting by washing with ProClean Professional® Mildew Eliminator or a solution of 1 part liquid bleach and 3 parts water. Apply the solution and scrub the mildewed area. Allow the solution to remain on the surface for 10 minutes. Rinse thoroughly with water and allow the surface to dry before painting. Wear protective eyewear, waterproof gloves, and protective clothing. Quickly wash off any of the mixture that comes in contact with your skin. Do not add detergents or ammonia to the bleach/water solution.

Caulking:
Gaps between windows, doors, trim, and other through-wall openings can be filled with Pro Select® Premium Siliconized Acrylic Latex Caulk 1100A after priming the surface.

CLEANUP INFORMATION

Clean spills and spatters immediately with soap and warm water. Clean hands and tools immediately after use with soap and warm water. Flush spray equipment after cleaning with mineral spirits to prevent rusting of the equipment. Follow manufacturer's safety recommendations when using mineral spirits.

CAUTIONS

For exterior use only.
Protect from freezing.
Non-photochemically reactive.
See label for additional cautions
DO NOT TAKE INTERNALLY.
KEEP OUT OF THE REACH OF CHILDREN.
29 00 B21WW5075 4/17/2003

PRODUCTS

Color	Rex	SMIS	Size
White	B21WW5075	6011-30636	1's
White	B21WW5075	6011-30644	5's
Extra White	B21WW5061	6011-36963	1's
Extra White	B21WW5061	6011-36922	5's
Deep Base	B21WW5063	6011-37219	1's
Deep Base	B21WW5063	6011-37227	5's

Technical Data Sheet

Dura-Craft™ Exterior 100% Acrylic Flat B2 Series

Dura-Craft Exterior 100% Acrylic Flat is designed to meet the demands of the New Multi-Family and New Residential Home construction markets. This product is recommended for use on new wood, brick, stucco, metal, as well as properly prepared previously painted surfaces.

PRODUCT CHARACTERISTICS

Color	Most Colors	
Sheen:	0-5 units @ 85°	
Coverage:	350-400 sq. ft./gal 4.0 mils wet; 1.0 mils dry	
Drying Time: @ 77°F, 50% RH	To Touch: To Recoat:	1 hour 4 hours
Flash Point:	N/A	

Tinting Information:	oz/gal	Strength
Extra White	0-4	100%
Deep Base	4-8	100%

B02WV0160

Volume Solids:	31% ± 2%
Weight Solids:	48% ± 2%
Weight per Gallon:	10.9 lb
VOC: (less exempt solvents)	148 g/L; 1.24 lb/gal

APPLICATION

Brush:	No reduction necessary. Use a nylon polyester brush.
Roller:	No reduction necessary. Use a 3/8" to ¾" synthetic cover
Spray—	Airless
Reduction:	Not recommended
Pressure:	2000 psi
Tip:	.015'' to .019''

APPLICATION SPECIFICATIONS

WARNING! Removal of old paint by sanding, scraping or other means may generate dust or fumes that contain lead. Exposure to lead dust or fumes may cause brain damage or other adverse health effects, especially in children or pregnant women. Controlling exposure to lead or other hazardous substances requires the use of proper protective equipment, such as a properly fitted respirator (NIOSH approved) and proper containment and cleanup. For more information, call the National Lead Information Center at 1-800-424-LEAD (in US) or contact your local health authority.

Aluminum and Galvanized Steel:
Wash with a ProClean Professional® Prep Wash Concentrated Cleaner to remove any oil, grease, or other surface contamination. All corrosion must be removed with sandpaper, steel wool, or other abrading method.

Masonry, Concrete, Cement, Block:
All new surfaces must be cured according to the supplier's recommendations—usually about 30 days. Remove all form release and curing agents. Rough surfaces can be filled to provide a smooth surface. If painting cannot wait 30 days, allow the surface to cure 7 days and prime the surface with Loxon® Masonry Primer. Repair cracks, voids, and other holes with ConSeal® Patches and Sealants.

Steel:
Rust and mill scale must be removed using sandpaper, steel wool, or other abrading method. Bare steel must be primed the same day as cleaned.

Rev 4/2003

Stucco:
Remove any loose stucco, efflorescence, or laitance. Allow new stucco to cure at least 30 days before painting. If painting cannot wait 30 days, allow the surface to dry 5-7 days and prime with Loxon Masonry Primer.

Wood:
Sand any exposed wood to a fresh surface. Patch all holes and imperfections with a wood filler or putty and sand smooth.

Vinyl:
Clean the surface thoroughly by scrubbing with warm, soapy water. Rinse thoroughly.

Mildew:
Remove before painting by washing with ProClean Professional® Mildew Eliminator or a solution of 1 part liquid bleach and 3 parts water. Apply the solution and scrub the mildewed area. Allow the solution to remain on the surface for 10 minutes. Rinse thoroughly with water and allow the surface to dry before painting. Wear protective eyewear, waterproof gloves, and protective clothing. Quickly wash off any of the mixture that comes in contact with your skin. Do not add detergents or ammonia to the bleach/water solution.

Caulking:
Gaps between windows, doors, trim, and other through-wall openings can be filled with Pro Select® Premium Siliconized Acrylic Latex Caulk 1100A after priming the surface.

CLEANUP INFORMATION

Clean spills and spatters immediately with soap and warm water. Clean hands and tools immediately after use with soap and warm water. Flush spray equipment after cleaning with mineral spirits to prevent rusting of the equipment. Follow manufacturer's safety recommendations when using mineral spirits.

CAUTIONS

For exterior use only.
Protect from freezing.
Non-photochemically reactive.
See label for additional cautions
DO NOT TAKE INTERNALLY.
KEEP OUT OF THE REACH OF CHILDREN.
27 00 B02WV0160 4/17/2003

PRODUCTS:

Color	Rex	SMIS	Size
White	B02WV0160	6011-24746	1's
White	B02WV0160	6011-24753	5's
Extra White	B02WW0551	6011-37011	1's
Extra White	B02WW0551	6011-37029	5's
Deep Base	B02WW0553	6011-37276	1's
Deep Base	B02WW0553	6011-37284	5's

Technical Data Sheet
Master Hide
Interior Latex Semi-Gloss
B31WW5251

Master Hide Interior Latex Semi-Gloss is specifically formulated to meet the demands of today's new homebuilder, where a semi-gloss durable finish is desired. The Master Hide Interior Latex Semi-Gloss also meets the expectations of the professional applicator, providing a uniform appearance and can be applied to various substrates. An excellent product for new construction or repaint.

PRODUCT CHARACTERISTICS

Color:	Extra White and Tints	
Sheen:	25 - 30 units @ 60°	
Coverage:	400 sq ft/gal 4.0 mils wet; 1.3 mils dry	
Drying Time @ 77°F, 50% RH	To touch: To recoat:	1 hour Overnight
Flash Point:	N/A	

Tinting Information:	oz/gal	Strength
Extra White	0-4	100%

B31WW5251

Volume Solids	33% ± 2%
Weight Solids:	41% ± 2%
Weight Per Gallon	9.9 lb
VOC: (less exempt solvents)	61 g/L; 0.50 lb/gal

APPLICATION

Brush:	No reduction necessary Use quality nylon brush
Roller:	No reduction necessary Use a 1/4" to 3/8" woven cover
Spray - Airless	
Reduction:	Not recommended
Pressure:	2000 psi
Tip:	.015" to .019"

APPLICATION SPECIFICATIONS

WARNING! Removal of old paint by sanding, scraping or other means may generate dust or fumes that contain lead. Exposure to lead dust or fumes may cause brain damage or other adverse health effects, especially in children or pregnant women. Controlling exposure to lead or other hazardous substances requires the use of proper protective equipment, such as a properly fitted respirator (NIOSH approved) and proper containment and cleanup. For more information, call the National Lead Information Center at 1-800-424-LEAD (in US) or contact your local health authority.

Remove all surface contamination by washing with ProClean Professional® Prep Wash Concentrated Cleaner or other appropriate cleaner, rinse thoroughly and allow to dry. Existing peeled or checked paint should be scraped and sanded to a sound surface. Glossy surfaces should be sanded dull. Stains from water, smoke, ink, pencil, grease, etc. should be sealed with PrepRite ProBlock Primer Sealer.

Previously Painted Surfaces:
Remove all loose coatings, dirt, grease and other foreign matter. Repair and fill cracks in wallboard with patching compound. Spot prime with PrepRite® 200 Latex Primer, B28W200. Dull glossy surfaces by lightly sanding. Finish with one or two coats of Master Hide Interior Latex Semi-Gloss.

Unpainted Wood:
Prime with one coat of PrepRite Wall and Wood Primer, B49W2 and finish with one or two coats of Master Hide Interior Latex Semi-Gloss.

Technical Data Sheet

Master Hide
Interior Latex Semi-Gloss
B31WW5251

Unpainted Drywall:
Remove all surface contaminants. Joint compound must be cured and sanded smooth. Prime with one coat of MasterPrep Interior Acrylic Latex Primer/Undercoater and finish with one or two coats of Master Hide Interior Latex Semi-Gloss.

Unpainted Concrete Block:
Surfaces must be thoroughly cured according to supplier's recommendations. Remove all surface contaminants and prime with one coat of PrepRite Classic, B28W101 or where a smoother finish is desired, fill block with one coat of PrepRite Interior/Exterior Block Filler, B25W25. Finish with one or two coats of Master Hide Interior Latex Semi-Gloss.

Mildew:
Remove before painting by washing with ProClean Professional® Mildew Eliminator or a solution of 1 part liquid bleach and 3 parts water. Apply the solution and scrub the mildewed area. Allow the solution to remain on the surface for 10 minutes. Rinse thoroughly with water and allow the surface to dry before painting. Wear protective eyewear, waterproof gloves, and protective clothing. Quickly wash off any of the mixture that comes in contact with your skin. Do not add detergents or ammonia to the bleach/water solution.

Caulking:
Gaps between walls, ceilings, crown moldings, and other interior trim can be filled with Pro Select® Premium Siliconized Acrylic Latex Caulk 1100A after priming the surface.

CLEANUP INFORMATION

Clean spills and spatters immediately with soap and warm water. Clean hands and tools immediately after use with soap and warm water. Flush spray equipment after cleaning with mineral spirits to prevent rusting of the equipment. Follow manufacturer's safety recommendations when using mineral spirits.

CAUTIONS

Interior use only.
Protect from freezing.
Do not apply at temperature below 50^0F.
This product meets all current ecological and lead hazard regulations.
Non-Photochemically reactive.
Use only with adequate ventilation.
Avoid contact with eyes and skin.
See label for additional cautions.
DO NOT TAKE INTERNALLY
KEEP OUT OF THE REACH OF CHILDREN
01 00 B31WW5251 4/24/2003

PRODUCTS

Color	Rex	SMIS	Size
Extra White	B31WW5251	6011-37409	1's
Extra White	B31WW5251	6011-37417	5's

THE SHERWIN–WILLIAMS PAINT CO.

The Sherwin–Williams Company
Michael Boney
1507 E. Franklin St.
Chapel Hill, NC 27514
919–235–7583

J & D Painting & Drywall
Daniel Espitia
4916 Lumley Rd.
Durham, NC

December 22, 2006

RE: Belle Hall, Daniel Island, SC

Daniel,

This letter pertains to our limited product warranty. When two coats of our products are applied according to label directions, Sherwin–Williams warrants that our products:

will not noticeably fade;
will not stain brick, glass, trim, or other surface below the painted surface;
will not peel or blister from properly prepared surfaces;
will not erode to expose the substrate.

The warranty is specific to material only for one year.

If you have any questions please give me a call.

Respectively Submitted,

Michael Boney
PC Sales Representative

DIVISION 10 – SPECIALTIES

FIRE EXTINGUISHERS/POSTAL BOXES – WHOLESALE BUILDING SUPPLY

WARRANTY AGREEMENT

Project: Belle Hall Condominiums

Owner: Belle Hall Direct 101, LP
Contractor: TCR NC Construction I Limited Partnership

Subcontractor: Wholesale Building Products

Subcontractor hereby expressly warrants and guarantees that all labor, materials, and equipment furnished and work performed in conjunction with the above referenced project are in accordance with the plans, specifications, the Subcontract Agreement and authorized modifications thereto. All labor, materials and equipment shall be free from defects, due to defective materials and/or workmanship, for a period of one (1) year from the date of Certificate of Occupancy for each building/structure, unless otherwise stated in the Subcontract Agreement.

Should any defects develop during the warranty period due to improper workmanship and/or arrangement, the same shall, upon notice, be made good by this Subcontractor at no expense to the Contractor, Owner, or Owner's Representative. Nothing in the above shall be deemed to apply to work or equipment which has been abused, neglected or altered by the Contractor, Owner, or Owner's Representative.

Unless otherwise stated in the Subcontract Agreement, warranty work shall be responded to within twenty-four (24) hours of notification by the Contractor, Owner, or Owner's Representative, including weekends and holidays. Warranty notices received before 10:00 am shall be responded to on the same day. Should Subcontractor fail to respond within twenty-four (24) hours of notification or correct the defective work or equipment within seventy-two (72) hours, the Contractor, Owner, or Owner's Representative shall proceed with the correction of the defective work. All costs associated with this corrective action shall be reimbursed by this Subcontractor or charged against its account. Subcontractor shall remit payment for such charges within five (5) calendar days of notification by the Contractor, Owner, or Owner's Representative.

Signature: _____

Printed Name: Matt Perry

Position/Title: Senior Project Manager

Date: 12/12/06

DIVISION 11 – RESIDENTIAL EQUIPMENT

APPLIANCES – GENERAL ELECTRIC

WARRANTY AGREEMENT

Project: Belle Hall Condominiums

Owner: Belle Hall Direct 101, LP
Contractor: TCR NC Construction I Limited Partnership

Subcontractor: G.E. Appliances

Subcontractor hereby expressly warrants and guarantees that all labor, materials, and equipment furnished and work performed in conjunction with the above referenced project are in accordance with the plans, specifications, the Subcontract Agreement and authorized modifications thereto. All labor, materials and equipment shall be free from defects, due to defective materials and/or workmanship, for a period of one (1) year from the date of Certificate of Occupancy for each building/structure, unless otherwise stated in the Subcontract Agreement.

Should any defects develop during the warranty period due to improper workmanship and/or arrangement, the same shall, upon notice, be made good by this Subcontractor at no expense to the Contractor, Owner, or Owner' s Representative. Nothing in the above shall be deemed to apply to work or equipment which has been abused, neglected or altered by the Contractor, Owner, or Owner' s Representative.

Unless otherwise stated in the Subcontract Agreement, warranty work shall be responded to within twenty-four (24) hours of notification by the Contractor, Owner, or Owner's Representative, including weekends and holidays. Warranty notices received before 10:00 am shall be responded to on the same day. Should Subcontractor fail to respond within twenty-four (24) hours of notification or correct the defective work or equipment within seventy-two (72) hours, the Contractor, Owner, or Owner's Representative shall proceed with the correction of the defective work. All costs associated with this corrective action shall be reimbursed by this Subcontractor or charged against its account. Subcontractor shall remit payment for such charges within five (5) calendar days of notification by the Contractor, Owner, or Owner's Representative.

Signature: Denny Jordan
Printed Name: Denny Jordan
Position/Title: Area Sales Manager
Date: 12-06-06

DISHWASHER MANUAL

ge.com

GE Profile™ Triton XL™ Dishwashers

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Model Number

GSD6900
PDW7300
PDW7700
PDW7800
PDW7880

Write the model and serial numbers here:

Model # _____

Serial # _____

You can find them on the tub wall just inside the door.

165D4700P323 *49-55003* *11-05 JR*

OBH - O&M 170

ROA_01308

IMPORTANT SAFETY INFORMATION. READ ALL INSTRUCTIONS BEFORE USING — SAVE THESE INSTRUCTIONS

⚠ WARNING!

For your safety, the information in this manual must be followed to minimize the risk of fire or explosion, electric shock, and to prevent property damage, personal injury, or death.

⚠ WARNING! WATER HEATER SAFETY

Under certain conditions hydrogen gas may be produced in a water heater that has not been used for two weeks or more. ***HYDROGEN GAS IS EXPLOSIVE.***

If the hot water has not been used for two weeks or more, prevent the possibility of damage or injury by turning on all hot water faucets and allow them to run for several minutes. Do this before using any electrical appliance which is connected to the hot water system. This simple procedure will allow any built-up hydrogen gas to escape. Since the gas is flammable, do not smoke or use an open flame or appliance during this process.

PROPER INSTALLATION AND MAINTENANCE

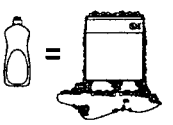
This dishwasher must be properly installed and located in accordance with the Installation Instructions before it is used. If you did not receive an Installation Instructions sheet with your dishwasher, you can receive one by visiting our website at **ge.com.**

- Connect to a grounded metal, permanent wiring system; or run an equipment-grounding conductor with the circuit conductors and connect to the equipment-grounding terminal or lead of the appliance.
- Improper connection of the equipment-grounding conductor can result in a risk of electric shock. Check with a qualified electrician or service representative if you are in doubt whether the appliance is properly grounded.
- Dispose of discarded appliances and shipping or packing material properly.
- Do not attempt to repair or replace any part of your dishwasher unless it is specifically recommended in this manual. All other servicing should be referred to a qualified technician.
- To minimize the possibility of electric shock, disconnect this appliance from the power supply before attempting any maintenance.

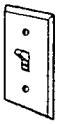
  NOTE: *Turning the dishwasher off does not disconnect the appliance from the power supply. We recommend having a qualified technician service your appliance.*

⚠ CAUTION: *To prevent minor injury or property damage*

- Contents washed in Anti-bacterial mode, if available, may be hot to the touch. Use care before handling.
- Using a detergent that is not specifically designed for dishwashers will cause the dishwasher to fill with suds.



- If your dishwasher is connected to a wall switch, ensure that the switch is on prior to use.



- On dishwashers with electronic controls, if you choose to turn the switch off between wash cycles, allow 5-10 seconds after turning the switch on before touching START/RESET to allow the control to reboot.
- Non-Dishware Items: Do not wash items such as electronic air cleaner filters, furnace filters and paint brushes in your dishwasher. Damage to dishwasher and discoloration or staining of dishwasher may result.
- Close supervision is necessary if this appliance is used by or near children.
- Load light, plastic items so they will not become dislodged and drop to the bottom of the dishwasher—they might come into contact with the heating element and be damaged.

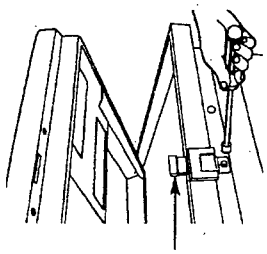
⚠ WARNING! RISK OF CHILD ENTRAPMENT

PROPER DISPOSAL OF THE DISHWASHER

Junked or abandoned dishwashers are dangerous ... even if they will sit for "just a few days." If you are getting rid of your old dishwasher, please follow the instructions below to help prevent accidents.

Before You Throw Away Your Old Dishwasher:

- Take off the door of the washing compartment or remove the door latch keeper (as shown).



Door latch keeper

⚠ WARNING!

When using your dishwasher, follow basic precautions, including the following:

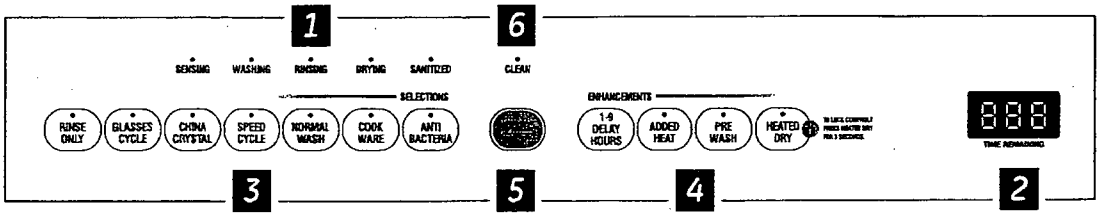
- Use this appliance only for its intended purpose as described in this Owner's Manual.
- Use only powder, tabs, liquid detergents or rinse agents recommended for use in a dishwasher and keep them out of the reach of children. ***Cascade®, Cascade® Complete*** and ***Electrasol®*** Automatic Dishwashing Detergents, and ***Jet-Dry®*** and ***Cascade Rinse Aid®*** rinse agents have been approved for use in all GE dishwashers.
- Locate sharp items so that they are not likely to damage the door seal.
- Load sharp knives with the handles up to reduce the risk of cut-type injuries.
- Do not wash plastic items unless marked dishwasher safe or the equivalent. For plastic items not so marked, check the manufacturer's recommendations.
- Do not touch the heating element during or immediately after use.
- Do not operate your dishwasher unless all enclosure panels are properly in place.
- Do not tamper with controls.
- Do not abuse, sit on or stand on the door or dish rack of the dishwasher.
- Do not allow children to play around dishwasher when opening or closing door due to the possibility of small fingers being pinched in door.
- Do not discard a dishwasher without first removing the door of the washing compartment.
- Do not store or use combustible materials, gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
- Do not allow children to play with, on or inside this appliance or any discarded appliance.

READ AND FOLLOW THIS SAFETY INFORMATION CAREFULLY.

SAVE THESE INSTRUCTIONS

About the dishwasher control panel.

You can locate your model number on the tub wall just inside the door. Throughout this manual, features and appearance may vary from your model.



Control Settings

1 Status Indicator Lights

The Status display tells you what's happening while the dishwasher is in operation and may flash, indicating a malfunction (see page 6). The lights will come **ON** indicating the sequence of operation the dishwasher is in.

SENSING	Displayed while the ExtraClean™ Sensor is measuring the amount of soil and temperature of water. The dishwasher will adjust the selected cycle to achieve optimal performance.
WASHING	Displayed during prewash and main wash periods.
RINSING	Displayed during rinse periods.
DRYING	Displayed during ***HEATED DRY.***
SANITIZED	Displayed when cycle has met sanitization conditions. Light remains **ON** until door is opened.
CLEAN	Displayed when a wash cycle is complete. The light will remain **ON** until door is opened.

2 Time Remaining Display *(on some models)*

During operation, the display shows the minutes remaining until the cycle is complete. The display may adjust the remaining time while the Sensing light is on. The time displayed at the start of each cycle may change from the factory setting as the unit customizes itself to home use. During a delay start, the display will show hours of time remaining until the cycle starts.

3 Selections

*The light above the selected pad will be **ON** to indicate which **WASH CYCLE** has been selected.*

ANTI-BACTERIA

Heavy 9.1 gal., 91 min.
Medium 7.8 gal., 89 min.
Light 6.5 gal., 87 min.

This cycle raises the water temperature in the final rinse to sanitize your dishware. The cycle length will vary depending on the temperature of your inlet water.

NOTE: The Anti-Bacteria cycle is monitored for sanitization requirements. If the cycle is interrupted during or after the main wash portion or if the incoming water temperature is so low that adequate water heating cannot be achieved, the sanitizing conditions may not be met. In these cases, the sanitized light will not illuminate at the end of the cycle.

NOTE: NSF-certified residential dishwashers are not intended for licensed food establishments.

POTS & PANS or **COOK WARE**

Heavy 10.4 gal., 102 min.
Medium 9.1 gal., 76 min.
Light 7.8 gal., 72 min.

This cycle is meant for heavily soiled dishes or cookware with dried-on or baked-on soils. This cycle may not remove burned-on foods. Everyday dishes are safe to be used in this cycle.

NORMAL WASH

Heavy 9.1 gal., 77 min.
Medium 6.5 gal., 62 min.
Light 5.2 gal., 49 min.

This cycle is for medium/heavily soiled dishes and glassware.

SPEED CYCLE	**Heavy** 7.8 gal., 37 min. **Medium** 6.5 gal., 33 min. **Light** 5.2 gal., 29 min. This cycle is for everyday dishes and glassware.
CHINA CRYSTAL	**Heavy** 9.1 gal., 52 min. **Medium** 7.8 gal., 45 min. **Light** 6.5 gal., 38 min. This cycle is for lightly soiled china and crystal.
GLASSES (on some models)	**Heavy** 9.1 gal., 49 min. **Medium** 7.8 gal., 42 min. **Light** 6.5 gal., 40 min. This cycle is specifically designed for glasses.
RINSE ONLY	**Heavy** 2.6 gal., 7 min. **Light** 1.3 gal., 4 min. For rinsing partial loads that will be washed later. Do not use detergent with this cycle.

NOTE: This dishwasher is equipped with an ExtraClean™ Sensor with automatic temperature control; therefore cycle length and time may vary depending on soil and temperature conditions.

NOTE: Only the Anti-Bacteria cycle has been designed to meet the requirements of Section 6, NSF 184 for soil removal and sanitization efficacy.

4 *Enhancements/Extras*

*The light above the selected pad will be **ON** to indicate which **ENHANCEMENT/EXTRA** has been selected.*

PRE WASH (on some models)	For use with heavily soiled and/or dried-on, baked-on soils. This option ***MUST*** be selected ***PRIOR*** to starting the cycle. *This option adds 16 minutes to the cycle time.* ***NOTE:*** Cannot be selected with ***RINSE ONLY*** cycle.
HEATED DRY *Light OFF*	Shuts off the drying heat option. Dishes air dry naturally and energy is saved. For faster air dry, you can prop the door open after the ***CLEAN*** light illuminates.
HEATED DRY *Light ON*	Turns the heater on for fast drying. This will extend the time to your wash cycle by 8 minutes for the ***SPEED CYCLE*** and 30 minutes for all other cycles. ***NOTE:*** Cannot be selected with ***RINSE ONLY*** cycle.
LOCK 🔒	*You can lock the controls to prevent any selections from being made. Or you can lock the controls after you have started a cycle.* *Children cannot accidentally start dishwasher by touching pads with this option selected.* To unlock the dishwasher controls, touch and hold the ***HEATED DRY*** pad for 3 seconds. To lock the dishwasher, touch and hold the ***HEATED DRY*** pad for 3 seconds. The light above the ***LOCK*** pad will turn off.
ADDED HEAT or EXTRA HOT WASH (on some models)	When selected, the cycle will run longer with heating elements on to improve both wash and dry performance. ***NOTE:*** Cannot be selected with ***RINSE ONLY*** cycle.
DELAY HOURS	You can delay the start of a wash cycle for up to 9 hours. Touch the ***DELAY HOURS*** pad to choose the number of hours you want to delay the start of the cycle; then touch ***START/RESET***. The machine will count down and start automatically at the correct time. **Touching *START/RESET* a second time will cancel the *DELAY START* selection.** ***NOTE:*** If you forget to fully close the door, a reminder signal will beep until you do so.
RESET	To change a cycle after washing starts, touch the ***START/RESET*** pad to cancel the cycle. The ***START/RESET*** light will flash while the water is pumped out if needed. This takes approximately 90 seconds. When the light stops flashing, the dishwasher can be reprogrammed and restarted.

ROA_01312

About the dishwasher control panel.

5 ***Start***

Close the dishwasher door and select the cycle and desired enhancements. Touch the ***START/RESET*** pad to begin the cycle. Water fill begins, and approximately 60 seconds later the wash action begins.

NOTE: The dishwasher remembers your last cycle so you don't have to reprogram each time. When the dishwasher door is fully closed, the control panel lights will display the last settings you selected.

6 ***Clean***

The ***CLEAN*** light is illuminated when a wash cycle is complete. The light will stay ***ON*** until the door is opened.

If you don't want to change any of the settings, simply touch the ***START/RESET*** pad to begin the cycle.

If the door is closed, the indicator lights will turn off if the ***START/RESET*** pad is not selected within two minutes. To activate the display, open and close the door or press any pad.

Also, if a power failure occurs, ***NORMAL*** and ***HEATED DRY*** will automatically be programmed. Make any new selections and touch the ***START/RESET*** pad to begin the cycle.

Flashing display lights.

Status Indicator Lights	*What It Means*
START/RESET	Cycle has been interrupted by pressing the ***START/RESET*** pad. Light will quit flashing after the dishwasher automatically drains out the water.

Using the dishwasher.

Check the Water Temperature

The entering water should be at least 120°F and not more than 150°F for effective cleaning and to prevent dish damage. Check the water temperature with a candy or meat thermometer. Turn on the hot water faucet nearest the dishwasher, place the thermometer in a glass and let the water run continuously into the glass until the temperature stops rising.

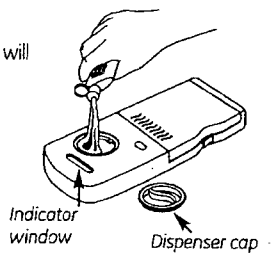
Use Jet-Dry® or Cascade Crystal Clear® Rinse Agent

Jet-Dry® or ***Cascade Crystal Clear®*** rinse agents remove spots and prevent new film buildup on your dishes, glasses, flatware, cookware and plastic.

Filling the Dispenser

The rinse agent dispenser holds 3.5 oz. of rinse agent. Under normal conditions, this will last approximately one month. Try to keep it full, but do not overfill.

1. Make sure the dishwasher door is fully open.
2. Turn the dispenser cap to the left and lift it out.
3. Add rinse agent until the indicator window looks full.
4. Clean up any spilled rinse agent with a damp cloth.
5. Replace the dispenser cap.

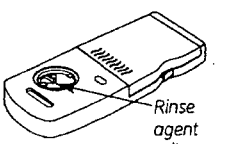


Rinse Aid Setting

The amount of rinse agent released into the final wash can be adjusted. The factory setting is at the midpoint. If there are rings of calcium (hard water) spots on dishes, try a higher setting.

To adjust the setting

Remove the dispenser knob; then turn the adjuster counterclockwise to increase the amount of rinse agent.



Dish Preparation Prior to Loading

- No prerinsing of normal food soil is required.
- Scrape off hard soils, including bones, toothpicks, skins and seeds.
- Remove large quantities of any remaining food.
- Remove leafy vegetables, meat trimmings and excessive amounts of grease or oil.
- Remove acidic food soils that can discolor stainless steel.

Using the Dishwasher Door

1. The door must be closed to select a ***LOAD SELECTION*** or an ***ENHANCEMENT***.
2. If the door is opened during a cycle and left open, *the dishwasher will beep once every minute* until the door is closed.

Proper Use of Detergent

Use only detergent specifically made for use in dishwashers. Cascade®, Cascade Complete® and Electrasol® Automatic Dishwashing Detergents have been approved for use in all GE dishwashers. Keep your detergent fresh and dry. Don't put detergent into the dispenser until you're ready to wash dishes.

All wash cycles except ***RINSE ONLY*** require detergent. The amount of detergent to use depends on whether your water is *hard* or *soft*.

Protect your dishes and dishwasher by contacting your water department and asking how hard your water is. Twelve or more grains is extremely hard water. A water softener is recommended. Without it, lime can build up in the water valve, which could stick while open and cause flooding. Too much detergent with soft water can cause a permanent cloudiness of glassware, called *etching*.

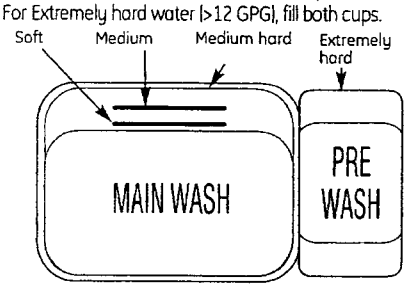
The detergent cup has indicator lines to help you. Use the right amount of detergent. As a guide:

For Soft water (water hardness <4 Grains Per Gallon, GPG), fill cup to the first line.

For Medium water (4–8 GPG), fill cup to the second line.

For Medium hard water (8–12 GPG), fill cup.

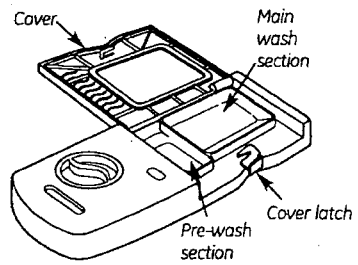
For Extremely hard water (>12 GPG), fill both cups.



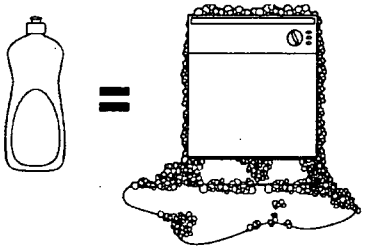
Filling the Dispenser

1. If the dispenser cover is closed, open the cover by depressing the cover latch.
2. Add the detergent to the Main Wash section, as per guidelines.
3. Fill the Pre-wash section if water is extremely hard.
4. Close the dispenser cover.

It is normal for the cover to open partially when dispensing detergent.



DO NOT USE HAND DISH DETERGENT



NOTE: *Using a detergent that is not specifically designed for dishwashers will cause the dishwasher to fill with suds. During operation, these suds will spill out of the dishwasher vents, covering the kitchen floor and making the floor wet.*

Because so many detergent containers look alike, store the dishwasher detergent in a separate space from all other cleaners. Show anyone who may use the dishwasher the correct detergent and where it is stored.

While there will be no lasting damage to the dishwasher, your dishes will not get clean using a dishwashing detergent that is not formulated to work with dishwashers.

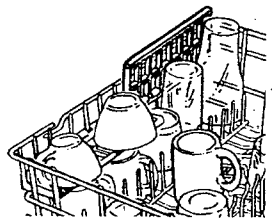
Forget to Add a Dish?

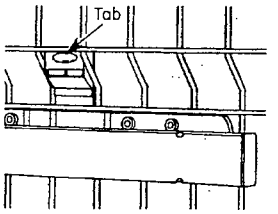
A forgotten dish can be added any time before the main wash.

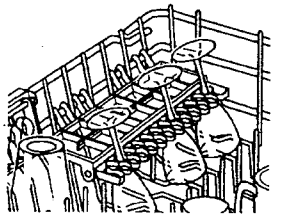
1. Squeeze the door latch to release the door.
2. Do not open the door until the water spray action stops. Steam may rise out of the dishwasher.
3. Add forgotten dishes.
4. Close the door.

Loading the dishwasher racks.

For best dishwashing results, follow these loading guidelines. Features and appearance of racks and silverware baskets may vary from your model.







Upper Rack

Although the upper rack is for glasses, cups and saucers, pots and pans can be placed in this rack for effective cleaning. Cups and glasses fit best along the sides. This is also a secure place for dishwasher-safe plastics.

The upper rack is adjustable (on some models) to add flexibility in loading your dishwasher. To lower, push tabs in and lower rack. To raise, just pull up on rack until it snaps.

The utility shelf (on some models) may be placed in the up or down position to add flexibility. *A wine glass holder* (on some models) secures wine glasses for best washability. Because wine glasses come in various sizes, after loading, slowly push in the rack to make sure they will clear the top of the dishwasher.

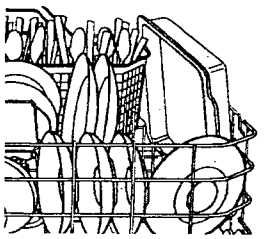
The upper rack is good for all kinds of odd-shaped utensils. Saucepans, mixing bowls and other items should be placed face down. Fold-down tines (on some models) provide flexibility for extra-large and hard-to-fit items.

Secure larger dishwasher-safe plastics over 2 tines when possible.

Make sure small plastic items are secure so they can't fall onto the heater.

Be sure that items do not protrude through the bottom of the rack and block rotation of the middle spray arm. This could result in poor wash performance for items in the upper rack.

Check to make sure that no items will block rotation of the wash arms.

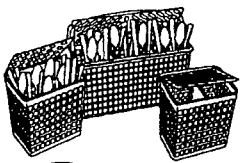


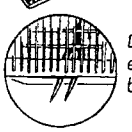
Lower Rack

The lower rack is best used for plates, saucers, and cookware. Large items such as broiler pans and baking racks should go along the left-hand side. Load platters, pots and bowls along the sides, in corners, or in the back. The soiled side of items should face the center of the rack. If necessary, oversized glasses and mugs can be placed in the lower rack to maximize loading flexibility.

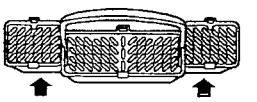
Also, be careful not to let a portion of an item such as a pot or dish handle extend through the bottom rack. This could block the wash arm and cause poor washing results.

Fold-down tines (on some models) provide flexibility for extra-large and hard-to-fit items. The tines may be left in the up position or folded down to customize the lower rack.





Don't let any item extend through bottom.



To remove end baskets, grasp the basket at opposite corners and slide apart.

Silverware Basket

A variety of options is available regarding the three-piece silverware basket in your dishwasher. The complete basket is designed to fit on the right side of the lower rack. Additionally, each end of the basket is removable to add loading flexibility to accommodate flatware and lower rack capacity needs.

To load flatware, simply push the adjustable handle to either side. Put flatware in the basket with knife handles up to protect your hands. Place spoons in the basket with handles down. Mix knives, forks and spoons so they don't nest together.

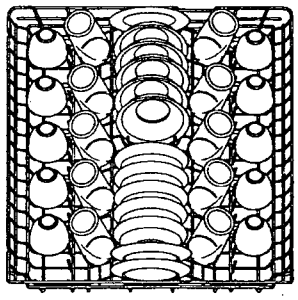
The provided lids with slots can be used to avoid nesting of silverware. Small plastic items, such as measuring spoons and lids for small containers, should go in the bottom of the silverware basket with silverware on top.

The lids of both end and middle baskets can be closed to contain small items. Long items can be placed on the utility shelf in the upper rack.

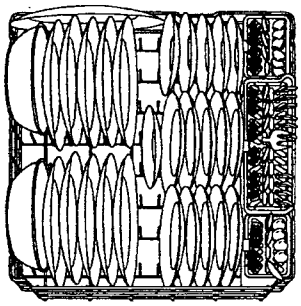
Loading place settings...

ge.com

Follow these guidelines for loading 10 place settings. Features and appearance of racks and silverware baskets may vary from your model.

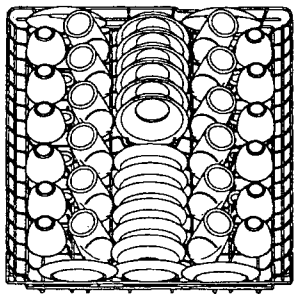


Upper Rack—10 place settings

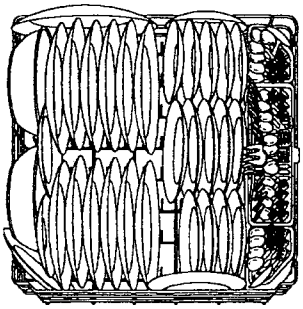


Lower Rack—10 place settings

Follow these guidelines for loading 12 place settings. Features and appearance of racks and silverware baskets may vary from your model.



Upper Rack—12 place settings



Lower Rack—12 place settings

About optional accessories.

You can change the appearance of your dishwasher to match your kitchen cabinets by ordering one of these optional accessories (PDW7700 models only):

- *1/4" Wood Panel Trim Kit*
- *3/4" Trimless Wood Panel Kit*

These accessories are available at extra cost (VISA, MasterCard, or Discover cards accepted) by calling 800.626.2002.

Specify accessory number when ordering.

Descriptions of Optional Accessories

Wood panel trim kit—This accessory contains *trim and instructions* **for you to supply and install a 1/4" thick decorative wood door:**

- *GPF825B (Black)*
- *GPF825W (White)*
- *GPF825C (Bisque)*

Trimless wood panel kit—This accessory contains *parts and instructions* **for you to supply and install a 3/4" thick decorative wood door:**

- *GPF875B (Black)*
- *GPF875W (White)*
- *GPF875C (Bisque)*

Caring for the dishwasher.

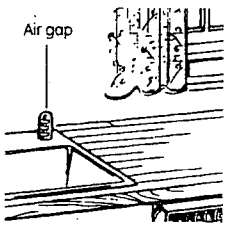
To clean the control panel use a lightly dampened cloth, then dry thoroughly. To clean the exterior, use a good appliance polish wax.

Never use sharp objects, scouring pads or harsh cleaners on any part of the dishwasher.

Protect Against Freezing

If your dishwasher is left in an unheated place during the winter, ask a service technician to:

1. Cut off electrical power to the dishwasher. Remove fuses or trip circuit breaker.
2. Turn off the water supply and disconnect the water inlet line from the water valve.
3. Drain water from the water inlet line and water valve. (Use a pan to catch the water.)
4. Reconnect the water inlet line to the water valve.



Check the air gap any time your dishwasher isn't draining well.

Does Your Dishwasher Have an Air Gap?

An air gap protects your dishwasher against water backing up into it if a drain clogs. The air gap is not a part of the dishwasher. It is not covered by your warranty. Not all plumbing codes require air gaps, so you may not have one.

The air gap is easy to clean.

1. Turn off the dishwasher and lift off the chrome cover.
2. Remove the plastic cap and clean with a toothpick.

The Stainless Steel Panels

The stainless steel panels can be cleaned with *CERAMA BRYTE* Stainless Steel Appliance Cleaner or a similar product using a clean, soft cloth.

You can order *CERAMA BRYTE* Stainless Steel Appliance Cleaner through GE Parts by calling 800.626.2002 (for U.S. only).

Before you call for service...

Troubleshooting Tips
*Save time and money! Review the charts on the following pages, or visit **ge.com**. You may not need to call for service.*

Error Messages	*Possible Causes*	*What To Do*
START/RESET status indicator light flashing	You have pressed the START/RESET pad while the dishwasher is running. This will cancel the cycle. The light will stop flashing after the dishwasher drains (about 90 seconds).	• Press the ***START/RESET*** pad only when you want to restart the dishwasher.
Dishwasher BEEPS once every 30 seconds	This is a reminder that your dishwasher door has been left open during operation. It will continue beeping until you close the door.	• Close and latch the door after opening it mid-cycle.

Problem	*Possible Causes*	*What To Do*
Dishes and flatware not clean	Low inlet water temperature	• Make sure inlet water temperature is correct (see page 8). Turn on the hot water faucet nearest the dishwasher, let run until the water temperature stops rising. Then start the dishwasher and turn off the faucet. This insures the entering water is hot.
	Water pressure is temporarily low	• Turn on a faucet. Is water coming out more slowly than usual? If so, wait until pressure is normal before using your dishwasher.
	Air gap or disposer is clogged	• Clean the air gap or flush the disposer.
	Improper rack loading	• Make sure large dishware does not block the detergent dispenser or the wash arms. See the *Loading the dishwasher racks* section.
	No air gap or high drain loop	• Verify that you have an air gap or a high drain loop. Refer to the Installation Instructions.
Spots and filming on glasses and flatware	Extremely hard water Low inlet water temperature Overloading the dishwasher Improper loading Old or damp powder detergent Rinse agent dispenser empty Too little detergent	• Use ***Jet-Dry®*** or ***Cascade Crystal Clear®*** rinse agents to remove spots and prevent new film buildup. • To remove stubborn spots and pre-existing film from glassware: 1 Remove all metal utensils from the dishwasher. 2 Do not add detergent. 3 Select the ***POTS & PANS*** cycle. 4 Start the dishwasher and allow to run for 18 to 22 minutes. Dishwasher will now be in the main wash. 5 Open the door and pour 2 cups (500 ml) of white vinegar into the bottom of the dishwasher. 6 Close the door and allow to complete the cycle. If vinegar rinse doesn't work: Repeat as above, except use 1/4 cup (60 ml) of citric acid crystals instead of vinegar.
Cloudiness on glassware	Combination of soft water and too much detergent	• This is called *etching* and is permanent. To prevent this from happening, use less detergent if you have soft water. Wash glassware in the shortest cycle that will get them clean.
	Water temperature entering the dishwasher exceeds 150°F	• This could be etching. Lower the water heater temperature.
Suds in the tub	Correct detergent wasn't used	• Use only automatic dishwasher detergents to avoid sudsing. ***Cascade®*** and ***Electrasol®*** Automatic Dishwashing Detergents have been approved for use in all GE dishwashers. • To remove suds from the tub, open the dishwasher and let suds dissipate. Close and latch the dishwasher. Pump out water by touching the ***START/RESET*** pad once; then 30 seconds later, touch the ***START/RESET*** pad again. Repeat if necessary.
	Rinse agent was spilled	• Always wipe up rinse agent spills immediately.

Before you call for service...

Problem	Possible Causes	What To Do
Detergent left in dispenser cups	**Dishes are blocking the detergent cup**	• Reposition the dishes, so the water from the lower spray arm can flush the detergent cup. See the *Loading the dishwasher* section.
Black or gray marks on dishes	**Aluminum utensils have rubbed against dishes**	• Remove marks with a mild, abrasive cleaner.
Dishes don't dry	**Low inlet water temperature**	• Make sure inlet water temperature is at least 120°F. • Select ***HEATED DRY.*** • Use ***HOT START, HOT WASH*** or ***ADDED HEAT*** options. • Select a higher cycle, such as ***ANTI-BACTERIA, SANI WASH*** or ***POTS & PANS.***
	Rinse agent dispenser is empty	• Check the rinse agent dispenser and fill as required.
Control panel responded to inputs but dishwasher never filled with water	**Door latch may not be properly seated**	• Make sure the door is firmly closed.
	Water valve may be turned off	• Make sure water valve (usually located under the sink) is turned on.
Stained tub interior	**Some tomato-based foods can cause reddish stains**	• Use of the ***RINSE ONLY*** cycle after adding the dish to the load can decrease the level of staining. GE recommends ***Cascade® Plastic Booster*** to help remove these types of stains.
	Tea or coffee stains	• Remove the stain by hand, using a solution of 1/2 cup bleach and 3 cups warm water. ***⚠ WARNING*** Before cleaning interior, wait at least 20 minutes after a cycle for the heating elements to cool down. Failure to do so can result in burns.
	An overall yellow or brown film can be caused by iron deposits in water	• A special filter in the water supply line is the only way to correct this problem. Contact a water softener company.
	White film on inside surface—hard water minerals	• GE recommends ***Jet-Dry®*** or ***Cascade Crystal Clear®*** to help prevent hard water mineral deposits from forming. • Run dishwasher with citric acid to remove mineral deposits. Citric acid (Part number: WD35X151) can be ordered through GE Parts. See back cover for ordering information.
Dishwasher won't run	**Fuse is blown or circuit breaker is tripped**	• Replace fuse or reset circuit breaker. Remove any other appliances from the circuit.
	Power is turned off	• In some installations, the power to the dishwasher is provided through a wall switch, often located next to the disposer switch. Make sure it is on.
	Control panel is locked	• Unlock control panel. See page 5 or 7.
	Reboot your control	• Turn off power to the dishwasher (circuit breaker or wall switch) for 30 seconds; then turn back on.
Control panel lights go off when you're setting controls	**Time too long between touching of selected pads**	• Each pad must be touched within 30 seconds of the others. To relight, touch any pad again, or unlock and relatch door.
Water standing in the bottom of the tub	**This is normal**	• A small amount of clean water around the outlet on the tub bottom at the back of the tub keeps the water seal lubricated.
Water won't pump out of the tub	**Drain is clogged**	• If you have an air gap, clean it. See page 12. • If the dishwasher drains into a disposer, run disposer clear. • Check to see if your kitchen sink is draining well. If not, you may need a plumber.
Steam	**This is normal**	• Warm, moist air comes through the vent by the door latch during drying and when water is being pumped out. This is necessary for drying.
Sanitized light does not illuminate at the end of the cycle (Anti-Bacteria cycle only)	**The door was opened and the cycle was interrupted during or after the main wash portion**	• Do not interrupt the cycle anytime during or after main wash.
	The incoming water temperature was too low	• Raise the water heater temperature to between 120°F and 140°F.
Noise	**Normal operating sounds**	• Detergent cup opening. • Water entering dishwasher. • The motor stops and starts at various times during the cycle. • Drain pump sounds during the pump out.
	Rattling dishes when the spray arm rotates	• Make sure dishes are properly loaded. See the *Loading the dishwasher racks* section.

ROA_01319

GE Service Protection Plus™

GE, a name recognized worldwide for quality and dependability, offers you Service Protection Plus™—comprehensive protection on all your appliances—**No Matter What Brand!**

Benefits Include:
- **Backed by GE**
- **All brands covered**
- **Unlimited service calls**
- **All parts and labor costs included**
- **No out-of-pocket expenses**
- **No hidden deductibles**
- **One 800 number to call**

We'll Cover Any Appliance. Anywhere. Anytime.*

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Protect your refrigerator, dishwasher, washer and dryer, range, TV, VCR and much more—**any brand!** Plus there's no extra charge for emergency service and low monthly financing is available. Even icemaker coverage and food spoilage protection is offered. You can rest easy, knowing that all your valuable household products are protected against expensive repairs.

Place your confidence in GE and call us in the U.S. toll-free at **800.626.2224** for more information.

*All brands covered, up to 20 years old, in the continental U.S.

Cut here

Please place in envelope and mail to:

General Electric Company
Warranty Registration Department
P.O. Box 32150
Louisville, KY 40232-2150

Consumer Product Ownership Registration

Dear Customer:
Thank you for purchasing our product and thank you for placing your confidence in us.
We are proud to have you as a customer!

Follow these three steps to protect your new appliance investment:

1 **Complete and mail your Consumer Product Ownership Registration today.** Have the peace of mind of knowing we can contact you in the unlikely event of a safety modification.

2 After mailing the registration below, store this document in a safe place. It contains information you will need should you require service. Our service number is 800.GE.CARES (800.432.2737).

3 Read your Owner's Manual carefully. It will help you operate your new appliance properly.

Model Number _____ Serial Number _____

Important: If you did not get a registration card with your product, detach and return the form below to ensure that your product is registered, or register online at ge.com.

Cut here

Consumer Product Ownership Registration

Important Mail Today!

Model Number _____ Serial Number _____

Mr.☐ Ms.☐ Mrs.☐ Miss☐

First Name _____ Last Name _____

Street Address _____

Apt. # _____ E-mail Address* _____

City _____ State _____ Zip Code _____

Date Placed in Use Month _____ Day _____ Year _____ Phone Number _____-_____-_____

GE Consumer & Industrial
Appliances
General Electric Company
Louisville, KY 40225
ge.com

* Please provide your e-mail address to receive, via e-mail, discounts, special offers and other important communications from GE Appliances (GEA).

☐ Check here if you do not want to receive communications from GEA's carefully selected partners.

FAILURE TO COMPLETE AND RETURN THIS CARD DOES NOT DIMINISH YOUR WARRANTY RIGHTS.

For information about GEA's privacy and data usage policy, go to ge.com and click on "Privacy Policy" or call 800.626.2224.

GE Dishwasher Warranty.

All warranty service provided by our Factory Service Centers, or an authorized Customer Care® technician. To schedule service, on-line, 24 hours a day, visit us at ge.com, or call 800.GE.CARES (800.432.2737). Please have serial number and model number available when calling for service.

Staple your receipt here. Proof of the original purchase date is needed to obtain service under the warranty.

For The Period Of:	GE Will Replace:
One Year *From the date of the original purchase*	***Any part*** of the dishwasher which fails due to a defect in materials or workmanship. During this ***limited one-year warranty,*** GE will also provide, ***free of charge,*** all labor and related service to replace the defective part.
Five Years (for models PDW7300, PDW7700, PDW7800 and PDW7880) *From the date of the original purchase*	***The dishwasher racks or the electronic control module,*** if they should fail due to a defect in materials or workmanship. During this ***five-year limited warranty,*** you will be responsible for any labor or in-home service costs.
Lifetime of Product (for models PDW7300, PDW7700, PDW7800 and PDW7880)	***The PermaTuf® tub or door liner,*** if it fails to contain water due to a defect in materials or workmanship. During this ***limited warranty,*** GE will also provide, ***free of charge,*** all labor and related service to replace the defective part.

What GE Will Not Cover:

- Service trips to your home to teach you how to use the product.
- Improper installation, delivery or maintenance.
- Failure of the product if it is abused, misused, or used for other than the intended purpose or used commercially.
- Replacement of house fuses or resetting of circuit breakers.
- Damage to the product caused by accident, fire, floods or acts of God.
- Incidental or consequential damage caused by possible defects with this appliance.
- Cleaning or servicing of the air gap device in the drain line.
- Damage caused after delivery.
- Product not accessible to provide required service.

EXCLUSION OF IMPLIED WARRANTIES—Your sole and exclusive remedy is product repair as provided in this Limited Warranty. Any implied warranties, including the implied warranties of merchantability or fitness for a particular purpose, are limited to one year or the shortest period allowed by law.

This warranty is extended to the original purchaser and any succeeding owner for products purchased for home use within the USA. If the product is located in an area where service by a GE Authorized Servicer is not available, you may be responsible for a trip charge or you may be required to bring the product to an Authorized GE Service location for service. Proof of original purchase date is needed to obtain service under the warranty. In Alaska, the warranty excludes the cost of shipping or service calls to your home.

Some states do not allow the exclusion or limitation of incidental or consequential damages. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state. To know what your legal rights are, consult your local or state consumer affairs office or your state's Attorney General.

Warrantor: General Electric Company. Louisville, KY 40225

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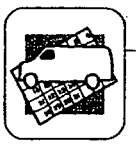
Consumer Support.

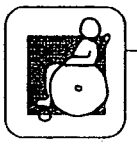
GE Appliances Website — ge.com

Have a question or need assistance with your appliance? Try the GE Appliances Website 24 hours a day, any day of the year! For greater convenience and faster service, you can now download Owner's Manuals, order parts, catalogs, or even schedule service on-line. You can also "Ask Our Team of Experts™" your questions, and so much more...



Schedule Service — ge.com

Expert GE repair service is only one step away from your door. Get on-line and schedule your service at your convenience 24 hours any day of the year! Or call 800.GE.CARES (800.432.2737) during normal business hours.

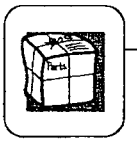


Real Life Design Studio — ge.com

GE supports the Universal Design concept—products, services and environments that can be used by people of all ages, sizes and capabilities. We recognize the need to design for a wide range of physical and mental abilities and impairments. For details of GE's Universal Design applications, including kitchen design ideas for people with disabilities, check out our Website today. For the hearing impaired, please call 800.TDD.GEAC (800.833.4322).

Extended Warranties — ge.com

Purchase a GE extended warranty and learn about special discounts that are available while your warranty is still in effect. You can purchase it on-line anytime, or call 800.626.2224 during normal business hours. GE Consumer Home Services will still be there after your warranty expires.



Parts and Accessories — ge.com

Individuals qualified to service their own appliances can have parts or accessories sent directly to their homes (VISA, MasterCard and Discover cards are accepted). Order on-line today, 24 hours every day or by phone at 800.626.2002 during normal business hours.

Instructions contained in this manual cover procedures to be performed by any user. Other servicing generally should be referred to qualified service personnel. Caution must be exercised, since improper servicing may cause unsafe operation.

Contact Us — ge.com

If you are not satisfied with the service you receive from GE, contact us on our Website with all the details including your phone number, or write to: General Manager, Customer Relations
GE Appliances, Appliance Park
Louisville, KY 40225

Register Your Appliance — ge.com

Register your new appliance on-line—at your convenience! Timely product registration will allow for enhanced communication and prompt service under the terms of your warranty, should the need arise. You may also mail in the preprinted registration card included in the packing material.

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Printed on Recycled Paper

RANGE MANUAL

ROA_01324

ge.com

Self-Cleaning Convection Ranges

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Write the model and serial numbers here:

Model # _____

Serial # _____

You can find them on a label behind the storage drawer on the front of the range frame.

JBP84

49-80364 *11-05 JR*

OBH - O&M 187

ROA_01325

IMPORTANT SAFETY INFORMATION. READ ALL INSTRUCTIONS BEFORE USING.

⚠ WARNING!

For your safety, the information in this manual must be followed to minimize the risk of fire, electric shock, or to prevent property damage, personal injury, or loss of life.

⚠ WARNING ANTI-TIP DEVICE

All ranges can tip and injury could result.

To prevent accidental tipping of the range, attach it to the wall and floor by installing the Anti-Tip device supplied.

If the Anti-Tip device supplied with the range does not fit this application, use the universal Anti-Tip device WB2X7909.

To check if the device is installed and engaged properly, remove the kick panel or storage drawer and inspect the rear leveling leg. Make sure it fits securely into the slot.

If you pull the range out from the wall for any reason, make sure the device is properly engaged when you push the range back against the wall. If it is not, there is a possible risk of the range tipping over and causing injury if you or a child stand, sit or lean on an open door.

Please refer to the Anti-Tip device information in this manual. Failure to take this precaution could result in tipping of the range and injury.

IMPORTANT SAFETY NOTICE

The California Safe Drinking Water and Toxic Enforcement Act requires the Governor of California to publish a list of substances known to the state to cause cancer, birth defects or other reproductive harm, and requires businesses to warn customers of potential exposure to such substances.

The fiberglass insulation in self-clean ovens gives off a very small amount of carbon monoxide during the cleaning cycle. Exposure can be minimized by venting with an open window or using a ventilation fan or hood.

SAFETY PRECAUTIONS

When using electrical appliances, basic safety precautions should be followed, including the following:

- Use this appliance only for its intended purpose as described in this Owner's Manual.
- Be sure your appliance is properly installed and grounded by a qualified installer in accordance with the provided installation instructions.
- Have the installer show you the location of the circuit breaker or fuse. Mark it for easy reference.
- Do not attempt to repair or replace any part of your range unless it is specifically recommended in this manual. All other servicing should be referred to a qualified technician.
- Before performing any service, disconnect the range power supply at the household distribution panel by removing the fuse or switching off the circuit breaker.
- Do not leave children alone—children should not be left alone or unattended in an area where an appliance is in use. They should never be allowed to sit or stand on any part of the appliance.
- Do not allow anyone to climb, stand or hang on the door, storage drawer or cooktop. They could damage the range and even tip it over, causing severe personal injury.

⚠ WARNING! SAFETY PRECAUTIONS

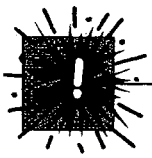
Do not operate the oven or cooktop controls if the glass is broken. Food splatter or cleaning solution may penetrate a broken control panel and create a risk of electrical shock. Contact a qualified technician immediately should your glass control panel become broken.

- Do not store flammable materials in an oven or near the cooktop.
- **CAUTION:** Items of interest to children should not be stored in cabinets above a range or on the backsplash of a range–children climbing on the range to reach items could be seriously injured.
- Never wear loose-fitting or hanging garments while using the appliance. Be careful when reaching for items stored over the range. Flammable material could be ignited if brought in contact with hot surface units or heating elements and may cause severe burns.
- Use only dry pot holders—moist or damp pot holders on hot surfaces may result in burns from steam. Do not let pot holders touch hot surface units or heating elements. Do not use a towel or other bulky cloth in place of pot holders.
- Do not use water on grease fires. Never pick up a flaming pan. Turn the controls off. Smother a flaming pan on a surface unit by covering the pan completely with a well-fitting lid, cookie sheet or flat tray. Use a multi-purpose dry chemical or foam-type fire extinguisher.

  Flaming grease outside a pan can be put out by covering it with baking soda or, if available, by using a multi-purpose dry chemical or foam-type fire extinguisher.

  Flame in the oven can be smothered completely by closing the oven door and turning the oven off or by using a multi-purpose dry chemical or foam-type fire extinguisher.
- For your safety, never use your appliance for warming or heating the room.

IMPORTANT SAFETY INFORMATION. READ ALL INSTRUCTIONS BEFORE USING.



⚠ WARNING!
SAFETY PRECAUTIONS

Do not operate the oven or cooktop controls if the glass is broken. Food splatter or cleaning solution may penetrate a broken control panel and create a risk of electrical shock. Contact a qualified technician immediately should your glass control panel become broken.

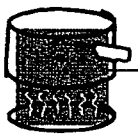
- Do not let cooking grease or other flammable materials accumulate in or near the range.
- Do not touch the surface units, the heating elements or the interior surface of the oven. These surfaces may be hot enough to burn even though they are dark in color. During and after use, do not touch, or let clothing or other flammable materials contact the surface units, areas nearby the surface units or any interior area of the oven; allow sufficient time for cooling first.

  Potentially hot surfaces include the cooktop, areas facing the cooktop, oven vent opening, surfaces near the opening, crevices around the oven door.

  REMEMBER: The inside surface of the oven may be hot when the door is opened.
- Do not store or use combustible materials, gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
- Keep the hood and grease filters clean to maintain good venting and to avoid grease fires.
- Teach children not to play with the controls or any other part of the range.
- Always keep dish towels, dish cloths, pot holders and other linens a safe distance from your range.
- Always keep wooden and plastic utensils and canned food a safe distance from your range.
- Always keep combustible wall coverings, curtains or drapes a safe distance from your range.

COOK MEAT AND POULTRY THOROUGHLY...

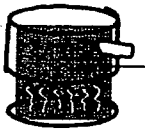
Cook meat and poultry thoroughly—meat to at least an INTERNAL temperature of 160°F and poultry to at least an INTERNAL temperature of 180°F. Cooking to these temperatures usually protects against foodborne illness.



SURFACE UNITS

Use proper pan size—select cookware having flat bottoms large enough to cover the surface unit heating element. The use of undersized cookware will expose a portion of the surface unit to direct contact and may result in ignition of clothing. Proper relationship of cookware to surface unit will also improve efficiency.

- Never leave the surface units unattended at high heat settings. Boilovers cause smoking and greasy spillovers that may catch on fire.
- Only certain types of glass, glass/ceramic, earthenware or other glazed containers are suitable for cooktop service; others may break because of the sudden change in temperature.
- To minimize the possibility of burns, ignition of flammable materials and spillage, the handle of a container should be turned toward the center of the range without extending over nearby surface units.
- Always turn the surface units off before removing cookware.
- When preparing flaming foods under the hood, turn the fan on.
- Use care when touching the cooktop. The glass surface of the cooktop will retain heat after the controls have been turned off.
- Keep an eye on foods being fried at high or medium high heat settings.



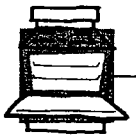
SURFACE UNITS

Use proper pan size—select cookware having flat bottoms large enough to cover the surface unit heating element. The use of undersized cookware will expose a portion of the surface unit to direct contact and may result in ignition of clothing. Proper relationship of cookware to surface unit will also improve efficiency.

- Foods for frying should be as dry as possible. Frost on frozen foods or moisture on fresh foods can cause hot fat to bubble up and over the sides of the pan.
- Use little fat for effective shallow or deep fat frying. Filling the pan too full of fat can cause spillovers when food is added.
- If a combination of oils or fats will be used in frying, stir together before heating, or as fats melt slowly.
- Always heat fat slowly, and watch as it heats.
- Use a deep fat thermometer whenever possible to prevent overheating fat beyond the smoking point.
- Avoid scratching the glass cooktop. The cooktop can be scratched with items such as sharp instruments, rings or other jewelry, and rivets on clothing.
- Do not operate the radiant surface units if the glass is broken. Spillovers or cleaning solution may penetrate a broken cooktop and create a risk of electrical shock. Contact a qualified technician immediately should your glass cooktop become broken.
- Never use the glass cooktop surface as a cutting board.
- Do not place or store items that can melt or catch fire on the glass cooktop, even when it is not being used.
- Be careful when placing spoons or other stirring utensils on glass cooktop surface when it is in use. They may become hot and could cause burns.
- Clean the cooktop with caution. If a wet sponge or cloth is used to wipe spills on a hot surface unit, be careful to avoid steam burns. Some cleaners can produce noxious fumes if applied to a hot surface.

  NOTE: We recommend that you avoid wiping any surface unit areas until they have cooled and the indicator light has gone off. ***Sugar spills are the exception to this.*** Please see the *Cleaning the glass cooktop* section.
- When the cooktop is cool, use only CERAMA BRYTE® Ceramic Cooktop Cleaner and the CERAMA BRYTE® Cleaning Pad to clean the cooktop.
- To avoid possible damage to the cooking surface, do not apply cleaning cream to the glass surface when it is hot.
- After cleaning, use a dry cloth or paper towel to remove all cleaning cream residue.
- Read and follow all instructions and warnings on the cleaning cream labels.
- Large scratches or impacts to glass doors or cooktops can lead to broken or shattered glass.
- Do not leave any items on the cooktop. The hot air from the vent may ignite flammable items and will increase pressure in closed containers, which may cause them to burst.
- Do not leave plastic items on the cooktop—they may melt if left too close to the vent.
- Do not lift the cooktop. Lifting the cooktop can lead to damage and improper operation of the range.

IMPORTANT SAFETY INFORMATION. READ ALL INSTRUCTIONS BEFORE USING.

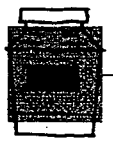


⚠ WARNING!

OVEN

Stand away from the range when opening the oven door. Hot air or steam which escapes can cause burns to hands, face and/or eyes.

- Do not heat unopened food containers. Pressure could build up and the container could burst, causing an injury.
- Keep the oven vent unobstructed.
- Keep the oven free from grease buildup.
- Place the oven shelf in the desired position while the oven is cool. If shelves must be handled when hot, do not let pot holder contact the heating elements.
- When using cooking or roasting bags in the oven, follow the manufacturer's directions.
- Pulling out the shelf to the stop-lock is a convenience in lifting heavy foods. It is also a precaution against burns from touching hot surfaces of the door or oven walls.
- Do not use the oven to dry newspapers. If overheated, they can catch on fire.
- Do not use the oven for a storage area. Items stored in an oven can ignite.
- Do not leave paper products, cooking utensils or food in the oven when not in use.
- Do not use aluminum foil to line oven bottoms, except as suggested in this manual. Improper installation of aluminum foil may result in a risk of electric shock or fire.



SELF-CLEANING OVEN

Do not use oven cleaners. No commercial oven cleaner or oven liner protective coating of any kind should be used in or around any part of the oven. Residue from oven cleaners will damage the inside of the oven when the self-clean cycle is used.

- Do not clean the door gasket. The door gasket is essential for a good seal. Care should be taken not to rub, damage or move the gasket.
- Before self-cleaning the oven, remove the broiler pan, grid and other cookware.
- Nickel oven shelves (on some models) should be removed from the oven before beginning the self-clean cycle, or they may discolor.
- Gray porcelain-coated oven shelves (on some models) may be cleaned in the oven during the self-clean cycle.
- Be sure to wipe off excess spillage before starting the self-cleaning operation.
- If the self-cleaning mode malfunctions, turn the oven off and disconnect the power supply. Have it serviced by a qualified technician.
- Clean only parts listed in this Owner's Manual.

READ AND FOLLOW THIS SAFETY INFORMATION CAREFULLY.

SAVE THESE INSTRUCTIONS

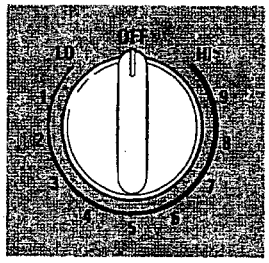
WARMING DRAWER

- The purpose of the warming drawer is to hold hot cooked foods at serving temperature. Always start with hot food; cold food cannot be heated or cooked in the warming drawer.
- Do not use the drawer to dry newspapers. If overheated, they can catch on fire.
- Do not leave paper products, plastics, canned food or combustible materials in the drawer.
- Never leave jars or cans of fat drippings in or near your drawer.
- Do not warm food in the drawer for more than two hours.
- Never place, use or self-clean the lower oven drawer pan in the upper oven.
- ***Do not touch the heating element or the interior surface of the drawer.*** These surfaces may be hot enough to burn.

  REMEMBER: The inside surface of the drawer may be hot when the drawer is opened.
- Use care when opening the drawer. Open the drawer a crack and let hot air or steam escape before removing or replacing food. Hot air or steam which escapes can cause burns to hands, face and/or eyes.
- Do not use aluminum foil to line the lower oven drawer. Foil is an excellent heat insulator and will trap heat beneath it. This will upset the performance of the drawer and it could damage the interior finish.

Using the surface units.

Throughout this manual, features and appearance may vary from your model.



Be sure you turn the control knob to OFF when you finish cooking.

How to Set

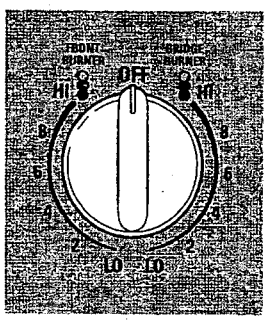
Push the knob in and turn in either direction to the setting you want.

At both ***OFF*** and ***HI*** the control ***clicks*** into position. You may hear slight ***clicking*** sounds during cooking, indicating the control is keeping the power level you set.

A ***HOT COOKTOP*** indicator light will glow when any radiant element is turned on, and will remain on until the surface is cooled to approximately 150°F.

Indicator light will:

- *come on when the unit is turned on or hot to the touch.*
- *stay on even after the unit is turned off.*
- *glow until the unit is cooled to approximately 150°F.*

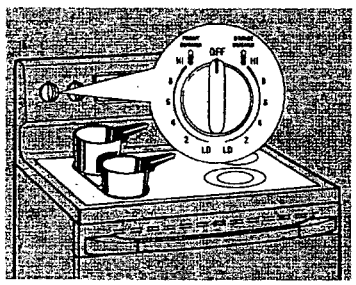


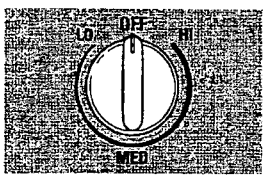
Using the Bridge Burner

To use the bridge burner, turn the control knob to the ***BRIDGE BURNER*** settings.

For full bridge burner operation, turn on the rear burner.

To use only the front burner, turn the control knob to the ***FRONT BURNER*** settings.





WARMER GUIDE

SETTING	FOOD
(Low)	Bread/Pastries
(Medium)	Chocolate/Butter
(Medium)	Sauces, Stews, Cream Soups
(Medium)	Vegetables
(High)	Soups (liquid)
(High)	Tea or Coffee

The Warmer Guide is for reference only and the SETTING that you need will depend on the amount and type of food, the starting temperature of the food and the length of the holding time.

Using the Warming Zone

The ***WARMING ZONE***, located in the back center of the glass surface, will keep hot, cooked food at serving temperature. Always start with hot food. Do not use to heat cold food. Placing uncooked or cold food on the ***WARMING ZONE*** could result in food-borne illness.

Push and turn the control knob to any desired setting.

For best results, all foods on the ***WARMING ZONE*** should be covered with a lid or aluminum foil. When warming pastries or breads, the cover should be vented to allow moisture to escape.

Always use potholders or oven mitts when removing food from the ***WARMING ZONE***, as cookware and plates will be hot.

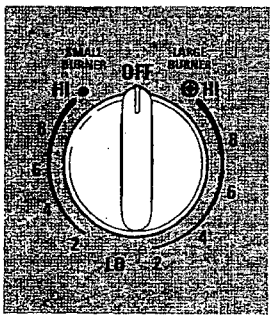
CAUTION: *Do not warm food on the **WARMING ZONE** for more than two hours.*

NOTE: *The surface warmer will not glow red like the cooking elements.*

A ***HOT*** surface indicator light will glow when the glass surface is hot and will remain on until the surface is cool enough to touch. Lower settings may not heat the glass surface enough to cause the ***HOT*** surface indicator light to come on.

A ***WARMING ZONE*** indicator light will glow when the unit is on.

- *Do not use plastic wrap to cover food. Plastic may melt onto the surface and be very difficult to clean.*
- *Use only cookware recommended for top-of-range cooking.*

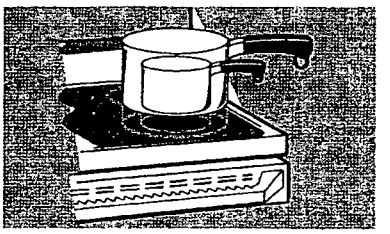


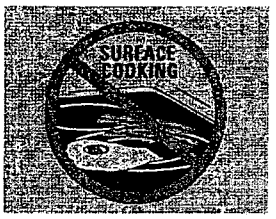
Dual Surface Unit Control Knob

The dual surface unit has 2 cooking sizes to select from so you can match the size of the unit to the size of the cookware you are using.

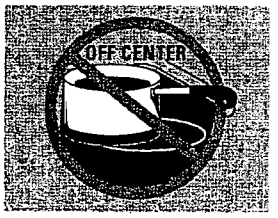
To use the small surface unit, turn the control knob to the ***SMALL BURNER*** settings.

To use the large surface unit, turn the control knob to the ***LARGE BURNER*** settings.

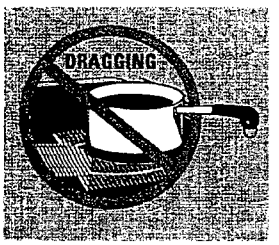




Never cook directly on the glass. Always use cookware.



Always place the pan in the center of the surface unit you are cooking on.



Do not slide cookware across the cooktop because it can scratch the glass—the glass is scratch resistant, not scratch proof.

About the radiant surface units...

The radiant cooktop features heating units beneath a smooth glass surface.

NOTE: *A slight odor is normal when a new cooktop is used for the first time. It is caused by the heating of new parts and insulating materials and will disappear in a short time.*

NOTE: *On models with light colored glass cooktops, it is normal for the cooking zones to change color when hot or cooling down. This is temporary and will disappear as the glass cools to room temperature.*

The surface unit will cycle on and off to maintain your selected control setting.

It is safe to place hot cookware on the glass surface even when the cooktop is cool.

Even after the surface units are turned off, the glass cooktop retains enough heat to continue cooking. To avoid over-cooking, remove pans from the surface units when the food is cooked. Avoid placing anything on the surface unit until it has cooled completely.

- *Water stains (mineral deposits) are removable using the cleaning cream or full strength white vinegar.*
- *Use of window cleaner may leave an iridescent film on the cooktop. The cleaning cream will remove this discoloration.*
- *Don't store heavy items above the cooktop. If they drop onto the cooktop, they can cause damage.*
- *Do not use the surface as a cutting board.*

Temperature Limiter

Every radiant surface unit has a temperature limiter.

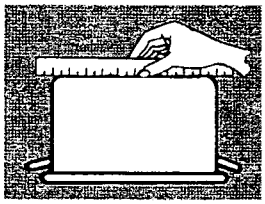
The temperature limiter protects the glass cooktop from getting too hot.

The temperature limiter may cycle the units off for a time if:

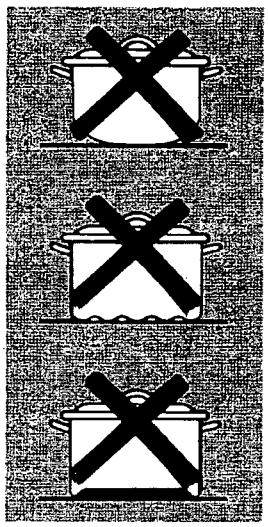
- *The pan boils dry.*
- *The pan bottom is not flat.*
- *The pan is off center.*
- *There is no pan on the unit.*

Selecting types of cookware.

The following information will help you choose cookware which will give good performance on glass cooktops.



Check pans for flat bottoms by using a straight edge.



Pans with rounded, curved, ridged or warped bottoms are not recommended.

Stainless Steel:
recommended

Aluminum:
heavy weight recommended

Good conductivity. Aluminum residues sometimes appear as scratches on the cooktop, but can be removed if cleaned immediately. Because of its low melting point, thin weight aluminum should not be used.

Copper Bottom:
recommended

Copper may leave residues which can appear as scratches. The residues can be removed, as long as the cooktop is cleaned immediately. However, do not let these pots boil dry. Overheated metal can bond to glass cooktops. An overheated copper bottom pot will leave a residue that will permanently stain the cooktop if not removed immediately.

Porcelain Enamel Covered Cast Iron:
recommended

As long as the cookware is covered completely with porcelain enamel, this cookware is recommended. Caution is recommended for cast iron cookware that is not completely covered with smooth porcelain enamel, as it may scratch the glass ceramic cooktop.

Glass-ceramic:
usable, but not recommended

Poor performance. May scratch the surface.

Stoneware:
usable, but not recommended

Poor performance. May scratch the surface.

Home Canning Tips:

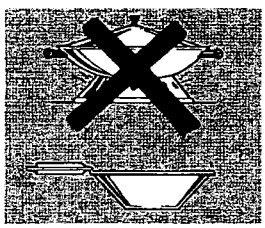
Be sure the canner is centered over the surface unit.

Make sure the canner is flat on the bottom.

Use recipes and procedures from reputable sources. These are available from manufacturers such as Ball® and Kerr® and the Department of Agriculture Extension Service.

To prevent burns from steam or heat, use caution when canning.

Flat-bottomed canners are recommended. Use of water bath canners with rippled bottoms may extend the time required to bring water to a boil.



Use only flat-bottomed woks.

Wok Cooking

We recommend that you use only a flat-bottomed wok. They are available at your local retail store.

Do not use woks that have support rings.

Do not use round bottom woks. You could be seriously burned if the wok tipped over.

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Using the oven controls.

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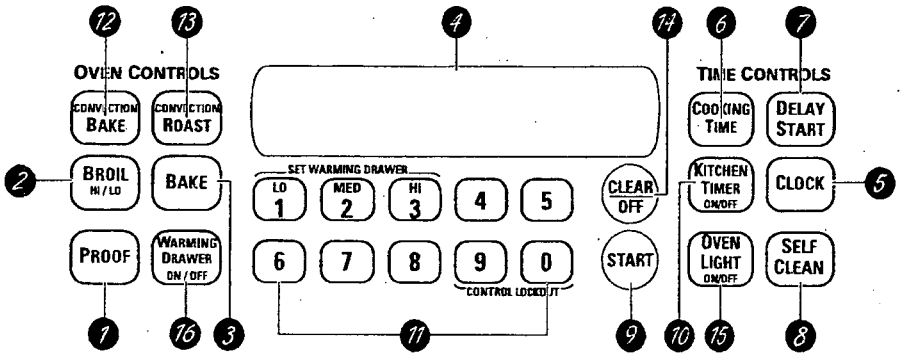
NOTE: *Throughout this manual, features and appearance may vary from your model.*



Oven Control, Clock and Timer Features and Settings

1. ***PROOF Pad***
   Touch to select a warm environment useful for rising yeast-leavened products.

2. ***BROIL HI/LO Pad***
   Touch this pad to select the broil function.

3. ***BAKE Pad***
   Touch this pad to select the bake function.

4. ***Display***
   Shows the time of day, oven temperature, whether the oven is in the bake, broil or self-cleaning mode and the times set for the timer or automatic oven operations.

If "F– and a number or letter" flash in the display and the oven control signals, this indicates a function error code.

If your oven was set for a timed oven operation and a power outage occurred, the clock and all programmed functions must be reset.

The time of day will flash in the display when there has been a power outage.

5. ***CLOCK Pad***
   Touch this pad before setting the clock.

6. ***COOKING TIME Pad***
   Touch this pad and then touch the number pads to set the amount of time you want your food to cook. The oven will shut off when the cooking time has run out.

7. ***DELAY START Pad***
   Use along with ***COOKING TIME*** or ***SELF CLEAN*** pads to set the oven to start and stop automatically at a time you set.

8. ***SELF CLEAN Pad***
   Touch this pad to select the self-cleaning function. See the *Using the self-cleaning oven* section.

9. ***START Pad***
   Must be touched to start any cooking or cleaning function.

10. ***KITCHEN TIMER ON/OFF Pad***
    Touch this pad to select the timer feature.

11. ***Number Pads***
    Use to set any function requiring numbers such as the time of day on the clock, the timer, the oven temperature, the start time and length of operation for timed baking and self-cleaning.

12. ***CONVECTION BAKE Pad***
    Touch this pad to select baking with the convection function.

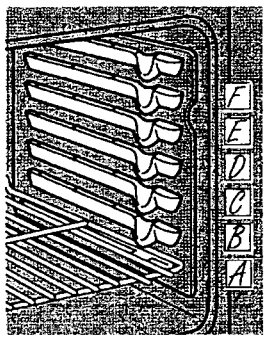
13. ***CONVECTION ROAST Pad***
    Touch this pad to select roasting with the convection function.

14. ***CLEAR/OFF Pad***
    Touch this pad to cancel ***ALL*** oven operations except the clock and timer.

15. ***OVEN LIGHT Pad***
    Touch this pad to turn the oven light on or off.

Using the oven.

To avoid possible burns, place the shelves in the desired position before you turn the oven on.



The oven has 6 shelf positions.

Before you begin...

The shelves have stop-locks, so that when placed correctly on the shelf supports (A through F), they will stop before coming completely out, and will not tilt.

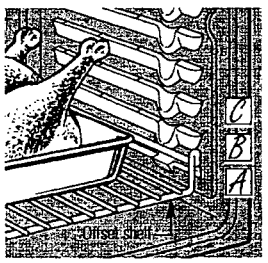
When placing and removing cookware, pull the shelf out to the bump on the shelf support.

On some models, the bake heating element is under the oven floor. Do not place foods on the oven bottom for cooking.

To remove a shelf, pull it toward you, tilt the front end up and pull it out.

To replace, place the end of the shelf (stop-locks) on the support, tilt up the front and push the shelf in.

CAUTION: *When you are using the shelf in the lowest position (A), you will need to use caution when pulling the shelf out. We recommend that you pull the shelf out several inches and then, using two pot holders, pull the shelf out by holding the sides of it. The shelf is low and you could be burned if you place your hand in the middle of the shelf and pull all the way out. Be very careful not to burn your hand on the door when using the shelf in the lowest position (A).*

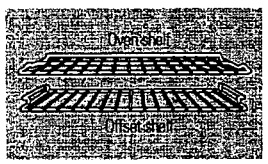


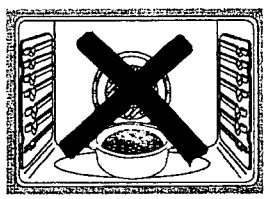
How to Set the Oven for Baking or Roasting

1. Touch the ***BAKE*** pad.
2. Touch the number pads to set the desired temperature.
3. Touch the ***START*** pad.

NOTE: You will hear the convection fan while the oven is preheating. The fan will stop after the oven is preheated and the display shows your set temperature. This is normal.

4. Check food for doneness at minimum time on recipe. Cook longer if necessary.
5. Touch the ***CLEAR/OFF*** pad when cooking is complete.





Do not place foods directly on the oven floor.

Preheating and Pan Placement

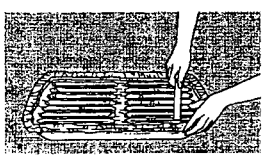
Preheat the oven if the recipe calls for it. Preheating is necessary for good results when baking cakes, cookies, pastry and breads.

To preheat, set the oven at the correct temperature. The control will beep when the oven is preheated and the display will show your set temperature. This will take approximately 10–15 minutes.

Baking results will be better if baking pans are centered in the oven as much as possible. If baking with more than one pan, place the pans so each has at least 1" to 1½" of air space around it.

Type of Food	Shelf Position
Frozen pies (on cookie sheet)	D
Angel food cake	A
Bundt or pound cakes	B or C
Biscuits, muffins, brownies, cookies, cupcakes, layer cakes, pies	C or D
Casseroles	C or D
Turkey on offset shelf	A

If baking four cake layers at the same time, place two layers on shelf B and two layers on shelf D. Stagger pans on the shelf so one is not directly above the other.



Cut slits in the foil just like the grid.

Aluminum Foil

You can use aluminum foil to line the broiler pan and broiler grid. However, you must mold the foil tightly to the grid and cut slits in it just like the grid.

Without the slits, the foil will prevent fat and meat juices from draining into the broiler pan. The juices could become hot enough to catch on fire. If you do not cut the slits, you are essentially frying, not broiling.

Do not use aluminum foil on the bottom of the oven.

Never entirely cover a shelf with aluminum foil. This will disturb the heat circulation and result in poor baking.

A smaller sheet of foil may be used to catch a spillover by placing it on a lower shelf several inches below the food.

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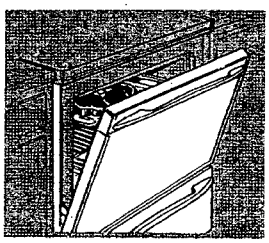


Leave the door open to the broil stop position. The door stays open by itself, yet the proper temperature is maintained in the oven.

How to Set the Oven for Broiling

1. Place the meat or fish on the broiler grid in the broiler pan.
2. Follow suggested shelf positions in the *Broiling Guide.*

If your range is connected to 208 volts, rare steaks may be broiled by preheating the broiler and positioning the oven shelf one position higher.

Use ***LO Broil*** to cook foods such as poultry or thick cuts of meat thoroughly without over-browning them.

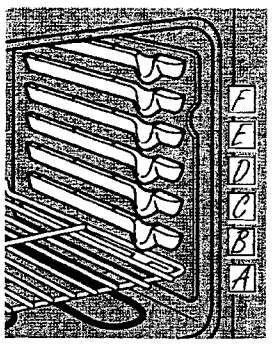
3. Touch the ***BROIL HI/LO*** pad once for ***HI Broil.***

   To change to ***LO Broil,*** touch the ***BROIL HI/LO*** pad again.
4. Touch the ***START*** pad.
5. When broiling is finished, touch the ***CLEAR/OFF*** pad.

Broiling Guide

The size, weight, thickness, starting temperature and your preference of doneness will affect broiling times. This guide is based on meats at refrigerator temperature.

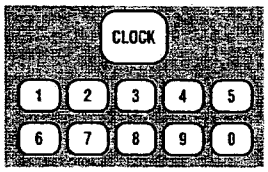
† *The U.S. Department of Agriculture says "Rare beef is popular, but you should know that cooking it to only 140°F means some food poisoning organisms may survive." (Source: Safe Food Book, Your Kitchen Guide. USDA Rev. June 1985.)*



Food	Quantity and/ or Thickness	Shelf Position*	First Side Time (min.)	Second Side Time (min.)	Comments
Ground Beef	1 lb. (4 patties)	E	9	6	Space evenly. Up to 8 patties take about the same time.
Well Done	1/2 to 3/4" thick	E	11	10	
Beef Steaks					
Rare†	1" thick	F	7	5	Steaks less than 1" thick cook through before browning. Pan frying is recommended. Slash fat.
Medium	1 to 1½ lbs.	E	9	6–7	
Well Done		E	11	8–9	
Rare†	1½" thick	D	14	11	
Medium	2 to 2½ lbs.	D	18	14–16	
Well Done		D	22	20	
Chicken	1 whole cut up 2 to 2½ lbs., split lengthwise	C	25	10	Broil skin-side-down first.
	2 Breasts	C	25	10–15	
Lobster Tails	2–4 10 to 12 oz. each	C	18–20	Do not turn over.	Cut through back of shell. Spread open. Brush with melted butter before broiling and after half of broiling time.
Fish Fillets	1/4 to 1/2" thick	E	6	5	Handle and turn very carefully. Brush with lemon butter before and during cooking, if desired.
Ham Slices (precooked)	1/2" thick	D	6	6	Increase time 5 to 10 minutes per side for 1½" thick or home-cured ham.
Pork Chops	2 (1/2" thick)	E	10	10	Slash fat.
Well Done	2 (1" thick) about 1 lb.	D	15	15	
Salmon Steaks	2 (1" thick)	D	10	7–8	Grease pan. Brush steaks with melted butter.
	4 (1" thick) about 1 lb.	D	12	10	

**See illustration for description of shelf positions.*

Using the clock and timer.

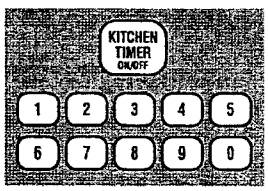


Make sure the clock is set to the correct time of day.

To Set the Clock

The clock must be set to the correct time of day for the automatic oven timing functions to work properly. The time of day cannot be changed during a timed baking or self-cleaning cycle.

1. Touch the ***CLOCK*** pad.
2. Touch the number pads.
3. Touch the ***START*** pad until the time of day shows in the display.



The timer is a minute timer only.

The timer does not control oven operations. The maximum setting on the timer is 9 hours and 59 minutes.

To Set the Timer

1. Touch the ***KITCHEN TIMER ON/OFF*** pad.
2. Touch the number pads until the amount of time you want shows in the display. For example, to set 2 hours and 45 minutes, touch ***2, 4*** and ***5*** in that order. If you make a mistake, touch the ***KITCHEN TIMER ON/OFF*** pad and begin again.
3. Touch the ***START*** pad.
4. When the timer reaches ***:00***, the control will beep 3 times followed by one beep every 6 seconds until the ***KITCHEN TIMER ON/OFF*** pad is touched.

The 6 second tone can be canceled by following the steps in the Special features of your oven control section under Tones at the End of a Timed Cycle.

To Reset the Timer

If the display is still showing the time remaining, you may change it by touching the ***KITCHEN TIMER ON/OFF*** pad, then touch the number pads until the time you want appears in the display.

If the remaining time is not in the display (clock, delay start or cooking time are in the display), recall the remaining time by touching the ***KITCHEN TIMER ON/OFF*** pad and then touching the number pads to enter the new time you want.

To Cancel the Timer

Touch the ***KITCHEN TIMER ON/OFF*** pad twice.

Using the timed baking and roasting features. (on some models)

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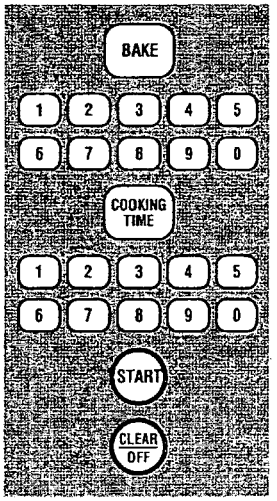
NOTE: *Foods that spoil easily—such as milk, eggs, fish, stuffings, poultry and pork—should not be allowed to sit for more than 1 hour before or after cooking. Room temperature promotes the growth of harmful bacteria. Be sure that the oven light is off because heat from the bulb will speed harmful bacteria growth.*



How to Set an Immediate Start and Automatic Stop

The oven will turn on immediately and cook for a selected length of time. At the end of the cooking time, the oven will turn off automatically.

1. Touch the ***BAKE*** pad.
2. Using the number pads, enter the desired temperature.
3. Touch the ***COOKING TIME*** pad.

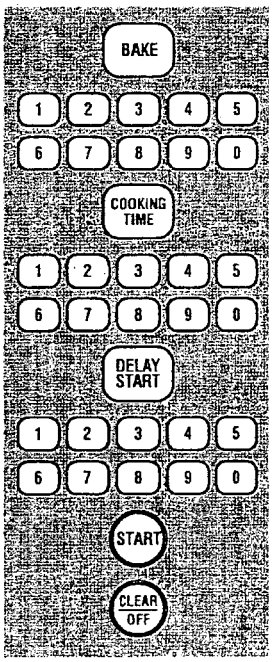
NOTE: *If your recipe requires preheating, you may need to add additional time to the length of the cooking time.*

4. Using the number pads, enter the desired baking time. The oven temperature and the cooking time that you entered will be displayed.
5. Touch the ***START*** pad.

The word ***ON*** and ***100°*** will be displayed. The cook time will begin to count down. As the oven heats up, the display will show the changing temperature. When the oven reaches the temperature you set, 3 beeps will sound.

At the end of timed baking, the oven will turn off unless Cook and Hold has been activated through special features. The end of cycle tone will sound.

Touch the ***CLEAR/OFF*** pad to clear the display.



How to Set a Delayed Start and Automatic Stop

You can set the oven control to delay-start the oven, cook for a specific length of time and then turn off automatically.

Make sure the clock shows the correct time of day.

1. Touch the ***BAKE*** pad.
2. Using the number pads, enter the desired temperature.
3. Touch the ***COOKING TIME*** pad.

NOTE: *If your recipe requires preheating, you may need to add additional time to the length of the cooking time.*

4. Using the number pads, enter the desired baking time.
5. Touch the ***DELAY START*** pad.
6. Using the number pads, enter the time of day you want the oven to turn on and start cooking.
7. Touch the ***START*** pad.

NOTE: *An attention tone will sound if you are using timed baking and do not touch the START pad after entering the baking temperature.*

If you would like to check the times you have set, touch the ***DELAY START*** pad to check the start time you have set or touch the ***COOKING TIME*** pad to check the length of cooking time you have set.

The oven will turn on automatically. The word ***ON*** and ***100°*** will be displayed. The cook time will begin to count down.

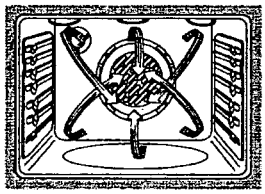
As the oven heats up, the display will show the changing temperature. The oven will cook for the programmed cooking time and shut off automatically.

At the end of timed baking, the oven will turn off unless Cook and Hold has been activated through special features. The end of cycle tone will sound.

Touch the ***CLEAR/OFF*** pad to clear the display.

Using the convection oven.

The convection oven fan shuts off when the oven door is opened. DO NOT leave the door open for long periods of time while using convection cooking or you may shorten the life of the convection heating element.



In a convection oven, a fan circulates hot air over, under and around the food. This circulating hot air is evenly distributed throughout the oven cavity. As a result, foods are evenly cooked and browned—often in less time than with regular heat.

To help you understand the difference between convection bake and roast and traditional bake and roast, here are some general guidelines.

Convection Bake

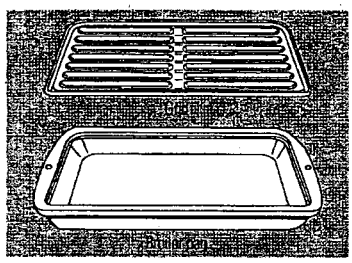
- *Ideal for evenly browned baked foods cooked on multiple shelves.*
- *Good for large quantities of baked foods.*
- *Good results with cookies, biscuits, brownies, cupcakes, cream puffs, sweet rolls, angel food cake and bread.*

Heat comes from the heating element in the rear of the oven. The convection fan circulates the heated air evenly over and around the food. Preheating is not necessary with foods having a bake time of over 15 minutes.

Convection Roast

- *Good for large tender cuts of meat, uncovered.*

Heat comes from the top heating element. The convection fan circulates the heated air evenly over and around the food. Meat and poultry are browned on all sides as if they were cooked on a rotisserie. The heated air seals in juices quickly for a moist and tender product while, at the same time, creating a rich golden brown exterior.



When you are convection roasting, it is important that you use the broiler pan and grid. The pan is used to catch grease spills and the grid is used to prevent grease spatters.

Adapting Recipes...

You can use your favorite recipes in the convection oven.

When convection baking, the auto recipe™ conversion feature automatically reduces the set regular baking temperature by the recommended 25°F. See *Using Convection Conversion* in the special features section.

- *Use pan size recommended.*
- *Some package instructions for frozen casseroles or main dishes have been developed using commercial convection ovens. For best results in this oven, preheat the oven and use the temperature on the package.*

Cookware for Convection Cooking

Before using your convection oven, check to see if your cookware leaves room for air circulation in the oven. If you are baking with several pans, leave space between them. Also, be sure the pans do not touch each other or the walls of the oven.

Paper and Plastic

Heat-resistant paper and plastic containers that are recommended for use in regular ovens can be used in convection ovens. Plastic cookware that is heat-resistant to temperatures of 400°F. can also be used, when oven is below 400°F.

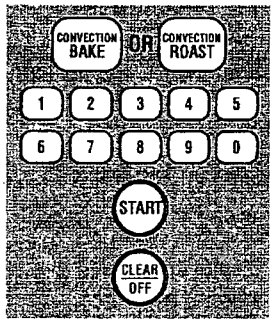
Metal and Glass

Any type of cookware will work in your convection oven. However, metal pans heat the fastest and are recommended for convection baking.

- *Darkened or matte-finished pans will bake faster than shiny pans.*
- *Glass or ceramic pans cook more slowly.*

When baking cookies, you will get the best results if you use a flat cookie sheet instead of a pan with low sides.

For recipes like oven-baked chicken, use a pan with low sides. Hot air cannot circulate well around food in a pan with high sides.



How to Set the Oven for Convection Baking or Roasting

1. Touch the ***CONVECTION BAKE*** or ***CONVECTION ROAST*** pad.
2. Touch the number pads to set the desired oven temperature.
3. Touch the ***START*** pad.

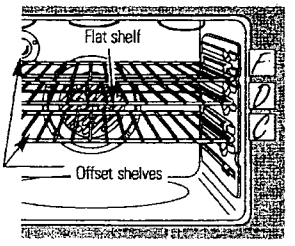
NOTE: If the auto recipe™ conversion feature is on, it will automatically reduce the set regular baking temperature by 25°F to the appropriate conversion temperature. See *Using Convection Conversion* in the special features section.

To change the oven temperature, touch the ***CONVECTION BAKE*** or ***CONVECTION ROAST*** pad and then the number pads to set the new temperature.

When the oven starts to heat, the changing temperature, starting at 100°F, will be displayed. When the oven reaches the temperature you set, 3 beeps will sound.

4. Touch the ***CLEAR/OFF*** pad when finished.

NOTE: *You will hear a fan while cooking with convection. The fan will stop when the door is opened, but the heat will not turn off.*



Multi-shelf position.

Multi-Shelf Convection Baking

Because heated air is circulated evenly throughout the oven, foods can be baked with excellent results using multiple shelves.

Multi-shelf baking may increase cook times slightly for some foods, but the overall result is time saved. Cookies, muffins, biscuits and other quickbreads give very good results with multi-shelf baking.

When baking on 3 shelves, place one offset shelf in the third (C) position, the flat shelf in the fourth (D) position and one offset shelf in the sixth (F) position.

For two-shelf baking, place one offset shelf in the second (B) shelf position. Place the flat shelf in the fourth (D) shelf position.

Using the convection oven.

Convection Roasting Guide

Meats			Minutes/Lb.	Oven Temp.	Internal Temp.
Beef	Rib, Boneless Rib, Top Sirloin (3 to 5 lbs.)	Rare	20–24	325°F	140°F†
		Medium	24–28	325°F	160°F
		Well	28–32	325°F	170°F
	Beef Tenderloin	Rare	10–14	325°F	140°F†
		Medium	14–18	325°F	160°F
Pork	Bone-In, Boneless (3 to 5 lbs.)		23–27	325°F	170°F
	Chops (1/2 to 1" thick)	2 chops	30–35 total	325°F	170°F
		4 chops	35–40 total	325°F	170°F
		6 chops	40–45 total	325°F	170°F
Ham	Canned, Butt, Shank (3 to 5 lbs. fully cooked)		14–18	325°F	140°F
Lamb	Bone-In, Boneless (3 to 5 lbs.)	Medium	17–20	325°F	160°F
		Well	20–24	325°F	170°F
Seafood	Fish, Whole (3 to 5 lbs.)		30–40 total	400°F	
	Lobster Tails (6 to 8 oz. each)		20–25 total	350°F	
Poultry	Whole Chicken (2½ to 3½ lbs.)		24–26	350°F	180°–185°F
	Cornish Hens, Unstuffed (1 to 1½ lbs.)		50–55 total	350°F	180°–185°F
	Stuffed (1 to 1½ lbs.)		55–60 total	350°F	180°–185°F
	Duckling (4 to 5 lbs.)		24–26	325°F	180°–185°F
	Turkey, Whole*				
	Unstuffed (10 to 16 lbs.)		8–11	325°F	180°–185°F
	Unstuffed (18 to 24 lbs.)		7–10	325°F	180°–185°F
	Turkey Breast (4 to 6 lbs.)		16–19	325°F	170°F

** Stuffed birds generally require 30–45 minutes additional roasting time. Shield legs and breast with foil to prevent overbrowning and drying of skin.*

† The U.S. Department of Agriculture says "Rare beef is popular, but you should know that cooking it to only 140°F means some food poisoning organisms may survive." (Source: Safe Food Book. Your Kitchen Guide. USDA Rev. June 1985.)

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Using the timed features for convection baking.

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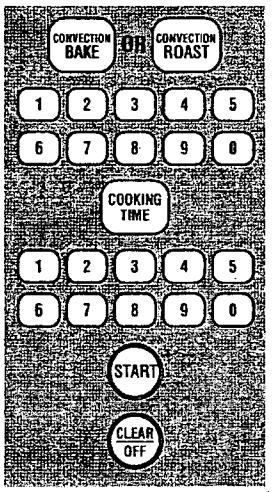
You will hear a fan while cooking with this feature. The fan will stop when the door is opened but the heat will not turn off.

NOTE: *Foods that spoil easily—such as milk, eggs, fish, stuffings, poultry and pork—should not be allowed to sit for more than 1 hour before or after cooking. Room temperature promotes the growth of harmful bacteria. Be sure that the oven light is off because heat from the bulb will speed harmful bacteria growth.*



How to Set an Immediate Start and Automatic Stop

The oven will turn on immediately and cook for a selected length of time. At the end of the cooking time the oven will turn off automatically.

1. Touch the ***CONVECTION BAKE*** or ***CONVECTION ROAST*** pad.
2. Touch the number pads to set the desired oven temperature.
3. Touch the ***COOKING TIME*** pad.

NOTE: *If your recipe requires preheating, you may need to add additional time to the length of the cooking time.*

4. Touch the number pads to set the desired length of cooking time. The minimum cooking time you can set is 1 minute.

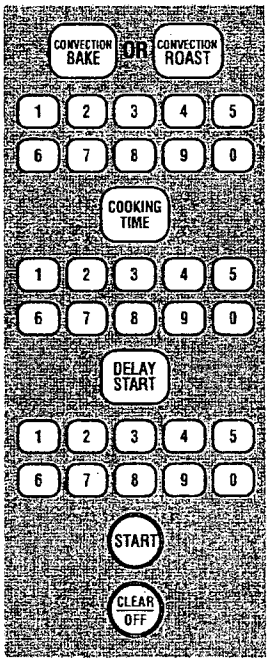
The oven temperature that you set and the cooking time that you entered will be in the display.

5. Touch the ***START*** pad.

The display shows the oven temperature that you set and the cooking time countdown. The display starts changing once the temperature reaches 100°F.

NOTE: If the auto recipe™ conversion feature is on, it will automatically reduce the set regular baking temperature by 25°F to the appropriate conversion temperature. See *Using Convection Conversion* in the special features section.

6. At the end of timed convection bake, the oven will turn off. The end of cycle tone will sound. Touch the ***CLEAR/OFF*** pad to clear the display if necessary.
7. Remove the food from the oven. Remember, foods that are left in the oven continue cooking after the controls are off.



How to Set a Delayed Start and Automatic Stop

You can set the oven control to delay-start the oven, cook for a specific length of time and then turn off automatically.

Make sure the clock shows the correct time of day.

1. Touch the ***CONVECTION BAKE*** or ***CONVECTION ROAST*** pad once (***CONV BAKE*** is displayed).
2. Touch the number pads to set the desired oven temperature.
3. Touch the ***COOKING TIME*** pad.

NOTE: *If your recipe requires preheating, you may need to add additional time to the length of the cooking time.*

4. Touch the number pads to set the desired cooking time.
5. Touch the ***DELAY START*** pad.
6. Touch the number pads to set the time of day you want the oven to turn on and start cooking.
7. Touch the ***START*** pad.

NOTE: *An attention tone will sound if you are using timed baking and do not touch the START pad after entering the baking temperature.*

NOTE: If the auto recipe™ conversion feature is on, it will automatically reduce the set regular baking temperature by 25°F to the appropriate conversion temperature. See *Using Convection Conversion* in the special features section.

When the oven turns on at the time of day you have set, the display will show the changing temperature (starting at 100°F.) and the cooking time countdown.

At the end of timed convection bake, the oven will turn off. The end of cycle tone will sound.

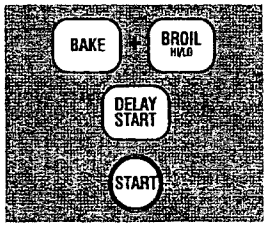
8. Touch the ***CLEAR/OFF*** pad to clear the display if necessary. When baking is finished, remove the food from the oven. Remember, even though the oven shuts off automatically, foods continue cooking after the controls are off.

Special features of your oven control.

Your new touch pad control has additional features that you may choose to use. The following are the features and how you may activate them.

The special feature modes can only be activated while the display is showing the time of day. They remain in the control's memory until the steps are repeated.

When the display shows your choice, touch the START pad. The special features will remain in memory after a power failure, except for the Sabbath feature, which will have to be reset.

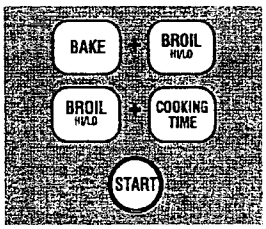


12 Hour Shut-Off

With this feature, should you forget and leave the oven on, the control will automatically turn off the oven after 12 hours during baking functions or after 3 hours during a broil function.

If you wish to turn ***OFF*** this feature, follow the steps below.

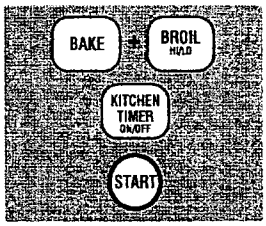
1. Touch the ***BAKE*** and ***BROIL HI/LO*** pads at the same time until the display shows ***SF***.
2. Touch the ***DELAY START*** pad. The display will show ***12 shdn*** (12 hour shut-off). Touch the ***DELAY START*** pad again and the display will show ***no shdn*** (no shut-off).
3. Touch the ***START*** pad to activate the no shut-off and leave the control set in this special features mode.



Fahrenheit or Celsius Temperature Selection

Your oven control is set to use the Fahrenheit temperature selections, but you may change this to use the Celsius selections.

1. Touch the ***BAKE*** and ***BROIL HI/LO*** pads at the same time until the display shows ***SF***.
2. Touch the ***BROIL HI/LO*** and ***COOKING TIME*** pads. The display will show ***F*** (Fahrenheit).
3. Touch the ***BROIL HI/LO*** and ***COOKING TIME*** pads again. The display will show ***C*** (Celsius).
4. Touch the ***START*** pad.



Tones at the End of a Timed Cycle

At the end of a timed cycle, 3 short beeps will sound followed by one beep every 6 seconds until the CLEAR/OFF pad is touched. This continual 6 second beep may be canceled.

To cancel the 6 second beep:

1. Touch the ***BAKE*** and ***BROIL HI/LO*** pads at the same time until the display shows ***SF***.
2. Touch the ***KITCHEN TIMER ON/OFF*** pad. The display shows ***CON BEEP*** (continual beep). Touch the ***KITCHEN TIMER ON/OFF*** pad again. The display shows ***BEEP***. (This cancels the one beep every 6 seconds.)
3. Touch the ***START*** pad.

Control Lockout *(on some models)*

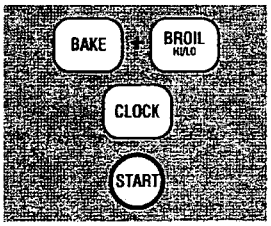
Your control will allow you to lock out the touch pads so they cannot be activated when touched or cleaning the control panel.

To activate this feature:

1. Touch the ***9*** and ***0*** touch pads at the same time for 5 seconds until the control beeps twice. The display will show ***LOC*** continuously and the time of day if not blacked out.

NOTE: *All cooking and timing functions will be cancelled when locking out the control.*

2. To unlock the control, touch the ***9*** and ***0*** touch pads at the same time for 5 seconds until the control beeps twice, and ***LOC*** will be removed from the display.



12 Hour, 24 Hour or Clock Black-Out

Your control is set to use a 12 hour clock.

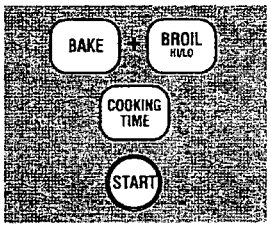
If you would prefer to have a 24 hour military time clock or black-out the clock display, follow the steps below.

1. Touch the ***BAKE*** and ***BROIL HI/LO*** pads at the same time until the display shows ***SF***.
2. Touch the ***CLOCK*** pad once. The display will show ***12 hr***. If this is the choice you want, touch the ***START*** pad.

Touch the ***CLOCK*** pad again to change to the 24 hour military time clock. The display will show ***24 hr***. If this is the choice you want, touch the ***START*** pad.

Touch the ***CLOCK*** pad again to black-out the clock display. The display will show ***OFF***. If this is the choice you want, touch the ***START*** pad.

NOTE: *If the clock is in the black-out mode, you will not be able to use the Delay Start function.*



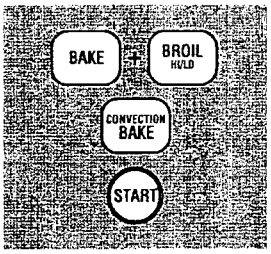
Cook and Hold

Your new control has a cook and hold feature that keeps cooked foods warm for up to 3 hours after the cooking function is finished.

To activate this feature, follow the steps below.

1. Touch the ***BAKE*** and ***BROIL HI/LO*** pads at the same time until the display shows ***SF***.
2. Touch the ***COOKING TIME*** pad. The display will show ***Hld OFF***.

   Touch the ***COOKING TIME*** pad again to activate the feature. The display will show ***Hld ON***.
3. Touch the ***START*** pad to activate the cook and hold feature and leave the control set in this special features mode.



Auto Recipe™ Conversion

When using convection bake, the Auto Recipe™ Conversion feature will automatically convert entered regular baking temperatures to convection baking temperatures.

This feature is activated so that the display will show the actual converted (reduced) temperature. For example, if you enter a regular recipe temperature of 350°F and touch the ***START*** *pad, the display will show* ***CON*** *and the converted temperature of 325°F.*

To deactivate the feature:

1. Touch the ***BAKE*** and ***BROIL HI/LO*** pads at the same time until the display shows ***SF***.
2. Touch the ***CONVECTION BAKE*** pad. The display will show ***CON ON***. Touch the ***CONVECTION BAKE*** pad again. The display will show ***CON OFF***.
3. Touch the ***START*** pad.

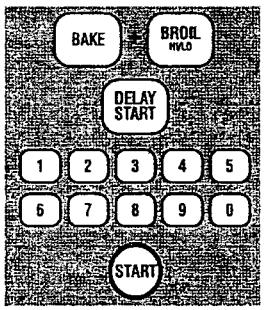
To reactivate the feature, repeat steps 1–3 above but touch the ***START*** pad when ***CON ON*** is in the display.

Using the Sabbath Feature.

(Designed for use on the Jewish Sabbath and Holidays) (on some models)

The Sabbath feature can be used for baking/roasting only. It cannot be used for convection, broiling, self-cleaning or Delay Start cooking.

***NOTE:** The oven light comes on automatically (on some models) when the door is opened and goes off when the door is closed. The bulb may be removed. See the Oven Light Replacement section. On models with a light switch on the control panel, the oven light may be turned on and left on.*



When the display shows ⊃ the oven is set in Sabbath. When the display shows ⊃ ⊂ the oven is baking/roasting.

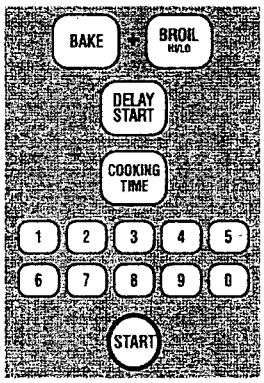
How to Set for Regular Baking/Roasting

Make sure the clock shows the correct time of day and the oven is off.

1. Press and hold ***both*** the ***BAKE*** and ***BROIL HI/LO*** pads, ***at the same time***, until the display shows ***SF***.
2. Tap the ***DELAY START*** pad until ***SAb bAtH*** appears in the display.
3. Touch the ***START*** pad and ⊃ will appear in the display.
4. Touch the ***BAKE*** pad. No signal will be given.
5. Using the number pads, enter the desired temperature between 170° and 550°. No signal or temperature will be given.
6. Touch the ***START*** pad.
7. After a random delay period of approximately 30 seconds to 1 minute, ⊃ ⊂ will appear in the display indicating that the oven is baking/roasting. If ⊃ ⊂ doesn't appear in the display, start again at Step 4.

To adjust the oven temperature, touch the ***BAKE*** pad, enter the new temperature using the number pads and touch the ***START*** pad.

NOTE: The ***CLEAR/OFF*** and ***COOKING TIME*** pads are active during the Sabbath feature.



When the display shows ⊃ the oven is set in Sabbath. When the display shows ⊃ ⊂ the oven is baking/roasting.

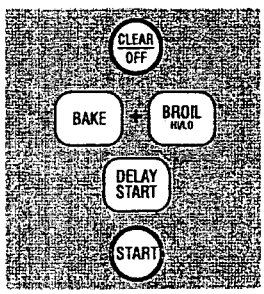
How to Set for Timed Baking/Roasting—Immediate Start and Automatic Stop

Make sure the clock shows the correct time of day and the oven is off.

1. Press and hold ***both*** the ***BAKE*** and ***BROIL HI/LO*** pads, ***at the same time***, until the display shows ***SF***.
2. Tap the ***DELAY START*** pad until ***SAb bAtH*** appears in the display.
3. Touch the ***START*** pad and ⊃ will appear in the display.
4. Touch the ***COOKING TIME*** pad.
5. Touch the number pads to set the desired length of cooking time between 1 minute and 9 hours and 59 minutes. The cooking time that you entered will be displayed.
6. Touch the ***START*** pad.
7. Touch the ***BAKE*** pad. No signal will be given.
8. Using the number pads, enter the desired temperature. No signal or temperature will be given.
9. Touch the ***START*** pad.
10. After a random delay period of approximately 30 seconds to 1 minute, ⊃ ⊂ will appear in the display indicating that the oven is baking/roasting. If ⊃ ⊂ doesn't appear in the display, start again at Step 7.

To adjust the oven temperature, touch the ***BAKE*** pad, enter the new temperature using the number pads, and touch the ***START*** pad.

When cooking is finished, the display will change from ⊃ ⊂ to ⊃ and ***0:00*** will appear, indicating that the oven has turned ***OFF*** but is still set in Sabbath. Remove the cooked food.



How to Exit the Sabbath Feature

1. Touch the ***CLEAR/OFF*** pad.
2. If the oven is cooking, wait for a random delay period of approximately 30 seconds to 1 minute, until only ⊃ is in the display.
3. Press and hold ***both*** the ***BAKE*** and ***BROIL HI/LO*** pads, ***at the same time***, until the display shows ***SF***.
4. Tap the ***DELAY START*** pad until ***12 shdn*** or ***no shdn*** appears in the display. ***12 shdn*** indicates that the oven will automatically turn off after 12 hours. ***no shdn*** indicates that the oven will not automatically turn off.
5. Touch the ***START*** pad.

NOTE: If a power outage occurred while the oven was in Sabbath, the oven will automatically turn off and stay off even when the power returns. The oven control must be reset.

Adjust the oven thermostat—Do it yourself!

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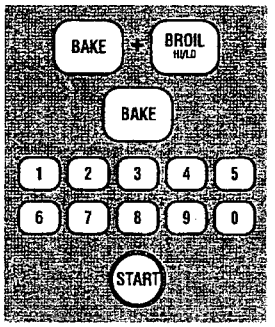
You may find that your new oven cooks differently than the one it replaced. Use your new oven for a few weeks to become more familiar with it. If you still think your new oven is too hot or too cold, you can adjust the thermostat yourself.

Do not use thermometers, such as those found in grocery stores, to check the temperature setting of your oven. These thermometers may vary 20–40 degrees.

NOTE: *This adjustment will not affect the broiling or the self-cleaning temperatures. The adjustment will be retained in memory after a power failure.*



To Adjust the Thermostat

1. Touch the ***BAKE*** and ***BROIL HI/LO*** pads at the same time until the display shows ***SF***.
2. Touch the ***BAKE*** pad. A two digit number shows in the display.

   Touch ***BAKE*** once to decrease (–) the oven temperature, or twice to increase (+).
3. The oven temperature can be adjusted up as much as 35°F or down as much as 35°F. Touch the number pads the same way you read them. For example, to change the oven temperature 15°F, touch ***1*** and ***5***.
4. When you have made the adjustment, touch the ***START*** pad to go back to the time of day display. Use your oven as you would normally.

The type of margarine will affect baking performance!

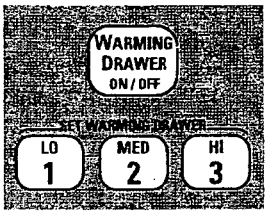
Most recipes for baking have been developed using high fat products such as butter or margarine (80% fat). If you decrease the fat, the recipe may not give the same results as with a higher fat product.

Recipe failure can result if cakes, pies, pastries, cookies or candies are made with low fat spreads. The lower the fat content of a spread product, the more noticeable these differences become.

Federal standards require products labeled "margarine" to contain at least 80% fat by weight. Low fat spreads, on the other hand, contain less fat and more water. The high moisture content of these spreads affects the texture and flavor of baked goods. For best results with your old favorite recipes, use margarine, butter or stick spreads containing at least 70% vegetable oil.

Using the warming drawer.

The warming drawer will keep hot, cooked foods at serving temperature. Always start with hot food. Do not use to heat cold food other than crisping crackers, chips or dry cereal.



To Use the Warming Drawer

1. Touch the ***WARMING DRAWER*** pad. "WARMER ON" and "1" are lit on the display and "Set" begins to blink.
2. On the number pad, touch ***1*** for Low, ***2*** for Medium or ***3*** for High. The display "1" changes corresponding to the number pad selected.
3. The warming drawer starts automatically after touching ***1, 2*** or ***3***. "WARMER ON" and the number remain lit. "Set" stops blinking.

To cancel, touch the ***WARMING DRAWER*** pad.

NOTE: *Touching the* ***CLEAR/OFF*** *pad does not turn the warming drawer off.*

NOTES:

- *The warming drawer cannot be used during a self-clean cycle.*
- *The warming drawer has three settings: 1, 2 and 3. These settings maintain different temperature levels in the warming drawer.*
- *On some models, if using the oven at the same time as the warming drawer, only the oven settings will be displayed.*

When Using the Warming Drawer

The warming drawer will keep hot, cooked foods warm. Always start with hot food. Do not use to heat cold food other than crisping crackers, chips or dry cereal.

Do not line the warming drawer or pan with aluminum foil. Foil is an excellent heat insulator and will trap heat beneath it. This will upset the performance of the drawer and could damage the interior finish.

Allow approximately 25 minutes for the warming drawer to preheat.

- Do not put liquid or water in the warming drawer.
- All foods placed in the warming drawer should be covered with a lid or aluminum foil. When warming pastries or breads, the cover should be vented to allow moisture to escape.
- Food should be kept hot in its cooking container or transferred to a heat-safe serving dish.

CAUTION: *Plastic containers or plastic wrap will melt if in direct contact with the drawer, pan or a hot utensil. Melted plastic may not be removable and is not covered under your warranty.*

- Remove serving spoons, etc., before placing containers in warming drawer.

Temperature Selection Chart

To keep several different foods hot, set the control to the food needing the highest setting.

- The temperature, type and amount of food, and the time held will affect the quality of the food.
- Repeated opening of the drawer allows the hot air to escape and the food to cool.
- With large loads it may be necessary to use a higher warming drawer setting and cover some of the cooked food items.
- Do not use plastic containers or plastic wrap.

Food Type	Control Setting
Bacon	3
Breads	1
Casserole	2
Chicken, fried	3
Ham	3
Muffins	1
Pies	1
Pizza	3
Potatoes, baked	3
Tortilla chips	1

CAUTION: *Do not keep food in the warming drawer for more than two hours.*

To Crisp Stale Items

- Place food in low-sided dishes or pans.
- Preheat on ***1*** setting.
- Check crispness after 45 minutes. Add time as needed.

To Warm Serving Bowls and Plates

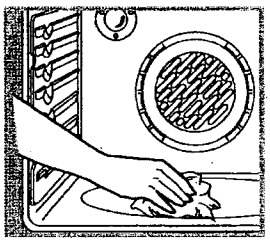
To warm serving bowls and plates, set the control on ***1***.

- Use only heat-safe dishes.
- If you want to heat fine china, please check with the manufacturer of the dishes for their maximum heat tolerance.
- You may warm empty serving dishes while preheating the drawer.

CAUTION: *Dishes will be hot. Use pot holders or mitts when removing hot dishes.*

Using the self-cleaning oven.

The oven door must be closed and all controls set correctly for the cycle to work properly.



Wipe up heavy soil on the oven bottom.

Before a Clean Cycle

We recommend venting your kitchen with an open window or using a ventilation fan or hood during the first self-clean cycle.

Remove the broiler pan, broiler grid, all cookware and any aluminum foil from the oven.

NOTE:

- If your oven is equipped with nickel oven shelves, remove them before you begin the self-clean cycle, or they may discolor.
- If your oven is equipped with gray porcelain-coated oven shelves, they may be left in the oven during the self-clean cycle.

The nickel oven shelves (on some models) can be self-cleaned, but they will darken, lose their luster and become hard to slide.

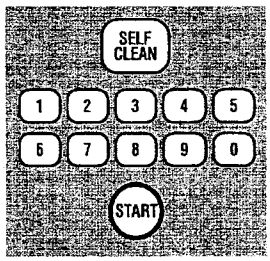
Soil on the front frame of the range and outside the gasket on the door will need to be cleaned by hand. Clean these areas with hot water, soap-filled steel-wool pads or cleansers such as Soft Scrub.® Rinse well with clean water and dry.

Do not clean the gasket. The fiberglass material of the oven door gasket cannot withstand abrasion. It is essential for the gasket to remain intact. If you notice it becoming worn or frayed, replace it.

Wipe up any heavy spillovers on the oven bottom.

Make sure the oven light bulb cover is in place and the oven light is off.

IMPORTANT: The health of some birds is extremely sensitive to the fumes given off during the self-cleaning cycle of any range. Move birds to another well ventilated room.



How to Set the Upper Oven for Cleaning

The oven door must be closed and all controls set correctly for the cycle to work properly.

1. Touch the ***SELF CLEAN*** pad once for a 4-hour clean time or twice for a 3-hour clean time.

   A 3-hour self-clean time is recommended for use when cleaning small, contained spills. A self-clean time of 4 hours or longer is recommended for a dirtier oven.

2. If a time other than 4 hours or 3 hours is needed, use the number pads and enter the desired clean time.

You can change the clean time to any time between 2½ hours and 5 hours, depending on how dirty your oven is.

3. Touch the ***START*** pad.

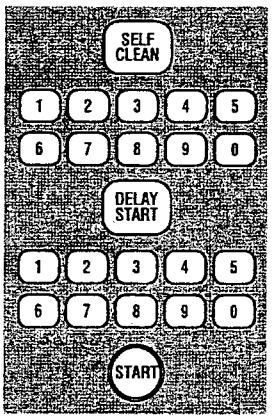
The door locks automatically. The display will show the clean time remaining. It will not be possible to open the oven door until the temperature drops below the lock temperature and the ***LOCKED*** light goes off.

When the ***LOCKED*** light goes off, you will be able to open the door.

- The word ***LOCKED*** will flash and the word ***door*** will display if you set the clean cycle and forget to close the oven door.
- To stop a clean cycle, touch the ***CLEAR/OFF*** pad. When the ***LOCKED*** light goes off indicating the oven has cooled below the locking temperature, you will be able to open the door.

NOTE: The warming drawer cannot be used during a self-clean cycle.

The oven door must be closed and all controls set correctly for the cycle to work properly.



How to Delay the Start of Cleaning

Make sure the clock shows the correct time of day.

1. Touch the ***SELF CLEAN*** pad.
2. Using the number pads, enter the desired clean time.
3. Touch the ***DELAY START*** pad. The earliest start time you can set will appear in the display.
4. Using the number pads, enter the time of day you want the clean cycle to start.
5. Touch the ***START*** pad.

The door locks automatically. The display will show the start time. It will not be possible to open the oven door until the temperature drops below the lock temperature and the ***LOCKED*** door light goes off.

When the ***LOCKED*** door light is off, open the door.

After a Clean Cycle

You may notice some white ash in the oven. Wipe it up with a damp cloth after the oven cools.

If white spots remain, remove them with a soap-filled steel wool pad and rinse thoroughly with a vinegar and water mixture.

These deposits are usually a salt residue that cannot be removed by the clean cycle.

If the oven is not clean after one clean cycle, repeat the cycle.

Apply a small amount of vegetable oil to a paper towel and wipe the edges of the oven shelves with the paper towel. Do not spray with Pam® or other lubricant sprays.

- You cannot set the oven for cooking until the oven is cool enough for the door to unlock.
- While the oven is self-cleaning, you can touch the ***CLOCK*** pad to display the time of day. To return to the clean countdown, touch the ***COOKING TIME*** pad.

Care and cleaning of the range.

Be sure all controls are off and all surfaces are cool before cleaning any part of the range.

If your range is removed for cleaning, servicing or any reason, be sure the anti-tip device is re-engaged properly when the range is replaced. Failure to take this precaution could result in tipping of the range and cause injury.

How to Remove Protective Shipping Film and Packaging Tape

Carefully grasp a corner of the protective shipping film with your fingers and slowly peel it from the appliance surface. Do not use any sharp items to remove the film. Remove all of the film before using the appliance for the first time.

To assure no damage is done to the finish of the product, the safest way to remove the adhesive from packaging tape on new appliances is an application of a household liquid dishwashing detergent. Apply with a soft cloth and allow to soak.

NOTE: *The adhesive must be removed from all parts. It cannot be removed if it is baked on.*

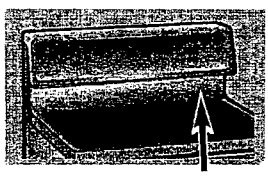
Control Knobs

The control knobs may be removed for easier cleaning.

Make sure the knobs are in the ***OFF*** positions and pull them straight off the stems for cleaning.

The knobs can be cleaned in a dishwasher or they may also be washed with soap and water. Make sure the inside of the knobs are dry before replacing.

Replace the knobs in the ***OFF*** position to ensure proper placement.



Oven Vent

The oven vent is located behind the right rear surface unit.

This area could become hot during oven use.

It is normal for steam to come out of the vent and moisture may collect underneath it when the oven is in use.

The vent is important for proper air circulation. Never block this vent.

Control Panel

Deactivate the touch pads before cleaning.

See the *Cooking/Self-Clean lockout* information in the *Special features of your oven control* section in this manual.

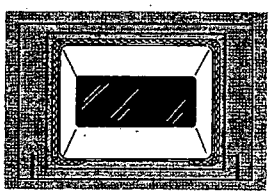
Clean up splatters with a damp cloth.

You may also use a glass cleaner.

Remove heavier soil with warm soapy water. Do not use abrasives of any kind.

Reactivate the touch pads after cleaning.

See the *Cooking/Self-Clean lockout* information in the *Special features of your oven control* section in this manual.



The gasket is designed with a gap at the bottom to allow for proper air circulation.

Do not rub or clean the door gasket—it has an extremely low resistance to abrasion.

If you notice the gasket becoming worn, frayed or damaged in any way, or if it has become displaced on the door, you should have it replaced.

Cleaning the Oven Door

To clean the inside of the door:

- Do not allow excess water to run into any holes or slots in the door.
- Because the area inside the gasket is cleaned during the self-clean cycle, you do not need to clean this by hand.
- The area outside the gasket and the door liner can be cleaned with a soap-filled steel wool or plastic pad, hot water and detergent. Rinse well with a vinegar and water solution.

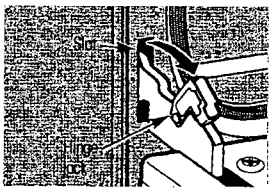
To clean the outside of the door:

- Use soap and water to thoroughly clean the top, sides and front of the oven door. Rinse well. You may also use a glass cleaner to clean the glass on the outside of the door. Do not let water drip into the vent openings.
- If any stain on the door vent trim is persistent, use a soft abrasive cleaner and a sponge-scrubber for best results.
- Spillage of marinades, fruit juices, tomato sauces and basting materials containing acids may cause discoloration and should be wiped up immediately. When surface is cool, clean and rinse.
- Do not use oven cleaners, cleaning powders or harsh abrasives on the outside of the door.

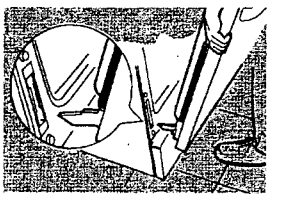
Lift-Off Oven Door

The door is very heavy. Be careful when removing and lifting the door.

Do not lift the door by the handle.



Pull hinge locks down to unlock.



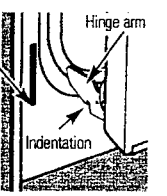
Removal position

To remove the door:

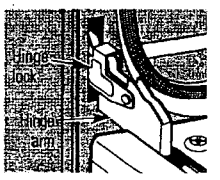
1. Fully open the door.
2. Pull the hinge locks down toward the door frame, to the unlocked position. A tool, such as a small flat-blade screwdriver, may be required.
3. Firmly grasp both sides of the door at the top.
4. Close door to the door removal position, which is halfway between the broil stop position and fully closed.
5. Lift door up and out until the hinge arm is clear of the slot.

To replace the door:

1. Firmly grasp both sides of the door at the top.
2. With the door at the same angle as the removal position, seat the indentation of the hinge arm into the bottom edge of the hinge slot. The notch in the hinge arm must be fully seated into the bottom of the slot.



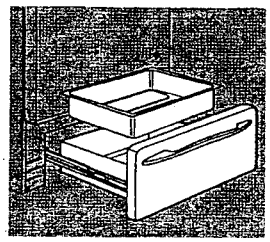
3. Fully open the door. If the door will not fully open, the indentation is not seated correctly in the bottom edge of the slot.
4. Push the hinge locks up against the front frame of the oven cavity to the locked position.



Push hinge locks up to lock.

5. Close the oven door.

Care and cleaning of the range.



Removable Warming Drawer Pan

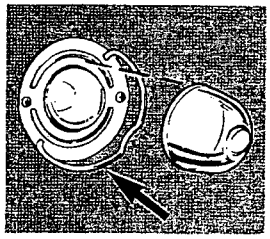
NOTE: *For models with a warming drawer, before performing any adjustments, cleaning or service, disconnect the range electrical power supply at the household distribution panel by removing the fuse or switching off the circuit breaker. Make sure the drawer heating element is cool.*

NOTE: *Allow warming drawer to cool before removing pan.*

NOTE: *Wipe spills promptly after each use.*

- Never place, use or self-clean the warming drawer pan in the upper oven.
- Warming drawer has a removable pan for easy cleaning. Clean with hot soapy water and a sponge or dish towel. Dry with a clean cloth. Replace the pan in the lower oven drawer.

ROA_01354



Wire cover holder.

Oven Light Replacement

CAUTION: *Before replacing your oven light bulb, disconnect the electrical power to the range at the main fuse or circuit breaker panel.*

Be sure to let the light cover and bulb cool completely.

To remove the cover:

1. Hold a hand under the cover so it doesn't fall when released. With fingers of the same hand, firmly push back the wire cover holder. Lift off the cover.

   Do not remove any screws to remove the cover.

2. Replace bulb with a 40-watt appliance bulb.

To replace the cover:

1. Place it into groove of the light receptacle. Pull wire forward to the center of the cover until it snaps into place.
2. Connect electrical power to the range.

Do not store a soiled broiler pan and grid anywhere in the range.

Broiler Pan & Grid

Do not clean the broiler pan or grid in a self-cleaning oven.

After broiling, remove the broiler pan from the oven. Remove the grid from the pan. Carefully pour out the grease from the pan into a proper container.

Wash and rinse the broiler pan and grid in hot water with a soap-filled or plastic scouring pad.

If food has burned on, sprinkle the grid with detergent while hot and cover with wet paper towels or a dishcloth. Soaking the pan will remove burned-on foods.

Both the broiler pan and grid may be cleaned with a commercial oven cleaner.

Both the broiler pan and grid can also be cleaned in a dishwasher.

Oven Heating Elements

Do not clean the broil element. Any soil will burn off when the element is heated. To clean the oven floor, gently lift the bake element. Clean with warm, soapy water.

On some models, the bake element is not exposed and is under the oven floor. If spillovers, residue or ash accumulate on the oven floor, wipe up before self-cleaning.

ROA_01355

Care and cleaning of the range.

Stainless Steel Surfaces

Do not use a steel wool pad; it will scratch the surface.

To clean the stainless steel surface, use warm sudsy water or a stainless steel cleaner or polish. Always wipe the surface in the direction of the grain. Follow the cleaner instructions for cleaning the stainless steel surface.

To inquire about purchasing stainless steel appliance cleaner or polish, or to find the location of a dealer nearest you, please call our toll-free number:

National Parts Center ***1.800.626.2002***

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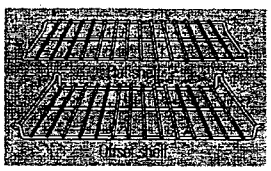
Painted Surfaces

Painted surfaces include the sides of the range and the door, top of control panel and the drawer front. Clean these with soap and water or a vinegar and water solution.

Do not use commercial oven cleaners, cleaning powders, steel wool or harsh abrasives on any painted surface.



Oven Shelves

If your oven is equipped with nickel oven shelves, they should be removed from the oven before beginning the self-clean cycle, or they may discolor. Clean with an abrasive cleanser or scouring pad. After cleaning, rinse the shelves with clean water and dry with a clean cloth.

If your oven is equipped with gray porcelain-coated oven shelves, they may be cleaned in the oven during the self-clean cycle.

NOTE: *The nickel oven shelves (on some models) may be cleaned in the self-cleaning oven. However, the shelves will darken in color, lose their luster and become hard to slide if cleaned during the self-cleaning cycle.*

To make the shelves slide more easily, apply a small amount of vegetable oil to a paper towel and wipe the edges of the oven shelves with the paper towel. Do not spray with Pam® or other lubricant sprays.

Cleaning the glass cooktop.

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Clean your cooktop after each spill. Use CERAMA BRYTE® Ceramic Cooktop Cleaner.

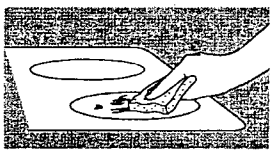
Normal Daily Use Cleaning

ONLY use CERAMA BRYTE® Ceramic Cooktop Cleaner on the glass cooktop. Other creams may not be as effective.

To maintain and protect the surface of your glass cooktop, follow these steps:

1. Before using the cooktop for the first time, clean it with CERAMA BRYTE® Ceramic Cooktop Cleaner. This helps protect the top and makes cleanup easier.
2. Daily use of CERAMA BRYTE® Ceramic Cooktop Cleaner will help keep the cooktop looking new.
3. Shake the cleaning cream well. Apply a few drops of CERAMA BRYTE® Ceramic Cooktop Cleaner directly to the cooktop.
4. Use a paper towel or CERAMA BRYTE® Cleaning Pad for Ceramic Cooktops to clean the entire cooktop surface.
5. Use a dry cloth or paper towel to remove all cleaning residue. No need to rinse.

NOTE: *It is very important that you DO NOT heat the cooktop until it has been cleaned thoroughly.*

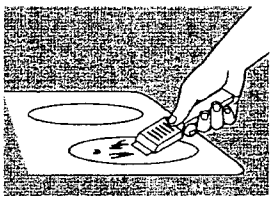


Use a CERAMA BRYTE® Cleaning Pad for Ceramic Cooktops.

Burned-On Residue

WARNING: *DAMAGE to your glass surface may occur if you use scrub pads other than those recommended.*

1. Allow the cooktop to cool.
2. Spread a few drops of CERAMA BRYTE® Ceramic Cooktop Cleaner on the entire burned residue area.
3. Using the included CERAMA BRYTE® Cleaning Pad for Ceramic Cooktops, rub the residue area, applying pressure as needed.
4. If any residue remains, repeat the steps listed above as needed.
5. For additional protection, after all residue has been removed, polish the entire surface with CERAMA BRYTE® Ceramic Cooktop Cleaner and a paper towel.



The CERAMA BRYTE® Ceramic Cooktop Scraper and all recommended supplies are available through our Parts Center. See instructions under "To Order Parts" section on next page.

NOTE: *Do not use a dull or nicked blade.*

Heavy, Burned-On Residue

1. Allow the cooktop to cool.
2. Use a single-edge razor blade scraper at approximately a 45° angle against the glass surface and scrape the soil. It will be necessary to apply pressure to the razor scraper in order to remove the residue.
3. After scraping with the razor scraper, spread a few drops of CERAMA BRYTE® Ceramic Cooktop Cleaner on the entire burned residue area. Use the CERAMA BRYTE® Cleaning Pad to remove any remaining residue.
4. For additional protection, after all residue has been removed, polish the entire surface with CERAMA BRYTE® Ceramic Cooktop Cleaner and a paper towel.

Cleaning the glass cooktop.

Metal Marks and Scratches

1. Be careful not to slide pots and pans across your cooktop. It will leave metal markings on the cooktop surface.

   These marks are removable using the CERAMA BRYTE® Ceramic Cooktop Cleaner with the CERAMA BRYTE® Cleaning Pad for Ceramic Cooktops.

2. If pots with a thin overlay of aluminum or copper are allowed to boil dry, the overlay may leave black discoloration on the cooktop.

   This should be removed immediately before heating again or the discoloration may be permanent.

WARNING: *Carefully check the bottom of pans for roughness that would scratch the cooktop.*

Rubber-like Seal

To clean the rubber-like seal at the outer edge of the glass, wipe it with cooktop cream when needed.

Glass surface—potential for permanent damage.

Our testing shows that if you are cooking high sugar mixtures such as jelly or fudge and have a spillover, it can cause permanent damage to the glass surface unless the spillover is immediately removed.

Damage from Sugary Spills and Melted Plastic

1. Turn off all surface units. Remove hot pans.
2. Wearing an oven mitt:
   a. Use a single-edge razor blade scraper (CERAMA BRYTE® Ceramic Cooktop Scraper) to move the spill to a cool area on the cooktop.
   b. Remove the spill with paper towels.
3. Any remaining spillover should be left until the surface of the cooktop has cooled.
4. Don't use the surface units again until all of the residue has been completely removed.

NOTE: *If pitting or indentation in the glass surface has already occurred, the cooktop glass will have to be replaced. In this case, service will be necessary.*

To Order Parts

To order CERAMA BRYTE® Ceramic Cooktop Cleaner and the cooktop scraper, please call our toll-free number:

National Parts Center ***800.626.2002***

ge.com

CERAMA BRYTE® Ceramic Cooktop Cleaner ..... *# WX10X300*

CERAMA BRYTE® Ceramic Cooktop Scraper ..... *# WX10X0302*

Kit ..... *# WB64X5027*
(Kit includes cream and cooktop scraper)

CERAMA BRYTE® Cleaning Pads for Ceramic Cooktops ..... *# WX10X350*

ROA_01358

Before you call for service...

ge.com

Troubleshooting Tips
Save time and money! Review the charts on the following pages first and you may not need to call for service.

	Possible Causes	What To Do
Surface units will not maintain a rolling boil or cooking is not fast enough	Improper cookware being used.	• Use pans which are flat and match the diameter of the surface unit selected.
Surface units do not work properly	A fuse in your home may be blown or the circuit breaker tripped.	• Replace the fuse or reset the circuit breaker.
	Cooktop controls improperly set.	• Check to see the correct control is set for the surface unit you are using.
Scratches (may appear as cracks) on cooktop glass surface	Incorrect cleaning methods being used.	• Scratches are not removable. Tiny scratches will become less visible in time as a result of cleaning.
	Cookware with rough bottoms being used or coarse particles (salt or sand) were between the cookware and the surface of the cooktop.	• To avoid scratches, use the recommended cleaning procedures. Make sure bottoms of cookware are clean before use, and use cookware with smooth bottoms.
	Cookware has been slid across the cooktop surface.	
Areas of discoloration on the cooktop	Food spillovers not cleaned before next use.	• See the *Cleaning the glass cooktop* section.
	Hot surface on a model with a light colored glass cooktop.	• This is normal. The surface may appear discolored when it is hot. This is temporary and will disappear as the glass cools.
Plastic melted to the surface	Hot cooktop came into contact with plastic placed on the hot cooktop.	• See the *Glass surface—potential for permanent damage* section in the *Cleaning the glass cooktop* section.
Pitting (or indentation) of the cooktop	Hot sugar mixture spilled on the cooktop.	• Call a qualified technician for replacement.
Frequent cycling off and on of surface units	Improper cookware being used.	• Use only flat cookware to minimize cycling.
Oven light does not work	Light bulb is loose or defective.	• Tighten or replace the bulb.
	Switch operating light is broken.	• Call for service.
Oven will not work	Plug on range is not completely inserted in the electrical outlet.	• Make sure electrical plug is plugged into a live, properly grounded outlet.
	A fuse in your home may be blown or the circuit breaker tripped.	• Replace the fuse or reset the circuit breaker.
	Oven controls improperly set.	• See the *Using the oven* section.

ROA_01359

Before you call for service...

Troubleshooting Tips

	Possible Causes	What To Do
Food does not bake or roast properly	Oven controls improperly set.	• See the *Using the oven* section.
	Shelf position is incorrect or the shelf is not level.	• See the *Using the oven* section.
	Incorrect cookware or cookware of improper size being used.	• See the *Using the oven* section.
	Oven thermostat needs adjustment.	• See the *Adjust the oven thermostat—Do it yourself!* section.
Food does not broil properly	Oven controls improperly set.	• Make sure you touch the ***BROIL HI/LO*** pad.
	Door not open to the broil stop position as recommended.	• See the *Using the oven* section.
	Improper shelf position being used.	• See the *Broiling Guide.*
	Cookware not suited for broiling.	• Use the broiling pan and grid that came with your range.
	Aluminum foil used on the the broiling pan and grid has not been fitted properly and slit as recommended.	• See the *Using the oven* section.
	In some areas the power (voltage) may be low.	• Preheat the broil element for 10 minutes. • Broil for the longest period of time recommended in the *Broiling Guide.*
Oven temperature too hot or too cold	Oven thermostat needs adjustment.	• See the *Adjust the oven thermostat—Do it yourself!* section.
Clock and timer do not work	Plug on range is not completely inserted in the electrical outlet.	• Make sure electrical plug is plugged into a live, properly grounded outlet.
	A fuse in your home may be blown or the circuit breaker tripped.	• Replace the fuse or reset the circuit breaker.
	Oven controls improperly set.	• See the *Using the clock and timer* section.
Oven will not self-clean	The oven temperature is too high to set a self-clean operation.	• Allow the range to cool to room temperature and reset the controls.
	Oven controls improperly set.	• See the *Using the self-cleaning oven* section.
"Crackling" or "popping" sound	This is the sound of the metal heating and cooling during both the cooking and cleaning functions.	• This is normal.

ROA_01360

	Possible Causes	What To Do
Excessive smoking during a clean cycle	Excessive soil.	• Touch the **CLEAR/OFF** pad. Open the windows to rid the room of smoke. Wait until the **LOCKED** door light goes off. Wipe up the excess soil and reset the clean cycle.
Oven door will not open after a clean cycle	Oven too hot.	• Allow the oven to cool below locking temperature.
Oven not clean after a clean cycle	Oven controls not properly set.	• See the *Using the self-cleaning oven* section.
	Oven was heavily soiled.	• Clean up heavy spillovers before starting the clean cycle. Heavily soiled ovens may need to self-clean again or for a longer period of time.
"LOCK DOOR" flashes in the display	The self-clean cycle has been selected, but the door is not closed.	• Close the oven door.
LOCKED DOOR light is on when you want to cook	The oven door is locked because the temperature inside the oven has not dropped below the locking temperature.	• Touch the **CLEAR/OFF** pad. Allow the oven to cool.
"F" and a number or letter flash in the display	You have a function error code.	• Touch the **CLEAR/OFF** pad. Put the oven back into operation.
	If the function code repeats.	• Disconnect all power to the range for at least 30 seconds and then reconnect power. If the function error code repeats, call for service.
Control signals after entering cooking time or start time	You forgot to enter a bake temperature or cleaning time.	• Touch the **BAKE** pad and desired temperature or the **SELF CLEAN** pad and desired clean time.
Display goes blank	A fuse in your home may be blown or the circuit breaker tripped.	• Replace the fuse or reset the circuit breaker.
	The clock is in the black-out mode.	• See the *Special features of your oven control* section.
Display flashes	Power failure.	• Reset the clock.
Unable to get the display to show "SF"	Oven control pads were not touched properly.	• The **BAKE** and **BROIL HI/LO** pads must be touched at the same time and held for 3 seconds.
Power outage, clock flashes	Power outage or surge.	• Reset the clock. If the oven was in use, you must reset it by touching the **CLEAR/OFF** pad, setting the clock and resetting any cooking function.

ROA_01361

Before you call for service...

Troubleshooting Tips

	Possible Causes	What To Do
Steam from the vent	When using the convection feature, it is normal to see steam coming out of the oven vent. As the number of shelves or amount of food being cooked increases, the amount of visible steam will increase.	• This is normal.
"Burning" or "oily" odor exiting from the vent	This is normal in a new oven and will disappear in time.	• To speed the process, set a self-clean cycle for a minimum of 3 hours. See the *Using the self-cleaning* oven section.
Strong odor	An odor from the insulation around the inside of the oven is normal for the first few times the oven is used.	• This is temporary.
Fan noise	Convection fan is running.	• This is normal. The convection fan will run until the function is over or the door is opened. • The convection fan will operate during preheat of the bake cycle. The fan will turn off after the oven is heated to the set temperature. This is normal.
	The oven is self-cleaning.	• Wait for the self-clean cycle to finish and the oven to cool.
Oven shelves are difficult to slide	The shelves were cleaned in a self-clean cycle.	• Apply a small amount of vegetable oil to a paper towel and wipe the edges of the oven shelves with the paper towel. Do not spray with Pam® or other lubricant sprays.
Drawer does not slide smoothly or drags	The drawer is out of alignment.	• Fully extend the drawer and push it all the way in. See the *Care and cleaning of the range* section.
	Drawer is over-loaded or load is unbalanced.	• Reduce weight. Redistribute drawer contents.
Warming drawer will not work	A fuse in your home may be blown or the circuit breaker tripped.	• Replace the fuse or reset the circuit breaker.
	Controls improperly set.	• See the *Warming drawer* section.
Excessive condensation in the drawer	Liquid in drawer.	• Remove liquid.
	Uncovered foods.	• Cover food with lid or aluminum foil.
	Temperature setting too high.	• Reduce temperature setting.
Food dries out in the warming drawer	Moisture escaping.	• Cover food with lid or aluminum foil.
	Drawer not fully closed.	• Push drawer in until latch engages.

ROA_01362

GE Service Protection Plus™

GE, a name recognized worldwide for quality and dependability, offers you Service Protection Plus™—comprehensive protection on all your appliances—**No Matter What Brand!**

Benefits Include:
- **Backed by GE**
- **All brands covered**
- **Unlimited service calls**
- **All parts and labor costs included**
- **No out-of-pocket expenses**
- **No hidden deductibles**
- **One 800 number to call**

We'll Cover Any Appliance. Anywhere. Anytime.*

You will be completely satisfied with our service protection or you may request your money back on the remaining value of your contract. No questions asked. It's that simple.

Protect your refrigerator, dishwasher, washer and dryer, range, TV, VCR and much more—**any brand!** Plus there's no extra charge for emergency service and low monthly financing is available. Even icemaker coverage and food spoilage protection is offered. You can rest easy, knowing that all your valuable household products are protected against expensive repairs.

Place your confidence in GE and call us in the U.S. toll-free at **800.626.2224** for more information.

*All brands covered, up to 20 years old, in the continental U.S.

Cut here

Please place in envelope and mail to:

General Electric Company
Warranty Registration Department
P.O. Box 32150
Louisville, KY 40232-2150

Consumer Product Ownership Registration

Dear Customer:
Thank you for purchasing our product and thank you for placing your confidence in us.
We are proud to have you as a customer!

Follow these three steps to protect your new appliance investment:

1 **Complete and mail your Consumer Product Ownership Registration today.** Have the peace of mind of knowing we can contact you in the unlikely event of a safety modification.

2 After mailing the registration below, store this document in a safe place. It contains information you will need should you require service. Our service number is 800.GE.CARES (800.432.2737).

3 Read your Owner's Manual carefully. It will help you operate your new appliance properly.

Model Number _____ **Serial Number** _____

Important: If you did not get a registration card with your product, detach and return the form below to ensure that your product is registered, or register online at ge.com.

Cut here

Consumer Product Ownership Registration

Important Mail Today!

Model Number _____ **Serial Number** _____

Mr. ☐ Ms. ☐ Mrs. ☐ Miss ☐

First Name _____ Last Name _____

Street Address _____

Apt. # _____ E-mail Address* _____

City _____ State _____ Zip Code _____

Date Placed In Use Month ____ Day ____ Year ____ Phone Number ____-____-____

* Please provide your e-mail address to receive, via e-mail, discounts, special offers and other important communications from GE Appliances (GEA).

☐ Check here if you do not want to receive communications from GEA's carefully selected partners.

FAILURE TO COMPLETE AND RETURN THIS CARD DOES NOT DIMINISH YOUR WARRANTY RIGHTS.

For more information about GEA's privacy and data usage policy, go to ge.com and click on "Privacy Policy" or call 800.626.2224.

GE Consumer & Industrial
Appliances
General Electric Company
Louisville, KY 40225
ge.com

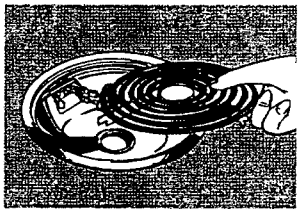
ROA_01364

Notes.

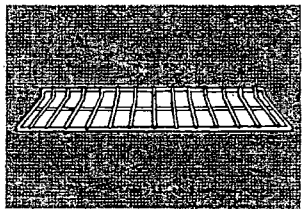
Accessories.

Looking For Something More?

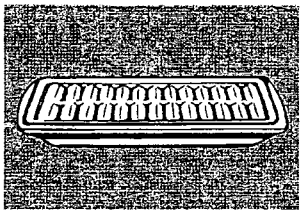
*You can find these accessories and many more at **ge.com**, or call **800.626.2002** (during normal business hours). Have your model number ready.*



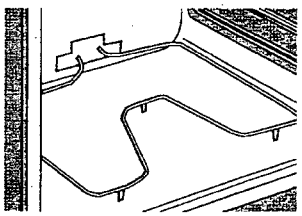
Surface Elements & Drip Pans



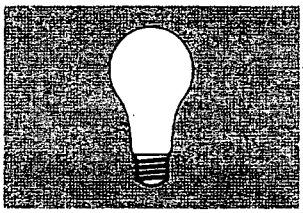
Oven Racks



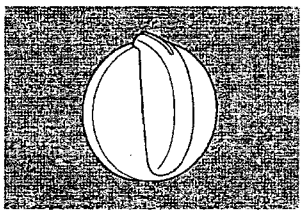
Broiler Pan



Oven Elements

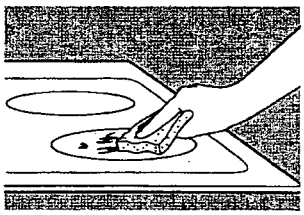


Light Bulbs

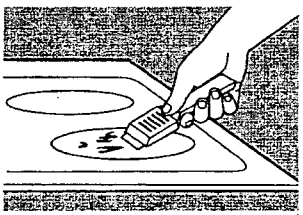


Knobs

Cleaner



Cleaning Pads



Scraper

Tired of discolored racks? Wishing you had extra-heavy-duty oven racks?

NOW AVAILABLE for your range:

GE's innovative, self-cleanable porcelain-coated oven racks!

- Heavy Duty
- Durable
- Able to be cleaned in a self-cleaning oven

Visit ***ge.com*** for more information.

GE Electric Range Warranty.

All warranty service provided by our Factory Service Centers, or an authorized Customer Care® technician. To schedule service, on-line, 24 hours a day, visit us at ge.com, or call 800.GE.CARES (800.432.2737). Please have serial number and model number available when calling for service.

Staple your receipt here. Proof of the original purchase date is needed to obtain service under the warranty.

For One Year from the date of original purchase

GE Will Provide:

Any part of the range which fails due to a defect in materials or workmanship. During this ***limited one-year warranty,*** GE will also provide, ***free of charge,*** all labor and in-home service to replace the defective part.

GE Will Not Provide:

- Service trips to your home to teach you how to use the product.
- Improper installation, delivery or maintenance.
- Failure of the product if it is abused, misused, or used for other than the intended purpose or used commercially.
- Replacement of house fuses or resetting of circuit breakers.
- Damage to the product caused by accident, fire, floods or acts of God.
- Incidental or consequential damage caused by possible defects with this appliance.
- Damage caused after delivery.
- Product not accessible to provide required service.

EXCLUSION OF IMPLIED WARRANTIES—Your sole and exclusive remedy is product repair as provided in this Limited Warranty. Any implied warranties, including the implied warranties of merchantability or fitness for a particular purpose, are limited to one year or the shortest period allowed by law.

This warranty is extended to the original purchaser and any succeeding owner for products purchased for home use within the USA. If the product is located in an area where service by a GE Authorized Servicer is not available, you may be responsible for a trip charge or you may be required to bring the product to an Authorized GE Service location for service. In Alaska, the warranty excludes the cost of shipping or service calls to your home.

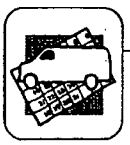
Some states do not allow the exclusion or limitation of incidental or consequential damages. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state. To know what your legal rights are, consult your local or state consumer affairs office or your state's Attorney General.

Warrantor: General Electric Company. Louisville, KY 40225

Consumer Support.

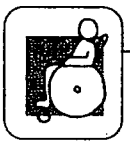
GE Appliances Website — ge.com

Have a question or need assistance with your appliance? Try the GE Appliances Website 24 hours a day, any day of the year! For greater convenience and faster service, you can now download Owner's Manuals, order parts, catalogs, or even schedule service on-line. You can also "Ask Our Team of Experts™" your questions, and so much more...



Schedule Service — ge.com

Expert GE repair service is only one step away from your door. Get on-line and schedule your service at your convenience 24 hours any day of the year! Or call 800.GE.CARES (800.432.2737) during normal business hours.

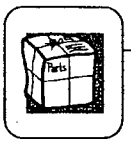


Real Life Design Studio — ge.com

GE supports the Universal Design concept—products, services and environments that can be used by people of all ages, sizes and capabilities. We recognize the need to design for a wide range of physical and mental abilities and impairments. For details of GE's Universal Design applications, including kitchen design ideas for people with disabilities, check out our Website today. For the hearing impaired, please call 800.TDD.GEAC (800.833.4322).

Extended Warranties — ge.com

Purchase a GE extended warranty and learn about special discounts that are available while your warranty is still in effect. You can purchase it on-line anytime, or call 800.626.2224 during normal business hours. GE Consumer Home Services will still be there after your warranty expires.



Parts and Accessories — ge.com

Individuals qualified to service their own appliances can have parts or accessories sent directly to their homes (VISA, MasterCard and Discover cards are accepted). Order on-line today, 24 hours every day or by phone at 800.626.2002 during normal business hours.

Instructions contained in this manual cover procedures to be performed by any user. Other servicing generally should be referred to qualified service personnel. Caution must be exercised, since improper servicing may cause unsafe operation.

Contact Us — ge.com

If you are not satisfied with the service you receive from GE, contact us on our Website with all the details including your phone number, or write to: General Manager, Customer Relations
GE Appliances, Appliance Park
Louisville, KY 40225

Register Your Appliance — ge.com

Register your new appliance on-line—at your convenience! Timely product registration will allow for enhanced communication and prompt service under the terms of your warranty, should the need arise. You may also mail in the pre-printed registration card included in the packing material.

Printed in the United States

ROA_01368

MICROWAVE OVEN MANUAL

ROA_01369

ge.com

Spacemaker Microwave Oven

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Español

For a Spanish version of this manual, visit our Website at ge.com.

Para consultar una version en español de este manual de instrucciones, visite nuestro sitio de internet ge.com.

[redacted]

JVM1850
JNM1851
JVM1870
JVM1871
JVM2050
JVM3670
DVM1850
EMO4000

Write the model and serial numbers here:

Model # _____

Serial # _____

Find these numbers on a label inside the oven.

DE68-03327A *49-40537 11-06 JR*

IMPORTANT SAFETY INFORMATION. READ ALL INSTRUCTIONS BEFORE USING.

⚠ WARNING!

For your safety, the information in this manual must be followed to minimize the risk of fire or explosion, electric shock, or to prevent property damage, personal injury, or loss of life.

PRECAUTIONS TO AVOID POSSIBLE EXPOSURE TO EXCESSIVE MICROWAVE ENERGY

- ***Do Not Attempt*** to operate this oven with the door open since open-door operation can result in harmful exposure to microwave energy. It is important not to defeat or tamper with the safety interlocks.
- ***Do Not Place*** any object between the oven front face and the door or allow soil or cleaner residue to accumulate on sealing surfaces.
- ***Do Not Operate*** the oven if it is damaged. It is particularly important that the oven door close properly and that there is no damage to the:
  - door (bent),
  - hinges and latches (broken or loosened),
  - door seals and sealing surfaces.
- ***The Oven Should Not*** be adjusted or repaired by anyone except properly qualified service personnel.

SAFETY PRECAUTIONS

When using electrical appliances, basic safety precautions should be followed, including the following:

- Read and follow the specific precautions in the *Precautions to Avoid Possible Exposure to Excessive Microwave Energy* section above.
- This appliance must be grounded. Connect only to a properly grounded outlet. See the *Grounding Instructions* section on page 8.
- Install or locate this appliance only in accordance with the provided Installation Instructions.
- This microwave oven is intended for household use and is UL listed for installation over electric and gas ranges.
- This microwave oven is not approved or tested for marine use.

ROA_01371

Use this appliance only for its intended purpose as described in this Owner's Manual.

- Do not mount this appliance over a sink.
- This over-the-range oven was designed for use over ranges no wider than 36". It may be installed over both gas and electric cooking equipment.
- Do not operate this appliance if it has a damaged power cord or plug, if it is not working properly or if it has been damaged or dropped. If the power cord is damaged, it must be replaced by General Electric Service or an authorized service agent using a power cord available from General Electric.
- Do not cover or block any openings on the appliance.
- Use this appliance only for its intended use as described in this manual. Do not use corrosive chemicals or vapors in this appliance. This microwave oven is specifically designed to heat, dry or cook food, and is not intended for laboratory or industrial use.
- Do not store this appliance outdoors. Do not use this product near water—for example, in a wet basement, near a swimming pool, near a sink or in similar locations.
- Keep power cord away from heated surfaces.
- Do not immerse power cord or plug in water.
- Do not store anything directly on top of the microwave oven surface when the microwave oven is in operation.
- To reduce the risk of fire in the oven cavity:
  - Do not overcook food. Carefully attend appliance when paper, plastic or other combustible materials are placed inside the oven while cooking.
  - Remove wire twist-ties and metal handles from paper or plastic containers before placing them in the oven.
  - Do not use the oven for storage purposes. Do not leave paper products, cooking utensils or food in the oven when not in use.
  - If materials inside the oven ignite, keep the oven door closed, turn the oven off and disconnect the power cord, or shut off power at the fuse or circuit breaker panel. If the door is opened, the fire may spread.
  - Do not use the Sensor Features twice in succession on the same food portion. If food is undercooked after the first countdown, use ***Time Cook*** for additional cooking time.
- See door surface cleaning instructions in the *Care and cleaning of the microwave oven* section of this manual.
- This appliance should be serviced only by qualified service personnel. Contact nearest authorized service facility for examination, repair or adjustment.
- As with any appliance, close supervision is necessary when used by children.

ROA_01372

IMPORTANT SAFETY INFORMATION. READ ALL INSTRUCTIONS BEFORE USING.

⚠ WARNING!

ARCING

*If you see arcing, press the **CLEAR/OFF** pad and correct the problem.*

Arcing is the microwave term for sparks in the oven. Arcing is caused by:

- The metal shelf not installed correctly so it touches the microwave wall.
- Metal or foil touching the side of the oven.
- Foil not molded to food (upturned edges act like antennas).
- Metal, such as twist-ties, poultry pins or gold-rimmed dishes, in the microwave.
- Recycled paper towels containing small metal pieces being used in the microwave.

FOODS

- Do not pop popcorn in your microwave oven unless in a special microwave popcorn accessory or unless you use popcorn labeled for use in microwave ovens.
- Some products such as whole eggs and sealed containers—for example, closed jars—are able to explode and should not be heated in this microwave oven. Such use of the microwave oven could result in injury.
- Do not boil eggs in a microwave oven. Pressure will build up inside egg yolk and will cause it to burst, possibly resulting in injury.
- Operating the microwave with no food inside for more than a minute or two may cause damage to the oven and could start a fire. It increases the heat around the magnetron and can shorten the life of the oven.
- Foods with unbroken outer "skin" such as potatoes, hot dogs, sausages, tomatoes, apples, chicken livers and other giblets, and egg yolks should be pierced to allow steam to escape during cooking.

■ ***SUPERHEATED WATER***

Liquids, such as water, coffee or tea are able to be overheated beyond the boiling point without appearing to be boiling. Visible bubbling or boiling when the container is removed from the microwave oven is not always present. THIS COULD RESULT IN VERY HOT LIQUIDS SUDDENLY BOILING OVER WHEN THE CONTAINER IS DISTURBED OR A SPOON OR OTHER UTENSIL IS INSERTED INTO THE LIQUID.

To reduce the risk of injury to persons:

— Do not overheat the liquid.

— Stir the liquid both before and halfway through heating it.

— Do not use straight-sided containers with narrow necks.

— After heating, allow the container to stand in the microwave oven for a short time before removing the container.

— Use extreme care when inserting a spoon or other utensil into the container.

■ Avoid heating baby food in glass jars, even with the lid off. Make sure all infant food is thoroughly cooked. Stir food to distribute the heat evenly. Be careful to prevent scalding when warming formula or breast milk. The container may feel cooler than the milk really is. Always test the milk before feeding the baby.

■ Don't defrost frozen beverages in narrow-necked bottles (especially carbonated beverages). Even if the container is opened, pressure can build up. This can cause the container to burst, possibly resulting in injury.

■ Hot foods and steam can cause burns. Be careful when opening any containers of hot food, including popcorn bags, cooking pouches and boxes. To prevent possible injury, direct steam away from hands and face.

■ Do not overcook potatoes. They could dehydrate and catch fire, causing damage to your oven.

■ Cook meat and poultry thoroughly—meat to at least an INTERNAL temperature of 160°F and poultry to at least an INTERNAL temperature of 180°F. Cooking to these temperatures usually protects against food-borne illness.

ROA_01374

IMPORTANT SAFETY INFORMATION. READ ALL INSTRUCTIONS BEFORE USING.

⚠ WARNING!

MICROWAVE-SAFE COOKWARE

Make sure all cookware used in your microwave oven is suitable for microwaving. Most glass casseroles, cooking dishes, measuring cups, custard cups, pottery or china dinnerware which does not have metallic trim or glaze with a metallic sheen can be used. Some cookware is labeled "suitable for microwaving."

- If you are not sure if a dish is microwave-safe, use this test: Place in the oven both the dish you are testing and a glass measuring cup filled with 1 cup of water—set the measuring cup either in or next to the dish. Microwave 30–45 seconds at high. If the dish heats, it should not be used for microwaving.

  If the dish remains cool and only the water in the cup heats, then the dish is microwave-safe.

- If you use a meat thermometer while cooking, make sure it is safe for use in microwave ovens.
- Do not use recycled paper products. Recycled paper towels, napkins and waxed paper can contain metal flecks which may cause arcing or ignite. Paper products containing nylon or nylon filaments should be avoided, as they may also ignite.
- Some styrofoam trays (like those that meat is packaged on) have a thin strip of metal embedded in the bottom. When microwaved, the metal can burn the floor of the oven or ignite a paper towel.
- Do not use the microwave to dry newspapers.
- Not all plastic wrap is suitable for use in microwave ovens. Check the package for proper use.
- Paper towels, waxed paper and plastic wrap can be used to cover dishes in order to retain moisture and prevent spattering. Be sure to vent plastic wrap so steam can escape.
- Cookware may become hot because of heat transferred from the heated food. Pot holders may be needed to handle the cookware.

- "Boilable" cooking pouches and tightly closed plastic bags should be slit, pierced or vented as directed by package. If they are not, plastic could burst during or immediately after cooking, possibly resulting in injury. Also, plastic storage containers should be at least partially uncovered because they form a tight seal. When cooking with containers tightly covered with plastic wrap, remove covering carefully and direct steam away from hands and face.
- Use foil only as directed in this manual. When using foil in the microwave oven, keep the foil at least 1" away from the sides of the oven.
- Plastic cookware – Plastic cookware designed for microwave cooking is very useful, but should be used carefully. Even microwave-safe plastic may not be as tolerant of overcooking conditions as are glass or ceramic materials and may soften or char if subjected to short periods of overcooking. In longer exposures to overcooking, the food and cookware could ignite.

Follow these guidelines:

- Use microwave-safe plastics only and use them in strict compliance with the cookware manufacturer's recommendations.
- Do not microwave empty containers.
- Do not permit children to use plastic cookware without complete supervision.

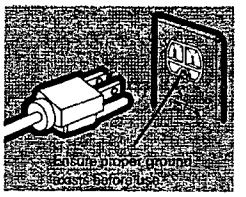
ROA_01376

IMPORTANT SAFETY INFORMATION. READ ALL INSTRUCTIONS BEFORE USING.

⚠ WARNING!

Improper use of the grounding plug can result in a risk of electric shock.

GROUNDING INSTRUCTIONS



This appliance must be grounded. In the event of an electrical short circuit, grounding reduces the risk of electric shock by providing an escape wire for the electric current.

This appliance is equipped with a power cord having a grounding wire with a grounding plug. The plug must be plugged into an outlet that is properly installed and grounded.

Consult a qualified electrician or service technician if the grounding instructions are not completely understood, or if doubt exists as to whether the appliance is properly grounded.

If the outlet is a standard 2-prong wall outlet, it is your personal responsibility and obligation to have it replaced with a properly grounded 3-prong wall outlet.

Do not under any circumstances cut or remove the third (ground) prong from the power cord.

Do not use an adapter plug with this appliance.

Do not use an extension cord with this appliance. If the power cord is too short, have a qualified electrician or service technician install an outlet near the appliance.

For best operation, plug this appliance into its own electrical outlet to prevent flickering of lights, blowing of fuse or tripping of circuit breaker.

THE VENT FAN

The fan will operate automatically under certain conditions (see Automatic Fan feature). Take care to prevent the starting and spreading of accidental cooking fires while the vent fan is in use.

- Clean the underside of the microwave often. Do not allow grease to build up on the microwave or the fan filter.
- In the event of a grease fire on the surface units below the microwave oven, smother a flaming pan on the surface unit by covering the pan completely with a lid, a cookie sheet or a flat tray.
- Use care when cleaning the vent fan filter. Corrosive cleaning agents, such as lye-based oven cleaners, may damage the filter.
- When preparing flaming foods under the microwave, turn the fan on.
- Never leave surface units beneath your microwave oven unattended at high heat settings. Boilovers cause smoking and greasy spillovers that may ignite and spread if the microwave vent fan is operating. To minimize automatic fan operation, use adequate-sized cookware and use high heat on surface units only when necessary.

READ AND FOLLOW THIS SAFETY INFORMATION CAREFULLY.

SAVE THESE INSTRUCTIONS

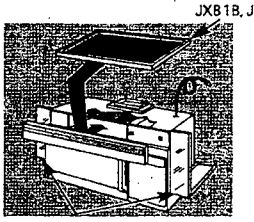
About optional kits.

OPTIONAL KITS

Filler Panel Kits
JX52WH – White
JX52BL – Black

When replacing a 36" range hood, filler panel kits fill in the additional width to provide a custom built-in appearance.

JX81B, JX81H



JX52

For installation between cabinets only; not for end-of-cabinet installation. Each kit contains two 3"-wide filler panels.

Filter Kits
JX81B – Recirculating Charcoal Filter Kit *(1800 and 3600 Series models)*

JX81H – Recirculating Charcoal Filter Kit *(2000 Series models)*

Filter kits are used when the microwave oven cannot be vented to the outside.

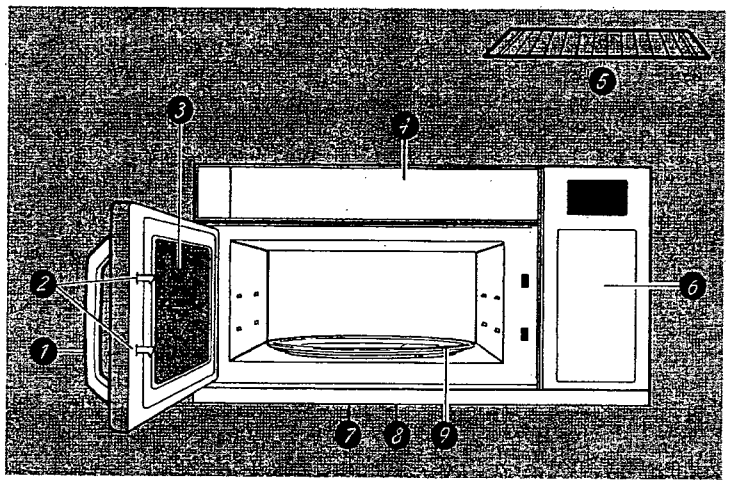
Available at extra cost from your GE supplier. See the back cover for ordering by phone or at ge.com.

ROA_01379

About the features of your microwave oven.

ge.com

Throughout this manual, features and appearance may vary from your model.



Features of the Oven

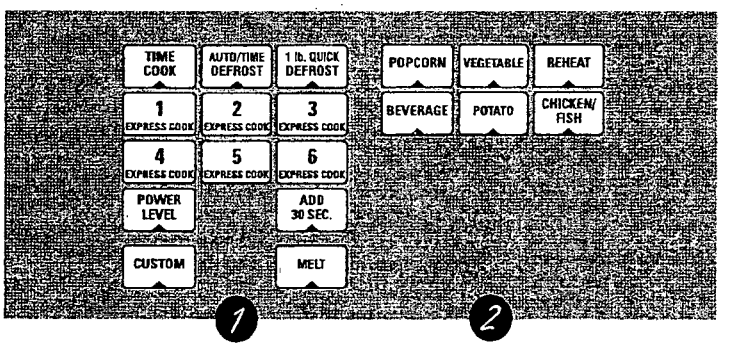
1. ***Door Handle.*** Pull to open the door. The door must be securely latched for the microwave to operate.
2. ***Door Latches.***
3. ***Window with Metal Shield.*** Screen allows cooking to be viewed while keeping microwaves confined in the oven.
4. ***Active Vent (on some models).*** The vent door swings open when the fan operates and closes when the fan shuts off.
5. ***Shelf.*** Lets you microwave several foods at once. Food microwaves best when placed directly on the turntable.
6. ***Touch Control Panel Display.***
7. ***Cooktop Light.***
8. ***Grease Filter.***
9. ***Removable Turntable.*** Turntable and support ***must*** be in place when using the oven. The turntable may be removed for cleaning.

NOTE: *Rating plate is located on the inside wall of the microwave, or on the upper left front behind the door. Oven vent(s) and oven light are located on the inside walls of the microwave oven.*

ROA_01380

About the features of your microwave oven.

You can microwave by time, with the sensor features or with the auto features.



Cooking Controls

1 Time and Auto Features

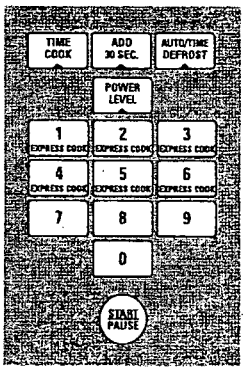
Press	*Enter*
TIME COOK I & II Press once or twice	Amount of cooking time
AUTO/TIME DEFROST Press twice	Amount of defrosting time
CUSTOM (on some models)	Follow displayed instructions
EXPRESS COOK	Starts immediately!
ADD 30 SEC	Starts immediately!
POWER LEVEL	Power level 1–10
AUTO/TIME DEFROST Press once	Food weight up to 6 lbs.
1 lb. QUICK DEFROST	Starts immediately!
MELT (on some models)	Food type

2 Sensor Features

Press	*Enter*	*Option*
POPCORN	Starts immediately!	more/less time
BEVERAGE	Starts immediately!	
REHEAT	Starts immediately!	
Press once (plate of 3 foods)		more/less time
Press twice (pasta 8–12 oz.)		more/less time
Press three times (vegetables 1/2–2 cups)		more/less time
POTATO	Starts immediately!	more/less time
VEGETABLE	Starts immediately!	
Press once (fresh vegetables)		more/less time
Press twice (frozen vegetables)		more/less time
Press three times (canned vegetables)		more/less time (on some models)
CHICKEN/FISH (on some models)	Starts immediately!	more/less time
Press once (chicken pieces)		
Press twice (fish)		

ROA_01381

About changing the power level.



How to Change the Power Level

The power level may be entered or changed immediately after entering the feature time for ***TIME COOK, TIME DEFROST, EXPRESS COOK*** or ***ADD 30 SEC.*** The power level may also be changed during time countdown.

- Press ***TIME COOK*** or select ***Time Defrost.***
- Enter cooking or defrosting time.
- Press ***POWER LEVEL.***
- Select desired power level 1–10.
- Press ***START.***

Variable power levels add flexibility to microwave cooking. The power levels on the microwave oven can be compared to the surface units on a range. High (power level 10) or full power is the fastest way to cook and gives you 100% power. Each power level gives you microwave energy a certain percent of the time. Power level 7 is microwave energy 70% of the time. Power level 3 is energy 30% of the time.

A high setting (10) will cook faster but food may need more frequent stirring, rotating or turning over. Most cooking will be done on High (power level 10). A lower setting will cook more evenly and need less stirring or rotating of the food.

Some foods may have better flavor, texture or appearance if one of the lower settings is used. Use a lower power level when cooking foods that have a tendency to boil over, such as scalloped potatoes.

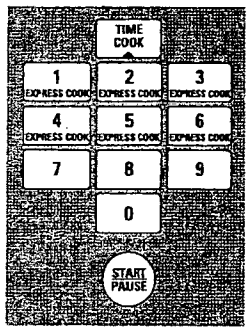
Rest periods (when the microwave energy cycles off) give time for the food to "equalize" or transfer heat to the inside of the food. An example of this is shown with power level 3—the defrost cycle. If microwave energy did not cycle off, the outside of the food would cook before the inside was defrosted.

Here are some examples of uses for various power levels:

Power Level	*Best Uses*
High 10	Fish, bacon, vegetables, boiling liquids.
Med-High 7	Gentle cooking of meat and poultry; baking casseroles and reheating.
Medium 5	Slow cooking and tenderizing such as stews and less tender cuts of meat.
Low 2 or 3	Defrosting without cooking; simmering; delicate sauces.
Warm 1	Keeping food warm without overcooking; softening butter.

ROA_01382

About the time features.



Time Cook I

Allows you to microwave for any time up to 99 minutes and 99 seconds.

Power level 10 (High) is automatically set, but you may change it for more flexibility.

You may open the door during ***TIME COOK*** to check the food. Close the door and press ***START*** to resume cooking.

- Press ***TIME COOK***.
- Enter cooking time.
- Change power level if you don't want full power. (Press ***POWER LEVEL***. Select a desired power level 1–10.)
- Press ***START***.

Time Cook II

Lets you change power levels automatically during cooking. Here's how to do it:

- Press ***TIME COOK***.
- Enter the first cook time.
- Change the power level if you don't want full power. (Press ***POWER LEVEL***. Select a desired power level 1–10.)
- Press ***TIME COOK*** again.
- Enter the second cook time.
- Change the power level if you don't want full power. (Press ***POWER LEVEL***. Select a power level 1–10.)
- Press ***START***.

At the end of ***Time Cook I***, ***Time Cook II*** counts down.

ROA_01383

Cooking Guide for Time Cook I and Time Cook II

***NOTE:** Use **power level High (10)** unless otherwise noted.*

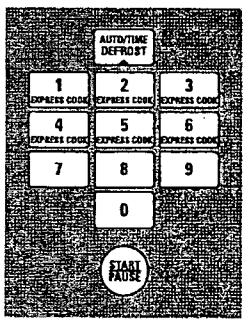
	Amount	Time	Comments
Asparagus			
(fresh spears)	1 lb.	6 to 9 min., Med-High (7)	In 1½-qt. oblong glass baking dish, place 1/4 cup water.
(frozen spears)	10-oz package	5 to 7 min.	In 1-qt. casserole.
Beans			
(fresh cut)	1 lb. cut in half	9 to 11 min.	In 1½-qt. casserole, place 1/2 cup water.
(frozen cut)	10-oz package	6 to 8 min.	In 1-qt. casserole, place 2 tablespoons water.
(frozen lima)	10-oz package	6 to 8 min.	In 1-qt. casserole, place 1/4 cup water.
Beets			
(fresh whole)	1 bunch	17 to 21 min.	In 2-qt. casserole, place 1/2 cup water.
Broccoli			
(fresh cut)	1 bunch (1¼ to 1½ lbs.)	7 to 10 min.	In 2-qt. casserole, place 1/2 cup water.
(fresh spears)	1 bunch (1¼ to 1½ lbs.)	9 to 13 min.	In 2-qt. oblong glass baking dish, place 1/4 cup water.
(frozen chopped)	10-oz package	5 to 7 min.	In 1-qt. casserole.
(frozen spears)	10-oz package	5 to 7 min.	In 1-qt. casserole, place 3 tablespoons water.
Cabbage			
(fresh)	1 medium head (about 2 lbs.)	8 to 11 min.	In 1½- or 2-qt. casserole, place 1/4 cup water.
(wedges)		7 to 10 min.	In 2- or 3-qt. casserole, place 1/4 cup water.
Carrots			
(fresh, sliced)	1 lb.	7 to 9 min.	In 1½-qt. casserole, place 1/4 cup water.
(frozen)	10-oz package	5 to 7 min.	In 1-qt. casserole, place 2 tablespoons water.
Cauliflower			
(flowerets)	1 medium head	9 to 14 min.	In 2-qt. casserole, place 1/2 cup water.
(fresh, whole)	1 medium head	10 to 17 min.	In 2-qt. casserole, place 1/2 cup water.
(frozen)	10-oz package	5 to 7 min.	In 1-qt. casserole, place 2 tablespoons water.

ROA_01384

About the time features.

	Amount	Time	Comments
Corn			
(frozen kernel)	10-oz package	5 to 7 min.	In 1-qt. casserole, place 2 tablespoons water.
Corn on the cob			
(fresh)	1 to 5 ears	3 to 4 min. per ear	In 2-qt. oblong glass baking dish, place corn. If corn is in husk, use no water; if corn has been husked, add 1/4 cup water. Rearrange after half of time.
(frozen)	1 ear	5 to 6 min.	Place in 2-qt. oblong glass baking dish.
	2 to 6 ears	3 to 4 min. per ear	Cover with vented plastic wrap. Rearrange after half of time.
Mixed vegetables			
(frozen)	10-oz package	5 to 7 min.	In 1-qt. casserole, place 3 tablespoons water.
Peas			
(fresh, shelled)	2 lbs. unshelled	9 to 12 min.	In 1-qt. casserole, place 1/4 cup water.
(frozen)	10-oz package	5 to 7 min.	In 1-qt. casserole, place 2 tablespoons water.
Potatoes			
(fresh, cubed, white)	4 potatoes (6 to 8 oz each)	9 to 12 min.	Peel and cut into 1 inch cubes. Place in 2-qt. casserole with 1/2 cup water. Stir after half of time.
(fresh, whole, sweet or white)	1 (6 to 8 oz)	3 to 4 min.	Pierce with cooking fork. Place in center of the oven. Let stand 5 minutes.
Spinach			
(fresh)	10 to 16 oz	5 to 7 min.	In 2-qt. casserole, place washed spinach.
(frozen chopped and leaf)	10-oz package	5 to 7 min.	In 1-qt. casserole, place 3 tablespoons water.
Squash			
(fresh, summer and yellow)	1 lb. sliced	5 to 7 min.	In 1½-qt. casserole, place 1/4 cup water.
(winter, acorn, butternut)	1 to 2 squash (about 1 lb. each)	8 to 11 min.	Cut in half and remove fibrous membranes. In 2-qt. oblong glass baking dish, place squash cut-side-down. Turn cut-side-up after 4 minutes.

ROA_01385



- Press ***AUTO/TIME DEFROST*** twice.
- Enter defrosting time.
- Press ***START.***

Time Defrost

Allows you to defrost for the length of time you select. See the Defrosting Guide for suggested times.

Power level 3 is automatically set, but you may change this for more flexibility. You may defrost small items more quickly by raising the power level after entering the time. However, they will need more frequent attention than usual.

Power level 7 cuts the total defrosting time in about half; power level 10 cuts the total time to approximately 1/3. Rotate or stir food frequently.

A dull thumping noise may be heard during defrosting. This sound is normal when the oven is not operating at High power.

Defrosting Tips

- Foods frozen in paper or plastic can be defrosted in the package. Tightly closed packages should be slit, pierced or vented AFTER food has partially defrosted. Plastic storage containers should be at least partially uncovered.
- Family-size, prepackaged frozen dinners can be defrosted and microwaved. If the food is in a foil container, transfer it to a microwave-safe dish.
- Foods that spoil easily, such as milk, eggs, fish, stuffings, poultry and pork should not be allowed to sit out for more than one hour after defrosting. Room temperature promotes the growth of harmful bacteria.
- For more even defrosting of larger foods, such as beef, lamb and veal roasts, use ***Auto Defrost.***
- Be sure large meats are completely defrosted before cooking.
- When defrosted, food should be cool but softened in all areas. If still slightly icy, return to the microwave very briefly, or let it stand a few minutes.

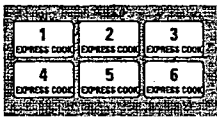
ROA_01386

About the time features.

Defrosting Guide

	Time	Comments
Breads, Cakes		
Bread, buns or rolls (1 piece)	1 min.	
Sweet rolls (approx. 12 oz.)	3 to 5 min.	
Fish and Seafood		
Fillets, frozen (1 lb.)	6 to 8 min.	
Shellfish, small pieces (1 lb.)	5 to 7 min.	Place block in casserole. Turn over and break up after half the time.
Fruit		
Plastic pouch – Two 12 oz. packages	3 to 6 min.	
Meat		
Bacon (1 lb.)	2 to 5 min.	Place unopened package in oven. Let stand 5 minutes after defrosting.
Franks (1 lb.)	2 to 5 min.	Place unopened package in oven. Microwave just until franks can be separated. Let stand 5 minutes, if necessary, to complete defrosting.
Ground meat (1 lb.)	5 to 7 min.	Turn meat over after half the time.
Roast: beef, lamb, veal, pork	12 to 16 min. per lb.	Use power level 1.
Steaks, chops and cutlets	5 to 7 min. per lb.	Place unwrapped meat in cooking dish. Turn over after half the time and shield warm areas with foil. When finished, separate pieces and let stand to complete defrosting.
Poultry		
Chicken, broiler-fryer – cut up (2½ to 3 lbs.)	15 to 19 min.	Place wrapped chicken in dish. Unwrap and turn over after half the time. When finished, separate pieces and microwave 2 to 4 minutes more, if necessary. Let stand to finish defrosting.
Chicken, whole (2½ to 3 lbs.)	17 to 21 min.	Place wrapped chicken in dish. After half the time, unwrap and turn chicken over. Shield warm areas with foil. Finish defrosting. If necessary, run cold water in the cavity until giblets can be removed.
Cornish hen	7 to 13 min. per lb.	Place unwrapped hen in the oven breast-side-up. Turn over after half the time. Run cool water in the cavity until giblets can be removed.
Turkey breast (4 to 6 lbs.)	5 to 9 min. per lb.	Place unwrapped breast in dish breast-side-down. After half the time, turn over and shield warm areas with foil. Finish defrosting. Let stand 1 to 2 hours in refrigerator to complete defrosting.

ROA_01387



Express Cook

This is a quick way to set cooking time for 1–6 minutes.

Press one of the ***Express Cook*** pads (from 1 to 6) for 1 to 6 minutes of cooking at ***power level 10.*** For example, press the ***2*** pad for 2 minutes of cooking time.

The power level can be changed as time is counting down. Press ***POWER LEVEL*** and enter 1–10.

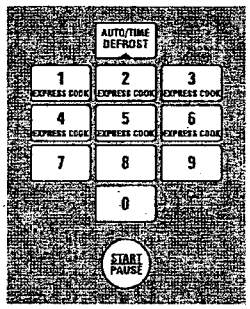
Add 30 Seconds

You can use this feature two ways:

- It will add 30 seconds to the time counting down each time the pad is pressed.
- It can be used as a quick way to set 30 seconds of cooking time.

ROA_01388

About the auto features.



Auto Defrost

Auto Defrost automatically sets the defrosting times and power levels to give even defrosting results for meats, poultry and fish weighing up to six pounds.

- Twice during ***Auto Defrost***, the oven signals ***Turn Food Over.*** At each signal, turn the food over. Remove defrosted meat or shield warm areas with small pieces of foil.
- After defrosting, most meats need to stand 5 minutes to complete defrosting. Large roasts should stand for about 30 minutes.

- Press ***AUTO/TIME DEFROST*** once for ***Auto Defrost.***
- Using the Conversion Guide at right, enter food weight. For example, press pads 1 and 2 for 1.2 pounds (1 pound, 3 ounces). Enter weight up to 6 pounds for ***Auto Defrost.***
- Press ***START.***

Conversion Guide

If the weight of food is stated in pounds and ounces, the ounces must be converted to tenths (.1) of a pound.

Weight of Food in Ounces	Enter Food Weight (tenths of a pound)	Weight of Food in Ounces	Enter Food Weight (tenths of a pound)
1–2	1	9–10	6
3–4	2	11	7
4–5	3	12–13	8
6–7	4	14–15	9
8	5	16	10

1 lb. Quick Defrost

1 lb. Quick Defrost automatically sets the defrosting times and power levels for foods weighing one pound.

Press ***1 lb. Quick Defrost.*** The oven starts automatically. When the oven signals, turn food over.

Melt *(on some models)*

A convenient way to melt frequently used food items.

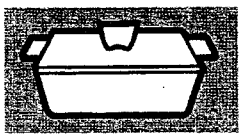
- Press ***MELT.***
- Enter number for food type.
- Press ***START.***

Food Type	Quantity	Enter
Butter	2, 4 or 8 oz	1
Chocolate Chips	2–16 oz	2
Marshmallow	2–16 oz	3
Caramel	2–16 oz	4
Cheese	2–32 oz	5

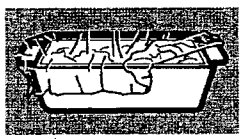
ROA_01389

About the sensor features.

ge.com



Covered



Vented

Dry off dishes so they don't mislead the sensor.

Humidity Sensor

What happens when using the Sensor Features:

The Sensor Features detect the increasing humidity released during cooking. The oven automatically adjusts the cooking time to various types and amounts of food.

Do not use the Sensor Features twice in succession on the same food portion—it may result in severely overcooked or burnt food. If food is undercooked after the countdown, use ***Time Cook*** for additional cooking time.

The proper containers and covers are essential for best sensor cooking.

Always use microwave-safe containers and cover them with lids or vented plastic wrap. Never use tight sealing plastic containers—they can prevent steam from escaping and cause food to overcook.

Be sure the outside of the cooking containers and the inside of the microwave oven are dry before placing food in the oven. Beads of moisture turning into steam can mislead the sensor.

Beverage

Press ***BEVERAGE*** once to heat an 8–10 oz cup of coffee or other beverage.

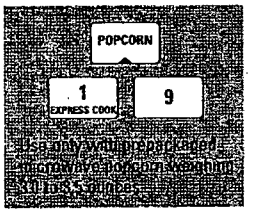
Drinks heated with the Beverage feature may be very hot. Remove the container with care.

If food is undercooked after the countdown use ***Time Cook*** for additional cooking time.

NOTE: *Do not use this feature twice in succession on the same food portion—it may result in severely overcooked or burnt food.*

ROA_01390

About the sensor features.



NOTE: *Do not use the metal shelf when using the* ***Popcorn*** *feature.*

NOTE: *Do not use this feature twice in succession on the same food portion—it may result in severely overcooked or burnt food.*

Popcorn

How to Use the Popcorn Feature

- Follow package instructions, using ***Time Cook*** if the package is less than 3.0 ounces or larger than 3.5 ounces. Place the package of popcorn in the center of the microwave.
- Press ***POPCORN*** for a regular size (3.0 to 3.5 oz) bag of popcorn. The oven starts immediately.

If you open the door while ***POPCORN*** is displayed, an error message will appear. Close the door and press ***START***.

If food is undercooked after the countdown use ***Time Cook*** for additional cooking time.

How to Adjust the Popcorn Program to Provide a Shorter or Longer Cook Time

If you find that the brand of popcorn you use underpops or overcooks consistently, you can add or subtract 20–30 seconds to the automatic popping time.

To add time:

After pressing ***POPCORN***, press ***9*** within the first 30 seconds after the oven starts for an extra 20 seconds.

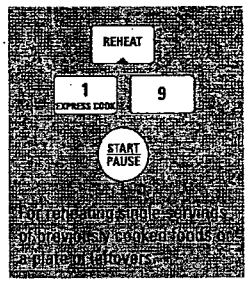
Press ***9*** again to add another 10 seconds (total 30 seconds additional time).

To subtract time:

After pressing ***POPCORN***, press ***1*** within the first 30 seconds after the oven starts for 20 seconds less cooking time.

Press ***1*** again to reduce cooking time another 10 seconds (total 30 seconds less time).

ROA_01391



Reheat

How to Use the Reheat feature:

- Place the cup of liquid or covered food in the oven. Press ***REHEAT*** once, twice or three times.
  The oven starts immediately.
  Press once for a plate of leftovers.
  Press twice for pasta (8–12 oz).
  Press three times for vegetables (1/2 to 2 cups).
- The oven signals when steam is sensed and the time remaining begins counting down.

*NOTE: Do not use the metal shelf when using the **Reheat** feature.*

NOTE: Do not use this feature twice in succession on the same food portion—it may result in severely overcooked or burnt food.

Do not open the oven door until time is counting down. If the door is opened, close it and press ***START*** immediately.

After removing food from the oven, stir, if possible, to even out the temperature. Reheated foods may have wide variations in temperature. Some areas may be extremely hot.

If food is not hot enough after the countdown use ***Time Cook*** for additional reheating time.

How to Change the Automatic Settings:

To reduce time by 10%:
Press ***1*** within 30 seconds after pressing the ***REHEAT*** pad.

To add 10% to cooking time:
Press ***9*** within 30 seconds after pressing the ***REHEAT*** pad.

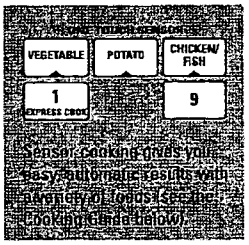
Some Foods Not Recommended For Use With Reheat:

It is best to use ***Time Cook*** for these foods:

- Bread products.
- Foods that must be reheated uncovered.
- Foods that need to be stirred or rotated.
- Foods calling for a dry look or crisp surface after reheating.

ROA_01392

About the sensor features.



NOTE: *Do not use the metal shelf with Sensor Cooking.*

NOTE: *Do not use this feature twice in succession on the same food portion—it may result in severely overcooked or burnt food.*

Sensor Cooking

(Fish and Chicken Pieces on some models)

1. Place covered food in the oven. Press the food pad. For vegetables, press the ***VEGETABLE*** pad once for fresh vegetables, twice for frozen vegetables or three times for canned vegetables. For chicken or fish, press the ***CHICKEN/FISH*** pad once for chicken pieces or twice for fish. The oven starts immediately.
2. The oven signals when steam is sensed and the time remaining begins counting down. Turn or stir the food if necessary.

Do not open the oven door until time is counting down. If the door is opened, close it and press ***START*** immediately.

If food is undercooked after the countdown use ***Time Cook*** for additional cooking time.

How to Change the Automatic Settings (automatic settings for canned vegetables cannot be adjusted on some models):

You can adjust the cooking time for all foods to suit your personal taste.

To reduce time by 10%:
Press ***1*** within 30 seconds after pressing the food pad.

To add 10% to cooking time:
Press ***9*** within 30 seconds after pressing the food pad.

Cooking Guide

	Amount	Comments
Canned Vegetables	4–16 oz	Cover with lid or vented plastic wrap.
Frozen Vegetables	4–16 oz	Follow package instructions for adding water. Cover with lid or vented plastic wrap.
Fresh Vegetables	4–16 oz	Add 1/4 cup water per serving. Cover with lid or vented plastic wrap.
Potatoes*	8–32 oz	Pierce skin with fork. Place potatoes on the turntable.
Fish*	4–16 oz	Cover with vented plastic wrap.
Chicken Pieces*	2–8 pieces	Cover with vented plastic wrap.

*On some models

ROA_01393

Other features your model may have.

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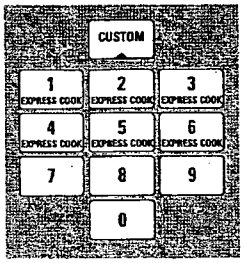


Custom

The ***CUSTOM*** pad allows you to save your most frequently used settings. (Sensor cooking settings cannot be saved.)

To set and save a setting:

- Press the ***CUSTOM*** pad.
- Set the amount of cooking time.
- Set the power level, if desired. (Full power will automatically be set if you do not change it.)
- Press the ***CUSTOM*** pad.

Your custom setting will be remembered for future one touch use.

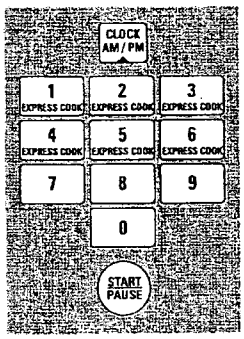
To clear the custom setting, press and hold the ***CUSTOM*** pad for 2 seconds.

Help

The ***HELP*** pad displays feature information and helpful hints. Press ***HELP***, then select a feature pad.

Cooking Complete Reminder

To remind you that you have food in the oven, the oven will display ***FOOD IS READY*** and beep once a minute until you either open the oven door or press ***CLEAR/OFF***.



Clock

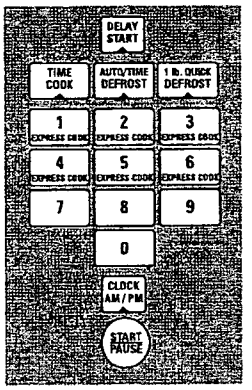
Press ***CLOCK*** to set the time of day.

- Press ***CLOCK***.
- Enter the time of day.
- Select AM or PM.
- Press ***START***.

To check the time of day while microwaving, press ***CLOCK***.

ROA_01394

Other features your model may have.



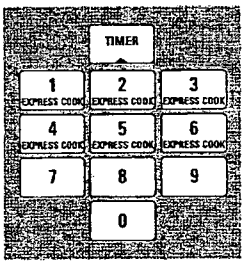
Delay Start

Delay Start allows you to set the microwave to delay cooking up to 24 hours.

- Press ***DELAY START.***
- Select the cooking or defrosting feature you wish to delay; then enter the cooking or defrosting time.
- Press ***START.***
- Enter the time you want the oven to start. (Be sure the microwave clock shows the correct time of day.)
- Select AM or PM.
- Press ***START.***

The start time will be displayed and will remain until the oven automatically starts at the delayed time.

The time of day may be displayed by pressing ***CLOCK.***



Timer

Timer operates as a minute timer and can be used at any time, even when the oven is operating.

- Press ***TIMER.***
- Enter time you want to count down.
- Press ***TIMER*** to start.

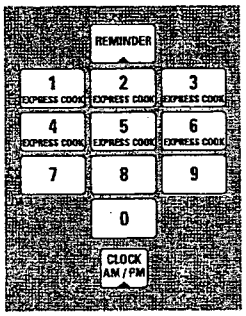
To pause the countdown, press ***TIMER.***

When time is up, the oven will signal. To turn off the timer signal, press ***TIMER.***

NOTE: The timer indicator will be lit while the timer is operating.

To cancel the timer, press and hold the ***TIMER*** pad for 2 seconds.

ROA_01395



Reminder

The ***Reminder*** feature can be used like an alarm clock, and can be used at any time, even when the oven is operating. The ***Reminder*** time can be set up to 24 hours later.

- Press ***REMINDER.***
- Enter the time you want the oven to remind you. (Be sure the microwave clock shows the correct time of day.)
- Select AM or PM.
- Press ***REMINDER.*** When ***Reminder*** signal occurs, press ***REMINDER*** to turn it off. The ***Reminder*** time may be displayed by pressing ***REMINDER.***

NOTE: *The* ***REM*** *indicator will remain lit to show that the* ***Reminder*** *is set. To clear the* ***Reminder*** *before it occurs, press and hold the* ***REMINDER*** *pad for 2 seconds.*

Start/Pause

In addition to starting many functions, ***START/PAUSE*** allows you to stop cooking without opening the door or clearing the display.

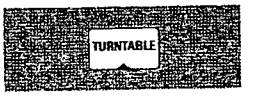
Child Lock-Out

You may lock the control panel to prevent the microwave from being accidentally started or used by children.

To lock or unlock the controls, press and hold ***CLEAR/OFF*** for about three seconds. When the control panel is locked, ***CONTROL LOCKED*** or ***LOCKED*** will be displayed.

ROA_01396

Other features your model may have.



Turntable

For best cooking results, leave the turntable on. It can be turned off for large dishes. Press ***TURNTABLE*** to turn the turntable on or off.

Sometimes the turntable can become too hot to touch. Be careful touching the turntable during and after cooking.

Vent Fan

The vent fan removes steam and other vapors from surface cooking.

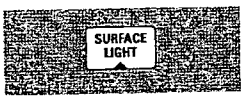
Press ***VENT FAN*** once for high fan speed, twice for medium fan speed, a third time for low fan speed or a fourth time to turn the fan off.

Press the ***VENT FAN BOOST*** pad (on some models) for extra fan speed.

Automatic Fan

An automatic fan feature protects the microwave from too much heat rising from the cooktop below it. It automatically turns on if it senses too much heat.

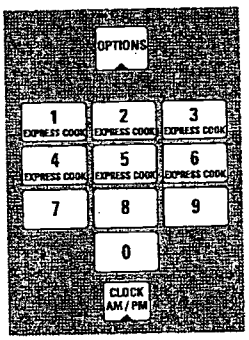
If you have turned the fan on, you may find that you cannot turn it off. The fan will automatically turn off when the internal parts are cool. It may stay on for 30 minutes or more after the cooktop and microwave controls are turned off.



Surface Light

Press ***SURFACE LIGHT*** once for bright light, twice for the night light, or three times to turn the light off.

ROA_01397



Options

Press the ***OPTIONS*** pad multiple times to cycle through the available options.

Auto Nite Light

The ***Auto Nite Light*** can be set to come on and go off at desired times.

To set the timer:

- Press ***1.***
- Enter the time of day for the light to come on.
- Select AM or PM.
- Press the ***OPTIONS*** pad.
- Enter the time of day for the light to go off.
- Select AM or PM.
- Press the ***OPTIONS*** pad.

To review the nite light settings, press ***2*** after selecting the ***Auto Nite Light*** option.

To turn the nite light off, press ***0*** after selecting the ***Auto Nite Light*** option.

Beeper Volume

The beeper sound level can be adjusted. Choose 0–3 for mute to loud.

Charcoal Filter Reminder

The ***Charcoal Filter Reminder*** is a 180-day timer to remind you when to change the charcoal filter. Press ***0*** to turn the reminder off. Press ***1*** to set the reminder. Press ***2*** to reset the reminder.

Display Language (on some models)

The language for the scrolling display may be set at either English or Spanish.

Press ***1*** for English or ***2*** for Spanish.

Display On/Off

You can choose to turn the clock display on or off. Press ***0*** to turn the display off. Press ***1*** to turn the display on.

Display Speed

The scroll speed of the display can be changed.

Select 1–5 for slowest to fastest scroll speed.

ROA_01398

Other features your model may have.

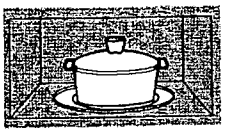
Shelf

Food microwaves best when placed on the turntable or on the shelf in the lower position.

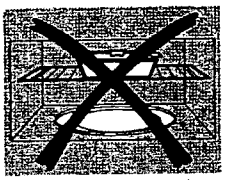
Only use the shelf when reheating on more than one level. Do not store the shelf inside the oven cavity.

How to Use the Shelf When Microwaving

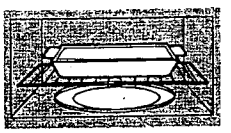
- Make sure the shelf is positioned properly inside the microwave to prevent damage to the oven from arcing.
- Do not use a microwave browning dish on the shelf. The shelf could overheat.
- Do not use the oven with the shelf on the microwave floor. This could damage the microwave.
- Use pot holders when handling the shelf—it may be hot.
- Do not use the shelf when cooking popcorn.
- Do not use the shelf with Sensor Cooking or ***Reheat***.

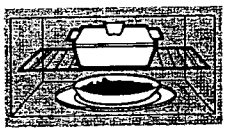


For best results



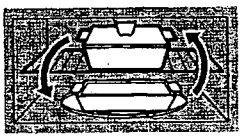
Uneven results



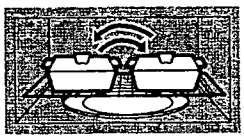


2-level reheating

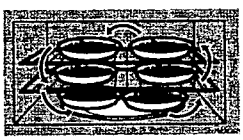
ROA_01399



Switch places after 1/2 time



Switch places after 1/2 time



Switch places twice

Shelf and Reheating

■ ***To reheat on 2 levels***

OR

■ ***To reheat 2 dishes on the lower level:***

- Multiply reheat time by 1½.
- Switch places after 1/2 the time.

■ ***To reheat on 3 levels*** *(on some models):*

- Turn the turntable off.
- Double the reheating time.
- Switch places twice and give the dishes a 1/2 turn during reheating. (Place dense foods, or those that require a longer cook time, on the upper shelf first.)

Microwave terms.

	Definition
Arcing	Arcing is the microwave term for sparks in the oven. Arcing is caused by: ■ the metal shelf being installed incorrectly and touching the microwave walls. ■ metal or foil touching the side of the oven. ■ foil that is not molded to food (upturned edges act like antennas). ■ metal such as twist-ties, poultry pins, gold-rimmed dishes. ■ recycled paper towels containing small metal pieces.
Covering	Covers hold in moisture, allow for more even heating and reduce cooking time. Venting plastic wrap or covering with wax paper allows excess steam to escape.
Shielding	In a regular oven, you shield chicken breasts or baked foods to prevent over-browning. When microwaving, you use small strips of foil to shield thin parts, such as the tips of wings and legs on poultry, which would cook before larger parts.
Standing time	When you cook with regular ovens, foods such as roasts or cakes are allowed to stand to finish cooking or to set. Standing time is especially important in microwave cooking. Note that a microwaved cake is not placed on a cooling rack.
Venting	After covering a dish with plastic wrap, you vent the plastic wrap by turning back one corner so excess steam can escape.

ROA_01401

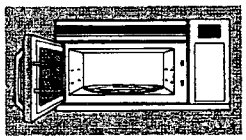
Care and cleaning of the microwave oven.

ge.com

Helpful Hints

An occasional thorough wiping with a solution of baking soda and water keeps the inside fresh.

NOTE: Be certain the power is off before cleaning any part of this oven.



How to Clean the Inside

Walls, Floor, Inside Window, Metal and Plastic Parts on the Door

Some spatters can be removed with a paper towel; others may require a damp cloth. Remove greasy spatters with a sudsy cloth; then rinse with a damp cloth. Do not use abrasive cleaners or sharp utensils on oven walls.

Never use a commercial oven cleaner on any part of your microwave.

Removable Turntable and Turntable Support

To prevent breakage, do not place the turntable into water just after cooking. Wash it carefully in warm, sudsy water or in the dishwasher. The turntable and support can be broken if dropped. Remember, do not operate the oven without the turntable and support in place.

Shelf

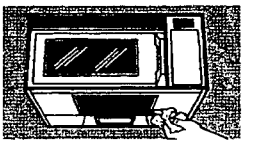
Clean with mild soap and water or in the dishwasher.

Do not clean in a self-cleaning oven.

Temperature Probe *(on some models)*

Clean immediately after using. To clean, wipe with a sudsy cloth, then rub lightly with a plastic scouring ball if necessary. Rinse and dry. The probe can also be washed in the dishwasher.

Care and cleaning of the microwave oven.



How to Clean the Outside

We recommend against using cleaners with ammonia or alcohol, as they can damage the appearance of the microwave oven. If you choose to use a common household cleaner, first apply the cleaner directly to a clean cloth, then wipe the soiled area.

Case

Clean the outside of the microwave with a sudsy cloth. Rinse and then dry. Wipe the window clean with a damp cloth.

Control Panel

Wipe with a damp cloth. Dry thoroughly. Do not use cleaning sprays, large amounts of soap and water, abrasives or sharp objects on the panel—they can damage it. Some paper towels can also scratch the control panel.

Door Panel

Before cleaning the front door panel, make sure you know what type of panel you have. Refer to the eighth digit of the model number (eleventh digit on models JVM1850, JNM1851 and DVM1850). "S" is stainless steel, "G" is Graphite, "L" is CleanSteel and "B", "W" or "C" are plastic colors.

Stainless Steel

The stainless steel panel can be cleaned with Stainless Steel Magic or a similar product using a clean, soft cloth. Apply stainless cleaner carefully to avoid the surrounding plastic parts. Do not use appliance wax, polish, bleach or products containing chlorine on Stainless Steel finishes.

CleanSteel, Graphite

Use a clean, soft, light and lightly dampened cloth, then dry thoroughly. Do not use appliance wax, polish, bleach or products containing any chemical agent on the CleanSteel surfaces.

Plastic Color Panels

Use a clean, soft, lightly dampened cloth, then dry thoroughly.

Door Seal

It's important to keep the area clean where the door seals against the microwave. Use only mild, non-abrasive detergents applied with a clean sponge or soft cloth. Rinse well.

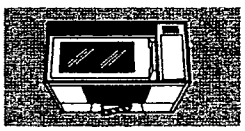
Bottom

Clean off the grease and dust on the bottom often. Use a solution of warm water and detergent.

ROA_01403

Replacing the light bulbs.

ge.com



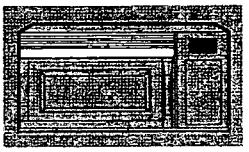
Cooktop Light/Night Light

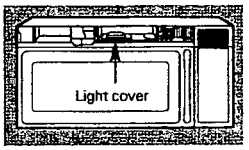
On models JVM1850, JNM1851, DVM1850 and EMO4000, replace the burned-out bulb with a 120 volt, 40-watt incandescent bulb (WB36X10003), available from your GE supplier.

On models JVM1870, JVM1871, JVM2050 and JVM3670, replace the burned-out bulb with a 120 volt, 20-watt halogen bulb (WB36X10213), available from your GE supplier.

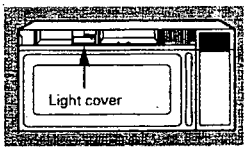
- To replace the bulb(s), first disconnect the power at the main fuse or circuit breaker panel or pull the plug.
- Remove the screw at the left edge of the light cover and push on the right edge of the cover to open.
- Be sure the bulb(s) to be replaced are cool before removing. After breaking the adhesive seal, remove the bulb by either gently turning (for models JVM1850, JNM1851, DVM1850 and EMO4000) or pulling straight out (for models JVM1870, JVM1871, JVM2050 and JVM3670). Replace with the same size and type bulb.
- Raise the light shield and replace the screw. Connect electrical power to the oven.

Replacing the light bulbs.





On some models



On some models

Oven Light

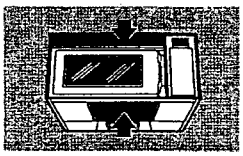
Replace the burned-out bulb with a 120 volt, 20-watt halogen bulb (WB36X10213), available from your GE supplier.

- To replace the oven light, first disconnect the power at the main fuse or circuit breaker panel or pull the plug.
- Remove the top grille by taking out the screws on top of the grille that hold it in place and sliding the grille to the left (opening the door makes grille removal easier).
- Next, remove the light cover.

  On some models, the light cover is located in the center of the top opening. Remove the screw that secures the light cover and lift the cover off.

  On some models, the light cover is located at the left of the top opening. Lift the cover off.
- Pinch the clips that hold the light socket in place and lift the socket out.
- Remove the bulb from the light socket by pulling straight out. Replace with the same size and type bulb, then replace the light socket and cover.
- Replace the grille and screws. Connect electrical power to the oven.

About the exhaust feature.



The Vent Fan

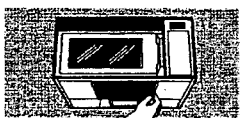
The vent fan has a metal reusable grease filter.

Models that recirculate air back into the room also use a charcoal filter.

Reusable Grease Filter

The reusable grease filter traps grease released by foods on the cooktop. It also prevents flames from foods on the cooktop from damaging the inside of the microwave.

For this reason, the filter must ALWAYS be in place when the hood is used. The grease filter should be cleaned once a month, or as needed.



Removing and Cleaning the Filter

To remove, slide it to the side using the tab. Pull it down and out.

To clean the grease filter, soak it and then swish it around in hot water and detergent. Don't use ammonia or ammonia products because it will darken the metal. Light brushing can be used to remove embedded dirt.

Rinse, shake and let it dry before replacing.

To replace, slide the filter in the frame slot at the side of the opening. Pull up and in to lock into place.

About the exhaust feature.

Charcoal Filter *(on some models)*

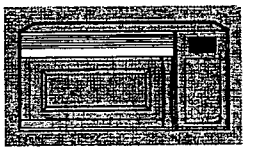
The charcoal filter cannot be cleaned. It must be replaced.

For JVM1800 and JVM3600 Series models, order Part No. WB2X10733 from your GE supplier.

For JVM2000 Series models, order Part No. WB2X10956 from your GE supplier.

If the model is not vented to the outside, the air will be recirculated through a disposable charcoal filter that helps remove smoke and odors.

The charcoal filter should be replaced when it is noticeably dirty or discolored (usually after 6 to 12 months, depending on hood usage). See "Optional Kits", page 10, for more information.

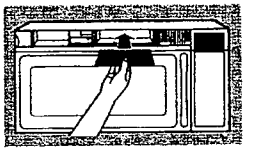


Remove grille screws to remove the grille.

To Remove Charcoal Filter

To remove the charcoal filter, disconnect power at the main fuse or circuit breaker panel or pull the plug.

Remove the top grille by removing the screws on top of the grille that hold it in place and sliding the grille to the left (opening the door makes grille removal easier). Slide the filter towards the front of the oven and remove it.



To Install Charcoal Filter

To install a new filter, remove plastic and other outer wrapping from the new filter.

Insert the filter into the top opening of the oven as shown. It will rest at an angle on 2 side support tabs and in front of the right rear tab. Replace the grille and screws.

ROA_01407

Before you call for service...

ge.com

Troubleshooting Tips
Save time and money! Review the charts on the following pages first and you may not need to call for service.

	Possible Causes	What To Do
Oven will not start.	A fuse in your home may be blown or the circuit breaker tripped.	• Replace fuse or reset circuit breaker.
	Power surge.	• Unplug the microwave oven; then plug it back in.
	Plug not fully inserted into wall outlet.	• Make sure the 3-prong plug on the oven is fully inserted into wall outlet.
	Door is not closed.	• Open and close the door securely.
Floor of the oven is warm.	Heat from the cooktop light may make the oven floor get warm.	• This is normal.
"CONTROL LOCKED" or "LOCKED" appears on the display.	The control has been locked.	• Press and hold ***CLEAR/OFF*** for about 3 seconds to unlock the control.
"SENSOR ERROR" appears on the display.	When using a Sensor feature, the door was opened before steam could be detected.	• Do not open door until steam is sensed and time is shown counting down on the display.
	Steam was not detected in maximum amount of time.	• Use ***Time Cook*** to heat for more time.
You hear an unusual low-tone beep.	You have tried to start the Reminder without a valid time of day.	• Start over and enter a valid time of day.
	You have tried to start the Auto Nite Light without a valid time of day entered for the on-time and off-time.	• Start over and enter a valid time of day.
	You have tried to change the power level when it is not allowed.	• Many of the oven's features are preset and cannot be changed.
Food amount too large for Sensor Reheat.	Sensor Reheat is for single servings of recommended foods.	• Use ***Time Cook*** for large amounts of food.

Before you call for service...

Things That Are Normal With Your Microwave Oven

- Moisture on the oven door and walls while cooking. Wipe the moisture off with a paper towel or soft cloth.
- Moisture between the oven door panels when cooking certain foods. Moisture should dissipate shortly after cooking is finished.
- Steam or vapor escaping from around the door.
- Light reflection around door or outer case.
- Dimming oven light and change in the blower sound at power levels other than high.
- Dull thumping sound while oven is operating.
- TV/radio interference might be noticed while using the microwave. Similar to the interference caused by other small appliances, it does not indicate a problem with the microwave. Plug the microwave into a different electrical circuit, move the radio or TV as far away from the microwave as possible, or check the position and signal of the TV/radio antenna.
- The Active Vent door (on some models) will open during operation, and remain open while the microwave is running, to keep the electronics cool. It is also normal to hear a clicking noise as the vent door opens and closes.

ROA_01409

GE Service Protection Plus™

GE, a name recognized worldwide for quality and dependability, offers you Service Protection Plus™—comprehensive protection on all your appliances—**No Matter What Brand!**

Benefits Include:
- **Backed by GE**
- **All brands covered**
- **Unlimited service calls**
- **All parts and labor costs included**
- **No out-of-pocket expenses**
- **No hidden deductibles**
- **One 800 number to call**

We'll Cover Any Appliance. Anywhere. Anytime.*

You will be completely satisfied with our service protection or you may request your money back on the remaining value of your contract. No questions asked. It's that simple.

Protect your refrigerator, dishwasher, washer and dryer, range, TV, VCR and much more—**any brand!** Plus there's no extra charge for emergency service and low monthly financing is available. Even icemaker coverage and food spoilage protection is offered. You can rest easy, knowing that all your valuable household products are protected against expensive repairs.

Place your confidence in GE and call us in the U.S. toll-free at **800.626.2224** for more information.

*All brands covered, up to 20 years old, in the continental U.S.

Cut here

Please place in envelope and mail to:

General Electric Company
Warranty Registration Department
P.O. Box 32150
Louisville, KY 40232-2150

ROA_01410

Consumer Product Ownership Registration

Dear Customer:
Thank you for purchasing our product and thank you for placing your confidence in us.
We are proud to have you as a customer!

Follow these three steps to protect your new appliance investment:

1 **Complete and mail your Consumer Product Ownership Registration today.** Have the peace of mind of knowing we can contact you in the unlikely event of a safety modification.

2 After mailing the registration below, store this document in a safe place. It contains information you will need should you require service. Our service number is 800.GE.CARES (800.432.2737).

3 Read your Owner's Manual carefully. It will help you operate your new appliance properly.

Model Number _____ **Serial Number** _____

Important: If you did not get a registration card with your product, detach and return the form below to ensure that your product is registered, or register online at ge.com.

Cut here

Consumer Product Ownership Registration

Important Mail Today!

Model Number _____ **Serial Number** _____

Mr. ☐ Ms. ☐ Mrs. ☐ Miss ☐

First Name _____ Last Name _____

Street Address _____

Apt. # _____ E-mail Address* _____

City _____ State _____ Zip Code _____

Date Placed In Use
Month _____ Day _____ Year _____

Phone Number _____-_____-_____

GE Consumer & Industrial
Appliances
General Electric Company
Louisville, KY 40225
ge.com

* Please provide your e-mail address to receive, via e-mail, discounts, special offers and other important communications from GE Appliances (GEA).
☐ Check here if you do not want to receive communications from GEA's carefully selected partners.

GE Microwave Oven Warranty.

All warranty service provided by our Factory Service Centers, or an authorized Customer Care® technician. To schedule service, on-line, 24 hours a day, visit us at ge.com, or call 800.GE.CARES (800.432.2737). Please have serial and model numbers available when calling for service.

Staple your receipt here. Proof of the original purchase date is needed to obtain service under the warranty.

GE Will Replace:

For GE and GE Profile Models:

One Year From the date of the original purchase

Any part of the microwave oven which fails due to a defect in materials or workmanship. During this ***limited one-year warranty,*** GE will also provide, ***free of charge,*** all labor and related service to replace the defective part.

For GE Profile Models ONLY:

Five Years From the date of original purchase

The magnetron tube, if the magnetron tube fails due to a defect in materials or workmanship. During this ***five-year limited warranty,*** you will be responsible for any labor or in-home service costs.

What is Not Covered:

- Service trips to your home to teach you how to use the product.
- Improper installation, delivery or maintenance.
- Product not accessible to provide required service.
- Failure of the product or damage to the product if it is abused, misused (for example, cavity arcing from wire rack or metal/foil), or used for other than the intended purpose or used commercially.
- Replacement of house fuses or resetting of circuit breakers.
- Damage to the product caused by accident, fire, floods or acts of God.
- Incidental or consequential damage caused by possible defects with this appliance.
- Damage caused after delivery.

EXCLUSION OF IMPLIED WARRANTIES—Your sole and exclusive remedy is product repair as provided in this Limited Warranty. Any implied warranties, including the implied warranties of merchantability or fitness for a particular purpose, are limited to one year or the shortest period allowed by law.

This warranty is extended to the original purchaser and any succeeding owner for products purchased for home use within the USA. If the product is located in an area where service by a GE Authorized Servicer is not available, you may be responsible for a trip charge or you may be required to bring the product to an Authorized GE Service Location for service. In Alaska, the warranty excludes the service calls to your home.

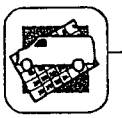
Some states do not allow the exclusion or limitation of incidental or consequential damages. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state. To know what your legal rights are, consult your local or state consumer affairs office or your state's Attorney General.

Warrantor: General Electric Company. Louisville, KY 40225

Consumer Support.

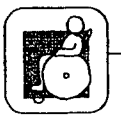
GE Appliances Website — ge.com

Have a question or need assistance with your appliance? Try the GE Appliances Website 24 hours a day, any day of the year! For greater convenience and faster service, you can now download Owner's Manuals, order parts or even schedule service on-line.



Schedule Service — ge.com

Expert GE repair service is only one step away from your door. Get on-line and schedule your service at your convenience 24 hours any day of the year! Or call 800.GE.CARES (800.432.2737) during normal business hours.

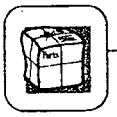


Real Life Design Studio — ge.com

GE supports the Universal Design concept—products, services and environments that can be used by people of all ages, sizes and capabilities. We recognize the need to design for a wide range of physical and mental abilities and impairments. For details of GE's Universal Design applications, including kitchen design ideas for people with disabilities, check out our Website today. For the hearing impaired, please call 800.TDD.GEAC (800.833.4322).

Extended Warranties — ge.com

Purchase a GE extended warranty and learn about special discounts that are available while your warranty is still in effect. You can purchase it on-line anytime, or call 800.626.2224 during normal business hours. GE Consumer Home Services will still be there after your warranty expires.



Parts and Accessories — ge.com

Individuals qualified to service their own appliances can have parts or accessories sent directly to their homes (VISA, MasterCard and Discover cards are accepted). Order on-line today, 24 hours every day or by phone at 800.626.2002 during normal business hours.

Instructions contained in this manual cover procedures to be performed by any user. Other servicing generally should be referred to qualified service personnel. Caution must be exercised, since improper servicing may cause unsafe operation.

Contact Us — ge.com

If you are not satisfied with the service you receive from GE, contact us on our Website with all the details including your phone number, or write to:

General Manager, Customer Relations
GE Appliances, Appliance Park
Louisville, KY 40225

Register Your Appliance — ge.com

Register your new appliance on-line—at your convenience! Timely product registration will allow for enhanced communication and prompt service under the terms of your warranty, should the need arise. You may also mail in the pre-printed registration card included in the packing material.

Printed in Malaysia

ROA_01413

DISPOSAL MANUAL

ROA_01414

ge.com

Disposall®

Food Waste Disposer

Safety Instructions
Connecting Electricity 2, 3
Safety Precautions 2

Installation Instructions
Attaching the
Discharge Elbow 6
Components and Installation
of Sink Flange 5
Connecting Disposer
to Sink Flange 7
Dimensions/Typical
Installations 8
Dishwasher Connection 6

Operating Instructions
Batch Feed Models 9
Care and Maintenance 10
Continuous Feed Models 9

Troubleshooting Tips
Before You Call for Service 11

Consumer Support
Warranty 12

Model Line Series
GFC320
GFC520
GFC530
GFC720
GFC1020
GFB760

Write the model and serial numbers for your disposall here:

Model # _____

Serial # _____

You can find them on a label on the bottom of the disposer.

165D4700P328 *49-55008* *12-05 JR*

OBH - O&M 277

ROA_01415

IMPORTANT SAFETY INSTRUCTIONS. READ ALL INSTRUCTIONS BEFORE USING.

INSTRUCTIONS PERTAINING TO A RISK OF FIRE, ELECTRIC SHOCK OR INJURY TO PERSONS

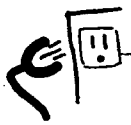
⚠ WARNING!

When using electrical appliances, basic safety precautions should be followed, including the following:

SAFETY PRECAUTIONS

- Use this appliance only for its intended purpose as described in this Owner's Manual.
- Read all the instructions before using the appliance.
- To reduce the risk of injury, close supervision is required when an appliance is used near children.
- Do not put fingers or hands into a waste disposer.
- Turn the power switch (normally a wall switch) to the off position before attempting to clear a jam or remove an object from the disposer.
- When attempting to loosen a jam in a waste disposer, use a long wooden object such as a wooden spoon or the wooden handle of a broom or mop.
- When attempting to remove objects from a waste disposer, only use long-handled, non-magnetic tools or utensils, since the disposer may be actuated magnetically.
- To reduce the risk of injury by materials that may be expelled by a waste disposer, do not put the following into a disposer:
  - a) Clam or oyster shells.
  - b) Caustic drain cleaners or similar products.
  - c) Glass, china or plastic.
  - d) Large whole bones.
  - e) Metal, such as bottle caps, tin cans, utensils or aluminum foil.
  - f) Hot grease or other hot liquids.
  - g) Whole corn husks.
- When not operating a disposer, leave the drain stopper in place to reduce the risk of objects falling into the disposer.
- ***For proper grounding instructions, see the ELECTRICAL CONNECTION portion of this manual.***

⚠ WARNING!



HOW TO CONNECT ELECTRICITY

If you are not familiar with electrical power and procedures, call a qualified electrician.

DANGER: *Improper connection of the equipment-grounding conductor can result in a risk of electric shock. Check with a qualified electrician or serviceman if you are in doubt as to whether the appliance is properly grounded. Do not modify the plug provided with the appliance if it will not fit the outlet; have a proper outlet installed by a qualified electrician.*

For Models Equipped with a Grounded Cord:

GROUNDING INSTRUCTIONS: This appliance must be grounded. In the event of a malfunction or breakdown, grounding provides a path of least resistance for electric current to reduce the risk of electric shock. This appliance is equipped with a cord having an equipment-grounding conductor and a grounding plug. The plug must be plugged into an appropriate outlet that is properly installed and grounded in accordance with all local codes and ordinances. Most houses have electrical outlets under the sink that are half-hot. This means one outlet is controlled by the wall switch, while the other is always hot. The batch-feed or "TC" model connects to the hot side, while the continuous feed model connects to the switch side.

⚠ WARNING!

HOW TO CONNECT ELECTRICITY (cont.)

If you are not familiar with electrical power and procedures, call a qualified electrician.

The power cord and/or connections must comply with the National Electrical Code, Section 422 and/or local codes and ordinances.

For Models Not Equipped with a Cord:

If your disposer does not come equipped with a cord, you can connect it in two ways:

1. Attach a power cord, minimum 18″ in length and not to exceed 36″ in length. GE Kit #PM3X115 provides the parts needed to make ***this connection.***

or

2. Wire the disposer directly into the house current. ***GE recommends that a qualified electrician make this connection.***

To Attach a Power Cord:

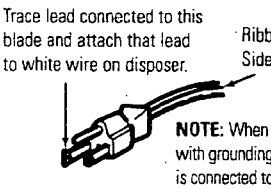
GROUNDING INSTRUCTIONS: This appliance must be grounded. In the event of malfunction or breakdown, grounding provides a path of least resistance for electric current to reduce the risk of electric shock. The power cord (to be installed) must have an equipment-grounding conductor and a grounding plug. The plug must be plugged into an appropriate outlet that is properly installed and grounded in accordance with all local codes and ordinances. In the absence of local codes and/or ordinances, the outlet must comply with NEC requirements.

DANGER: *Improper connection of the equipment-grounding conductor can result in a risk of electric shock. Check with a qualified electrician or serviceman if you are in doubt as to whether the appliance is properly grounded.*

NOTE: *Disconnect electric power to disposer circuit before installation. Turn the circuit breaker to the* ***OFF*** *position or remove the fuse.*

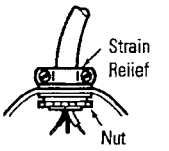
A. Connect the disposer to 110–120 Volt, 60 Hz AC current only.

B. If a plug-in cord is used, use a three-prong plug. Ground wire should be attached to the ground screw in the bottom of the disposer (end bell).



NOTE: When viewing face of electrical plug with grounding pin at top, the larger left blade is connected to the identified wire.

C. Use a cable clamp strain relief connector where power cord enters the disposer.



To Wire Your Disposer Directly into the House Current:

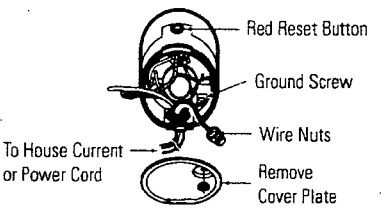
GE recommends that a qualified electrician make this connection.

GROUNDING INSTRUCTIONS: This appliance must be connected to a grounded, metal, permanent wiring system; or an equipment-grounding conductor must be run with the circuit conductors and connected to the equipment-grounding terminal or lead on the appliance.

DANGER: *Improper connection of the equipment-grounding conductor can result in a risk of electric shock. Check with a qualified electrician or serviceman if you are in doubt as to whether the appliance is properly grounded.*

A. If you use BX cable:
   1. Install the cable connector in the hole.
   2. Connect white wire to white lead of disposer.
   3. Connect black wire.
   4. Connect bare ground wire.

If BX cable is not used, provide a separate ground wire to the nearest grounded connection, using the screw in the end bell for the ground wire.



Bottom of the Disposer (end bell)

B. If your power supply does not include a ground wire, you must provide one unless metal cable is used. Attach a copper wire securely to disposer ground screw and attach other end of wire to the nearest grounded connection. Use only UL approved ground clamp. If plastic pipe is used in your home, a qualified electrician should install a proper ground. Most houses have electrical outlets under the sink that are half-hot. This means one outlet is controlled by the wall switch, while the other is always hot. The batch-feed or "TC" model connects to the hot side, while the continuous feed model connects to the switch side.

READ AND FOLLOW THIS SAFETY INFORMATION CAREFULLY.

SAVE THESE INSTRUCTIONS

Installation Instructions

Disposer

If you have questions, call 800.GE.CARES (800.432.2737) or Visit our Website at: ***ge.com***

BEFORE YOU BEGIN

Read these instructions completely and carefully.

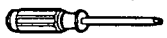
- **IMPORTANT** – Save these instructions for local inspector's use.
- **IMPORTANT** – Observe all governing codes and ordinances.
- **Note to Installer** – Be sure to leave these instructions with the Consumer.
- **Note to Consumer** – Keep these instructions for future reference.
- **Skill level** – Installation of this appliance requires basic mechanical skills.
- **Completion time** – 1 hour
- Proper installation is the responsibility of the installer.
- Product failure due to improper installation is not covered under the Warranty.

PREPARATION

1. Disconnect electrical power supply to disposer.
2. Remove old disposer or sink flange assembly.
3. Inspect drain line. If it is heavily coated with hardened grease and accumulations, rout out with a plumber's snake.
4. Remove old sealing materials and gasketing from sink opening, both top and bottom.

NOTE: Top and bottom of sink surfaces must be free of any materials to prevent leaks.

WHAT YOU WILL NEED



- **Phillips and flat blade screwdrivers**

- **Channel lock pliers, slip joint**

- **Hammer**

- **Nut driver**

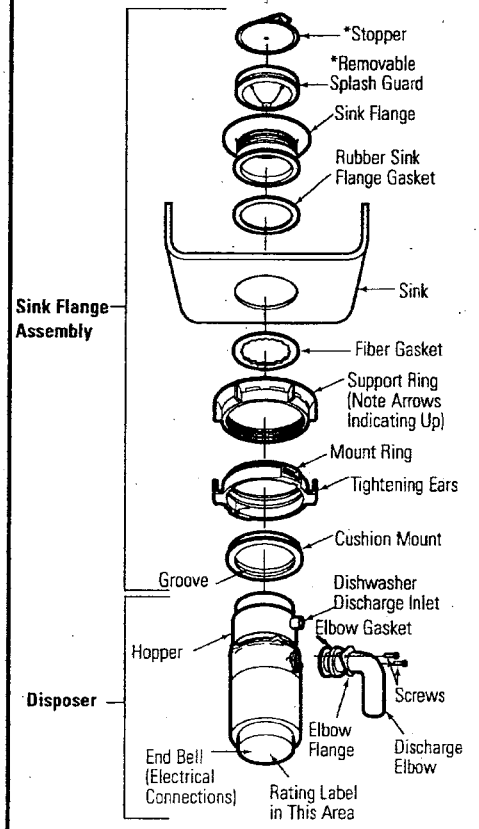
ADDITIONAL MATERIALS YOU MAY NEED

- **Steel punch or wooden dowel**
- **Petroleum jelly or liquid soap**
- **Hose clamp**
- **Dishwasher drain connector**
- **Adjustable pipe wrench**
- **Plumber's putty (for cast sinks)**
- **Stepped rubber drain adapter**
- **Wire nuts**
- **Cable connector**
- **Flexible drain pipe**
- **Power cord kit (Part Number PM3X215GDS)**

Installation Instructions

1 COMPONENTS AND INSTALLATION

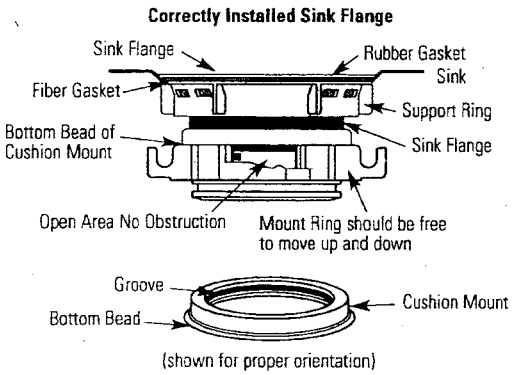
COMPONENTS



*Not used with batch feed model

INSTALLATION OF SINK FLANGE

(Read completely before starting.)



NOTE: Pay close attention to the order of the sink flange parts, as they have been correctly assembled by the factory.

A. Disassemble the sink flange assembly from the disposer by turning the mount ring to the left (clockwise) and removing it.

B. Raise the mount ring toward the top of the sink flange. Remove the cushion mount and the mount ring. You may want to practice installing the cushion mount at this point before you are under the sink.

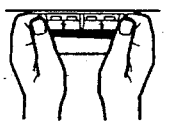
C. Unscrew the support ring from the sink flange and remove the fiber gasket. You are now left with the sink flange and the rubber gasket.

D. The rubber gasket is used instead of plumbers putty with stainless steel sinks.

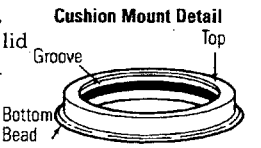
E. If no putty is used, insert the sink flange through the rubber gasket into the sink opening. Do not turn the flange once it is seated.

F. If you use putty instead of the gasket, form a ring around the underside of the sink flange. Insert the flange into the sink opening, press down hard to squeeze out excess putty. From under the sink, trim off excess putty flush with the bottom edge of the sink opening. Use putty sparingly on cast iron sinks.

G. From underneath the sink, slip the fiber gasket onto the exposed sink flange. With arrows pointing up, screw the support ring onto the sink flange and hand tighten until the sink flange will not move. At this point you may want to insert the stopper in the sink and fill with water to check the sink flange seal and insure there are no leaks.


Hand-tighten sink flange

H. Place the mount ring over the sink flange and hold in place while installing the cushion mount (large side down). Make sure the groove on the inside of the cushion mount fits over the lip on the sink flange, similar to putting the lid on a plastic container. Run your fingers around the entire cushion mount with slight pressure. Do not press too hard. When the cushion mount is properly seated, the mount ring can be pulled downward over the cushion mount and will be free to turn.

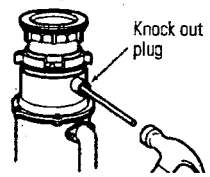


2 DISHWASHER CONNECTION (IF REQUIRED)

If you are connecting to a dishwasher, complete the following step. If a dishwasher is not to be connected, go on to "Attaching the Discharge Elbow" section.

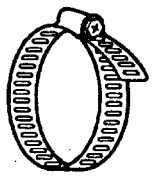
1 KNOCK OUT PLUG

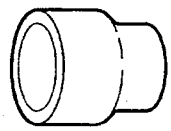
Using a blunt instrument (steel punch or wooden dowel), knock out entire plug. Do not use a screwdriver or sharp instrument. When knockout plug falls into disposer, you may remove it or simply grind it up when the disposer is used. This will not damage the disposer in any way, but may take some time to grind, over the course of several uses.



2 CONNECT HOSE

Connect the dishwasher hose using a hose clamp. If the hose size is different, you will need a stepped rubber adapter.

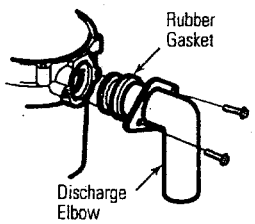

Hose Clamp

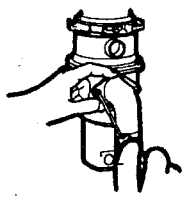

Stepped Rubber Adapter

3 ATTACHING THE DISCHARGE ELBOW

CONNECT DISCHARGE ELBOW

Connect the discharge elbow to the disposer.* Make sure all plumbing connections are tight.



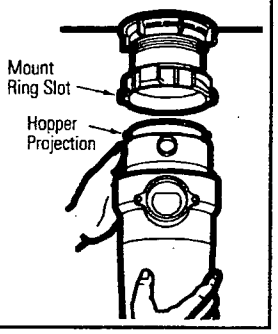


* Some installations (see page 8 for examples) may require the use of a flexible drain pipe.

4 CONNECTING DISPOSER TO SINK FLANGE

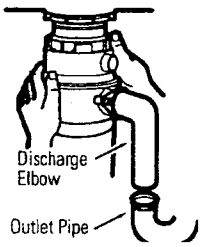
1 ATTACH TO SINK FLANGE

Line up the disposer under the sink flange. Guide the hopper projections into the mount ring slots. Turn the mount ring about 1/4" to the right so that the disposer is temporarily supported.



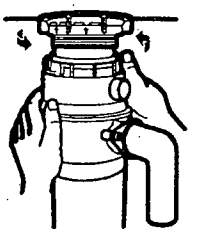
2 LINE UP WITH OUTLET PIPE

Turn the mount ring and the disposer until the disposer discharge elbow lines up with the outlet pipe (see page 8).

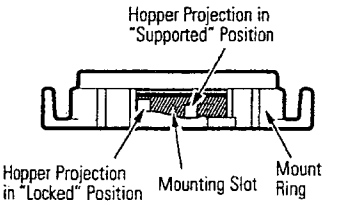


3 LOCK MOUNT RING

Turn the mount ring **slowly** to the right until it locks up tight. **Hopper projections must be to the extreme left of the mounting slots.** If the mount ring is hard to turn, you may add a small amount of petroleum jelly or liquid soap to the hopper projection. Run water and check for leaks.



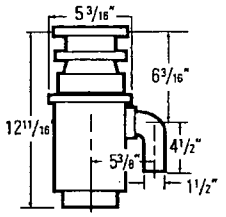
Locking Detail



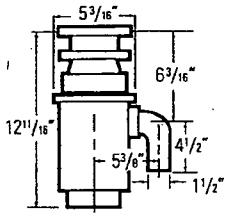
4 CHECK FOR LEAKS

Check the unit for leaks 24 hours after installation and first operation.

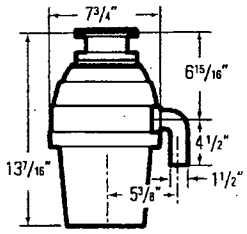
DIMENSIONS



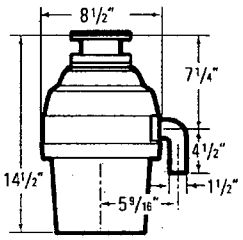
GFC320 Model Series



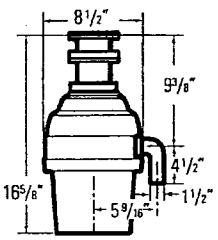
GFC520 Model Series



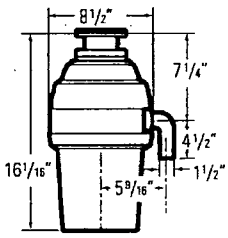
GFC530 Model Series



GFC720 Model Series



GFB760 Model Series
Batch Feed Operation



GFC1020 Model Series

SOME TYPICAL INSTALLATIONS

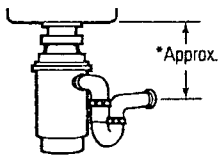
Direct replacement for most makes & models.

*9" for Model Series GFC320 and GFC520

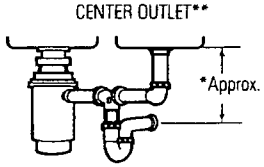
*10" for Model Series GFC530, GFC720 and GFC1020

*12" for Model Series GFB760

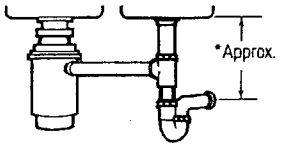
SINGLE BOWL



DOUBLE BOWL
CENTER OUTLET**



DOUBLE BOWL
END OUTLET**



NOTE: It is essential for the proper operation of the disposer that this dimension be 9"–12", depending upon the models listed above, to avoid standing water in disposer motor housing.

**Flexible drain pipe may be necessary for this application.

This disposer uses anti-jam swivel impellers that make a clicking sound as they swing into place. This indicates normal operation.

Continuous Feed Models

A. Remove the sink stopper and turn on a medium flow of cold water.

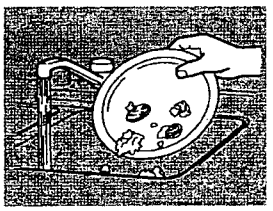
B. Turn the switch to ***ON***.

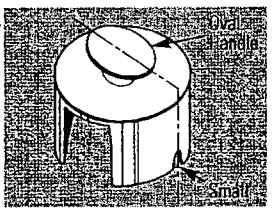
C. Scrape in food waste. To speed up food waste disposal, cut or break up large bones, rinds and cobs. Large bones and fibrous husks require considerable grinding time and are more easily thrown away with other trash. Do not be alarmed that the disposer slows down while grinding. The disposer is actually increasing torque (grinding power) and is operating under normal conditions.

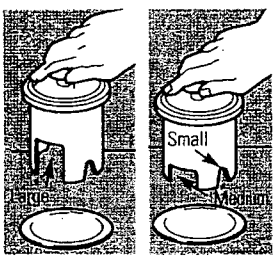
D. Before turning the disposer off, let the water and the disposer run for approximately 25 seconds after shredding stops. This assures that all waste is thoroughly flushed through the trap and drain.

E. Do not use hot water while running the disposer. Cold water will keep food waste and fats solid so they can be flushed down the drain.

Batch Feed Models







A. Remove the sink stopper and turn on a medium flow of cold water.

B. Scrape in food waste.

C. Insert the stopper to start the disposer. One of the two small slots in the stopper base must line up with the switch plunger inside the neck of the disposer.

NOTE: *The oval shaped handle aligns with the 2 small slots in the stopper.*

Push down firmly to start.

D. Run the disposer for 25 seconds after shredding stops. This assures that all waste is thoroughly flushed through the trap and drain.

Lift the stopper to shut the disposer off.

E. To fill the sink, insert the stopper so that the largest slot lines up with the switch plunger. The stopper can now be pushed down to seal the sink without starting the disposer. When the medium-sized slot in the stopper base is lined up with the switch plunger, water can drain, but tableware, etc., cannot be accidentally dropped into the disposer.

Operating instructions.

Helpful Hints

A. Be sure the disposer is empty before using the dishwasher so it can drain properly.

B. You may want to leave the stopper in the drain when not in use to prevent utensils and foreign objects from falling into the disposer.

C. The disposer is ruggedly built to give you years and years of trouble-free service. It will handle all normal food wastes—BUT it will not grind and dispose such items as tin cans, bottles and bottle caps, glass, china, leather, cloth, crockery, rubber, string, feathers, or clam or oyster shells. These are waste materials and belong in the trash can or trash compactor.

D. TO SPEED UP FOOD WASTE DISPOSAL...Cut or break up large bones, melon rinds, grapefruit skins and corn cobs. Items such as large bones, fibrous husks like lima bean pods and corn husks require considerable cutting time. For this reason, you may prefer to place them in the trash can or trash compactor.

Care and maintenance.

THE MOTOR IS PERMANENTLY LUBRICATED FOR LIFE. DO NOT ATTEMPT TO LUBRICATE YOUR DISPOSER. *The disposer is self cleaning and scours itself with each use.*

- ***NEVER*** put lye or chemical cleaners into the disposer, as they cause serious corrosion of metal parts.
- Your disposer, except for the Batch Feed model, is equipped with a removable splash guard for ease of cleaning or replacement. Remove the splash guard by pulling it out from the top. To replace, insert into the sink flange and push down until it is properly seated.
- If an odor develops, run orange or lemon rinds through the disposer. A dozen ice cubes sprinkled with a little household scouring powder will also work.

ROA_01424

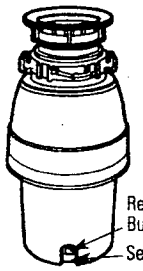
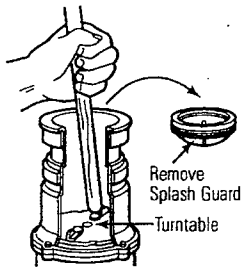
Before you call for service...

Troubleshooting Tips
Save time and money! Review the chart on this page first and you may not need to call for service.

SAFETY NOTE: *Before investigating, you must disconnect the power supply.*

⚠ WARNING!

Before resetting, disconnect the power supply–please see SAFETY NOTE above. The overload control prevents the motor from operating should overloading occur. This feature protects your house wiring and your disposer. When overloaded, the motor will stop automatically.

	Possible Causes	What To Do
Loud noises (other than those during grinding of bones and fruit pits)	**Silverware, bottle cap or other foreign object has fallen into the disposer.**	• Remove the splash guard* and remove the object with long-handled tongs. Replace the splash guard.*
Disposer does not start	**Reset button has been tripped.** 	• With the splash guard* removed, check to see if the turntable will move freely using a broom handle. If the turntable moves freely, replace the splash guard* and check the reset button to see if it has been tripped. The reset button is red and located opposite the discharge elbow, near the bottom of the disposer. Push the button in until it clicks and remains depressed. If the reset button has not been tripped, check for a shorted or broken wire connecting to the disposer. Check the electrical power switch, fuse box or circuit breaker. If wiring and electrical components are intact, the unit may have internal problems that require service or replacement.
	Turntable cannot rotate. 	• If the turntable does not turn freely, check for an object lodged between the turntable and the grind ring. Dislodge the object by moving the turntable with a broom handle. Then remove the object. If no foreign object is present, there may be internal problems.
Disposer leaks	**If the leak is at the top, it may be caused by:** **1. Improper seating of sink flange (gasket choice, putty or tightening).** **2. Support ring not tightened properly.** **3. Defective cushion mount.** **If the leak is at the discharge elbow, leak may be caused by improper tightening of elbow flange screws.**	

*Batch Feed does not include splash guard.

Disposer Warranty.

All warranty service provided by our Factory Service Centers, or an authorized Customer Care® technician. To schedule service, on-line, 24 hours a day, visit us at ge.com, or call 800.GE.CARES (800.432.2737). Please have serial and model numbers available when calling for service.

Staple your receipt here. Proof of the original purchase date is needed to obtain service under the warranty.

One Year
From the date of the original purchase

GE Will Replace:

The entire disposer if there is a defect in materials or workmanship relating to functional parts only (appearance parts are excluded). During this ***limited one-year warranty***, GE will also provide, ***free of charge***, all labor charges related to replacing the original disposer ***along*** with the replacement disposer within the first year.

What GE Will Not Cover During the First Year:

- Service trips to your home to teach you how to use the product.
- Improper installation, delivery or maintenance.
- Failure of the product if it is abused, misused, or used for other than the intended purpose or used commercially.
- Replacement of house fuses or resetting of circuit breakers.
- Damage to the product caused by accident, fire, floods or acts of God.
- Incidental or consequential damage caused by possible defects with this appliance.
- Damage caused after delivery.
- Product not accessible to provide required service.

EXCLUSION OF IMPLIED WARRANTIES—Your sole and exclusive remedy is product repair as provided in this Limited Warranty. Any implied warranties, including the implied warranties of merchantability or fitness for a particular purpose, are limited to one year or the shortest period allowed by law.

This warranty is extended to the original purchaser and any succeeding owner for products purchased for home use within the USA. If the product is located in an area where service by a GE Authorized Servicer is not available, you may be responsible for a trip charge or you may be required to bring the product to an Authorized GE Service Location for service. In Alaska, the warranty excludes the service calls to your home.

Some states do not allow the exclusion or limitation of incidental or consequential damages. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state. To know what your legal rights are, consult your local or state consumer affairs office or your state's Attorney General.

Warrantor: General Electric Company. Louisville, KY 40225

DIVISION 12 – FURNISHINGS

CABINETS/CULTURED MARBLE - LEEDO

ROA_01427

WARRANTY AGREEMENT

Project: Belle Hall Condominiums

Owner: Belle Hall Direct 101, LP
Contractor: TCR NC Construction I Limited Partnership

Subcontractor: Leeds Carpentry

Subcontractor hereby expressly warrants and guarantees that all labor, materials, and equipment furnished and work performed in conjunction with the above referenced project are in accordance with the plans, specifications, the Subcontract Agreement and authorized modifications thereto. All labor, materials and equipment shall be free from defects, due to defective materials and/or workmanship, for a period of one (1) year from the date of Certificate of Occupancy for each building/structure, unless otherwise stated in the Subcontract Agreement.

Should any defects develop during the warranty period due to improper workmanship and/or arrangement, the same shall, upon notice, be made good by this Subcontractor at no expense to the Contractor, Owner, or Owner's Representative. Nothing in the above shall be deemed to apply to work or equipment which has been abused, neglected or altered by the Contractor, Owner, or Owner's Representative.

Unless otherwise stated in the Subcontract Agreement, warranty work shall be responded to within twenty-four (24) hours of notification by the Contractor, Owner, or Owner's Representative, including weekends and holidays. Warranty notices received before 10:00 am shall be responded to on the same day. Should Subcontractor fail to respond within twenty-four (24) hours of notification or correct the defective work or equipment within seventy-two (72) hours, the Contractor, Owner, or Owner's Representative shall proceed with the correction of the defective work. All costs associated with this corrective action shall be reimbursed by this Subcontractor or charged against its account. Subcontractor shall remit payment for such charges within five (5) calendar days of notification by the Contractor, Owner, or Owner's Representative.

Signature: _____

Printed Name: Scott Studebaker

Position/Title: Contract Officer

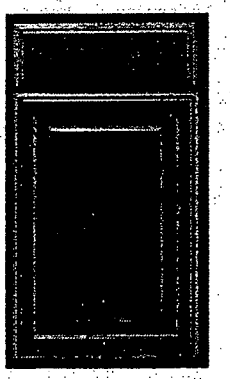
Date: 12/15/06

Natural

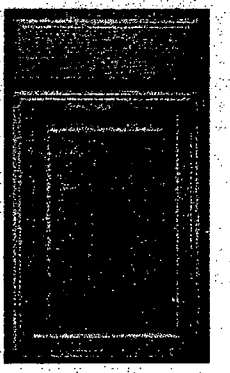
Spice

Bordeaux

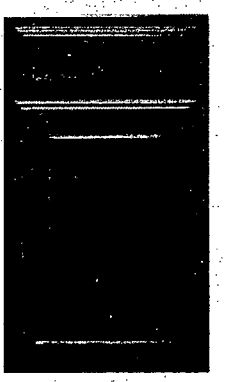
LEEDO CABINETRY



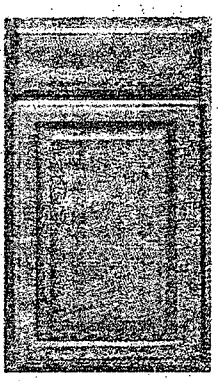
Bordeaux



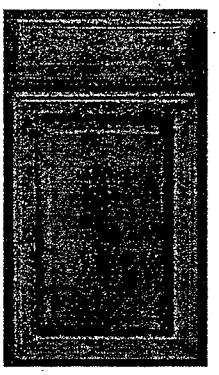
Cinnamon



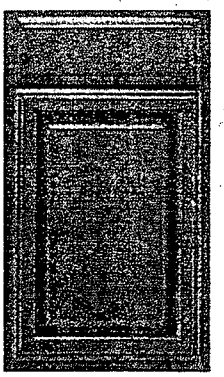
Espresso



Natural



Spice



Toffee

Richmond

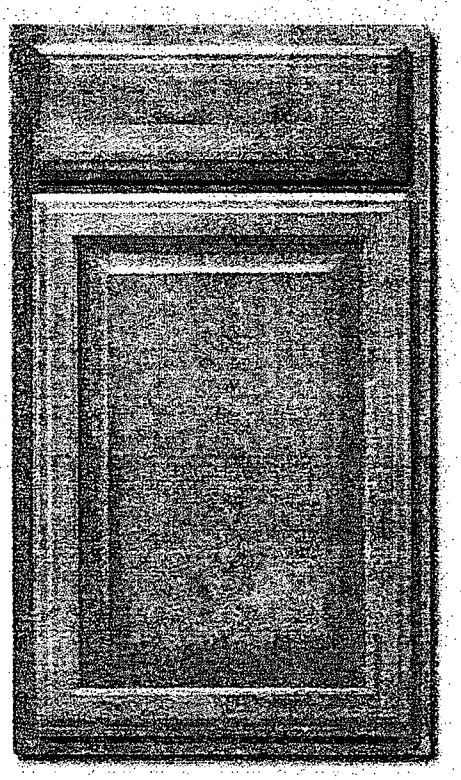
OBH - O&M 291

866-GO-LEEDO
www.leedo.com

LEEDO CABINETRY

Richmond

This raised-panel maple door accommodates the most discriminating of tastes. A standard overlay door with details that set it apart makes Richmond one of our most popular door styles. Richmond is available in all 6 maple stains.



Construction Features ...

- **Face Frames:** All face frames are solid hardwood (oak or hard maple). All joints are mortise and tenon. Frames are glued and stapled, then sanded to a uniform ¾" thickness.
- **Drawers:** All standard drawers feature a four-sided box made from ½" particleboard and 1/8" hardboard bottom finished with melamine coated laminate. Fronts and backs of drawers are nailed to the drawer sides with 1" galvanized steel staples. Drawers measure 19" long and 3 ½" deep, larger than most of our competitors.
- **Hinges:** European, fully-concealed hinges. All Leedo hinges have a lifetime guarantee.
- **Sides, Tops, Bottoms and Shelves:** All sides, tops, bottoms, and shelves are ½" particleboard with melamine coated laminate on all visible faces. Shelf edges are finished with matching PVC edge banding. Tops and bottoms are secured to sides, back and face frames by a dado joint. All shelves are adjustable. Wall cabinets with center mullions feature shelf supports at the center mullion.
- **Back:** Back panels are 1/8" hardboard with a melamine coated laminate finish. The back is glued to the edge of a dado cut in the end panel and stapled at the joint. A ½" plywood nail strip is applied at the top and bottom of the cabinet resting on the hardboard. We then staple the nail strips to the back of the cabinet using a 1 1/8" staple through the nail strip which firmly attaches the back into the hang rails. The back is then stapled to the end panel. Finally, a 1/8" hot melt is applied around the perimeter of the back, firmly securing the cabinet.

LEEDO Cabinetry

CERTIFIED CABINET NCMA

Upgrades Available

- *Cabinets Prepped for Glass*
- *All Plywood Cabinets*
- *Plywood Sink Base Floors*
- *All Plywood Drawers*
- *Roll Out Shelves*
- *Full Extension Slides*
- *Solid Hardwood Drawer*
- *Solid Hardwood Drawer w/Full Extension Slides*

ROA_01430

VIRGINIAMARBLE
MANUFACTURERS, INC.
1201 Fifth Avenue, P.O. Box 766, Kenbridge, Virginia 23944
Phone: (434) 676-3204 Fax: (434) 676-3299

WARRANTY

Seller warrants to its immediate purchasers that all new products supplied by seller are free from defects in workmanship and materials used in manufacturing of the same, when installed and used in accordance with seller's recommended procedures. Seller's obligation under this warranty is limited to repairing or replacing, as seller may elect, any product sold by seller which shall be returned to seller's place of business, with transportation charges prepaid, and as to which examination shall disclose to seller's satisfaction to have been thus defective, provided that such products shall be so returned no later than thirty-six (36) months from seller's shipment of same to purchaser. Such defective product shall be repaired or replaced at seller's place of business.

This warranty shall not apply, and seller have no liability with respect (1) to the removal or reinstallation of warranted products; (2) to any product installed or used in any way so as to have affected adversely such product; (3) damages to products while in transit after leaving seller's place of business; (4) cracks or chips in surface unless caused by defects in workmanship or material; (5) slight imperfections, warpage and shade variations in products; or (6) any transportation or cartage charges.

Close inspection of synthetic marble may reveal minor surface irregularities and warpage, color variation, small particles of foreign matter and other conditions commonly encountered with products of nature such as stone, marble, granite, etc.

This warranty is in lieu of all warranties, express or implied, including, but without limitation, warranties of **MERCHANTABILITY** and **FITNESS FOR PARTICULAR PURPOSE**, all other representations to purchaser, and all other obligations for liabilities, including liability for incidental or consequential damages on the part of the seller. No person is authorized to give any other warranties or to assume any liability on seller's behalf unless made or assumed in writing by seller.

VIRGINIA MARBLE
MANUFACTURERS, INC.
1201 Fifth Avenue, P.O. Box 766, Kenbridge, Virginia 23944
Phone: (434) 676-3204 Fax: (434) 676-3299

CARE AND MAINTENANCE

CLEANING

Cultured Marble and cultured Onyx provide extremely durable, nonporous surfaces, which resist staining. Routine Cleaning with a soft sponge or cloth, or nonabrasive aerosol foam cleaner, is all that is normally needed to give many years of trouble-free services. [Products such as "Soft Scrub" or "Comet" are not recommended, as they tend to reduce the shine of the gel coat, and leave small scratches.]

POLISHING

To maintain luster and make cleaning easier, periodic applications of paste wax or products like "Gel Gloss" may be applied. Take care in using a clean, soft, cloth for both applying the wax and polishing the top. ["Gel Gloss" can be purchased at home centers and plumbing supply stores that sell cultured marble.]

REMOVING SCRATCHES

Mild abrasives such as automotive polishing compound, or baking soda, will remove simple scratches and stains. After using a polish compound, if the scratches are still visible, try using 600 grit wet/dry sand paper, lightly rubbing at the area. [To sand as flat as possible, try using a small block of wood with the sand paper around it, this prevents from putting any type of indention in the surface by using your hands, and allows for more even sanding.] At Virginia Marble we use air powered disc sanders, and orbital buffers, for the volume of sanding and buffing that we do. A soft terry cloth will work just as well.

CUTTING OR DRILLING

Masonry blades are recommended for cutting tops or panels made of cultured marble. Always cut from the rough or unfinished side of the marble, once the material has been cut, the edge cannot be refinished, so work with an edge that will be concealed on the finished product. Drilling requires the same steps as cutting.

Virginia Marble is willing to provide a gel coat repair kit to any customer, with instructions and the material you need to patch certain areas on the top. If you should chip the gel coat surface, this can be fixed with little effort. However, a chip that goes beyond the surface of the gel coat and into the matrix of the top will be a different matter. The repair kit is really only to patch gel coat, other material will be needed to repair a deeper chip, and should probably be done professionally.

VIRGINIA MARBLE MANUFACTURERS, INC.

PLEASE READ BEFORE INSTALLATION: IMPORTANT PRODUCT INFORMATION

This cultured marble product will enhance the beauty of your bath by giving the appearance of natural marble. Each product is individually cast and contains natural materials including marble. The quality finish on your cultured marble top is made of the finest material available.

Because each top is made individually, the manufacturing process allows for infinite variations in color, veining, shape and design. No two products will look the same, and if you look carefully, you may see minor color variation, small particles of foreign matter or other conditions encountered with products of nature such as stone, natural marble, and granite. These variations give a unique look and add character to each product.

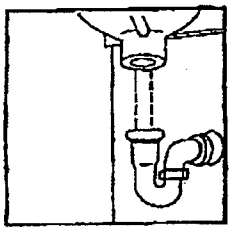
CARING FOR THE PRODUCT

Use only non-abrasive liquid cleaners. To polish we recommend periodic use of "Gel Gloss", a liquid product produced by TRIndustries. After hand polishing the top with Gel Gloss, you may apply a good liquid or paste wax to maintain luster. The surface of this product is a clear gel coat. Care should be taken to avoid scratching the surface. Minor scratches can be repaired by wet sanding with #600 grit sandpaper. Next apply a polishing compound. Finish with an auto paste type wax. let set and wipe to a sheen. Check your water temperature – water temperature in excess of 140 degrees Fahrenheit can damage this surface. Do not use instant hot water dispensers.

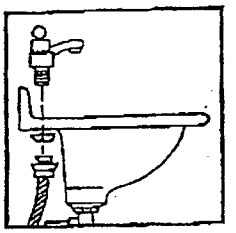
WARRANTY INFORMATION

This product carries a three year limited warranty against manufacturing defects. Claims regarding veining, background color, broken or chipped products must be made before installation. Warranty claims should go through the original distributor.

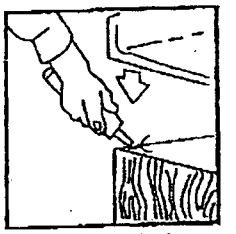
INSTALLATION INSTRUCTIONS



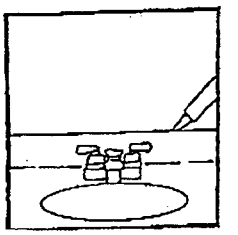
Level vanity base. Place the vanity top on the vanity. Check positioning of water lines and drain.



Remove the vanity top from vanity and mount your faucet to the vanity top. Tighten pop up drain by hand. (WARNING: Over-tightening can cause cracking.) Attach the water lines to faucet.



Apply thin bead of sealing compound to each corner of vanity. Set your cultured marble top in place.



Carefully apply a bead of sealing compound where backsplash meets wall. Clean excess sealing compound with a damp cloth. Complete water and drain connections.

1. Carefully inspect product prior to installation or removal of an existing top.
2. Verify that vanity base or supporting surface is level and flat. If wall to wall installation, check wall dimension against vanity top.
3. It may be necessary to sand or cut edge of top if walls are not square. Dimensional tolerances of +-1/4" should be expected on all products.
4. Hardware can be installed at this point per manufacturer's instructions. Do not over tighten drain fixture. Apply a high quality clear silicone sealant to bottom of the top where drain gasket seals and under drain fitting flange. Hand tighten plus one half turn should be sufficient. Wipe off excess sealant immediately.
5. Apply small amount of sealant to each corner of cabinet or support and place top into position
6. If side splashes are used they can now be installed by applying sealant to back of splash and pressing splash firmly against wall.
7. Joints or seams may be caulked with clear or white silicone. For best results always follow manufacturer's recommendation for application and clean up.

CAUTION: Check water temperature-water temperature in excess of 140 degrees can damage surface of product.

NOTICE TO INSTALLER:
DO NOT wipe excess caulk or silicone on surface of top or protective film... this WILL cause yellowing wherever caulk or silicone is wiped.
THIS IS NOT COVERED UNDER WARRANTY!

12/04/08 11:54 FAX 434 676 2774 VIRGINIA MARBLE 005

NAHB RESEARCH CENTER, INC.

400 Prince George's Boulevard
Upper Marlboro, MD 20774-8731
Phone: 301-249-4000 / Fax: 301-430-6180
www.nahbrc.org

LISTING CERTIFICATE

NAHB Research Center, Inc., through its ongoing quality assurance and testing program, certifies that

Virginia Marble Manufacturers, Inc.
P O BOX 766
Kenbridge, VA 23944

is in conformance with the Program Requirements and is licensed to Affix the NAHB Research Center Certification Label to the following Plumbing Fixtures: Lavatories, Shower Receptors, Bathtubs, Whirlpool Bathtubs

Manufactured in any of the following Approved Materials: Cultured Marble, Cultured Onyx, Cultured Granite

The listed products have been tested in accordance with the appropriate ANSI Z124 and A112.19.7 Standards

Manager, Plumbing Certification Program

January 1, 2006
Issuance Date

December 31, 2008
Expiration Date

This certificate becomes invalid upon suspension, cancellation, revocation or expiration of certification.

ROA_01434

OBH - O&M 296

LEEDO CABINETRY

WARRANTY LETTER

DATE: 11-27-06

TCR NC CONSTRUCTION I LIMITED PARTNERSHIP
230 SEVEN FARMS DRIVE SUITE 104
CHARLESTON, SC 29492

RE: BELLE HALL CONDOMINIUMS

To Whom It May Concern:

Leedo Cabinetry works hard to provide an excellent product at a very competitive price. All of our products come with a full ONE YEAR Warranty. We guarantee that the materials we supplied to Belle Hall Condominiums will be free to defects for one year from the date of our final shipment to the job site until November 27, 2007.

During this period we agree to repair, at no cost to the owner, any portion of our work that is defective.

Please contact out Customer Service Department at 1-800-955-7538 to schedule any necessary work. Thank you for your business. We look forward to working with you on your next project.

LEEDO CABINETRY

16856 Cabinet Road, East Bernard, TX 77435
Phone: 979-335-4885 Fax: 979-335-4109

ONE
BELLE HALL

OPERATION AND MAINTENANCE DOCUMENTS

VOLUME 2 OF 2

ROA_01436

TCR
TRAMMELL CROW RESIDENTIAL
230 Seven Farms Drive
Suite 104
Charleston, SC 29492

ONE BELLE HALL CONDOMINIUMS

OPERATION AND MAINTENANCE DOCUMENTS

PRODUCT DATA

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- PLUMBING/ BUDGET MECHANICAL
- HVAC/ GENERAL HEATING & AIR

- **DIVISION 16- ELECTRICAL**
- ELECTRICAL/LIGHT FIXTURES/ HOUSTON STAFFORD

DIVISION 12 – FURNISHINGS

GRANITE – SOLID SOLUTIONS

WARRANTY AGREEMENT

Project: Belle Hall Condominiums

Owner: Belle Hall Direct 101, LP
Contractor: TCR NC Construction I Limited Partnership

Subcontractor: Solid Solutions

Subcontractor hereby expressly warrants and guarantees that all labor, materials, and equipment furnished and work performed in conjunction with the above referenced project are in accordance with the plans, specifications, the Subcontract Agreement and authorized modifications thereto. All labor, materials and equipment shall be free from defects, due to defective materials and/or workmanship, for a period of one (1) year from the date of Certificate of Occupancy for each building/structure, unless otherwise stated in the Subcontract Agreement.

Should any defects develop during the warranty period due to improper workmanship and/or arrangement, the same shall, upon notice, be made good by this Subcontractor at no expense to the Contractor, Owner, or Owner's Representative. Nothing in the above shall be deemed to apply to work or equipment which has been abused, neglected or altered by the Contractor, Owner, or Owner's Representative.

Unless otherwise stated in the Subcontract Agreement, warranty work shall be responded to within twenty-four (24) hours of notification by the Contractor, Owner, or Owner's Representative, including weekends and holidays. Warranty notices received before 10:00 am shall be responded to on the same day. Should Subcontractor fail to respond within twenty-four (24) hours of notification or correct the defective work or equipment within seventy-two (72) hours, the Contractor, Owner, or Owner's Representative shall proceed with the correction of the defective work. All costs associated with this corrective action shall be reimbursed by this Subcontractor or charged against its account. Subcontractor shall remit payment for such charges within five (5) calendar days of notification by the Contractor, Owner, or Owner's Representative.

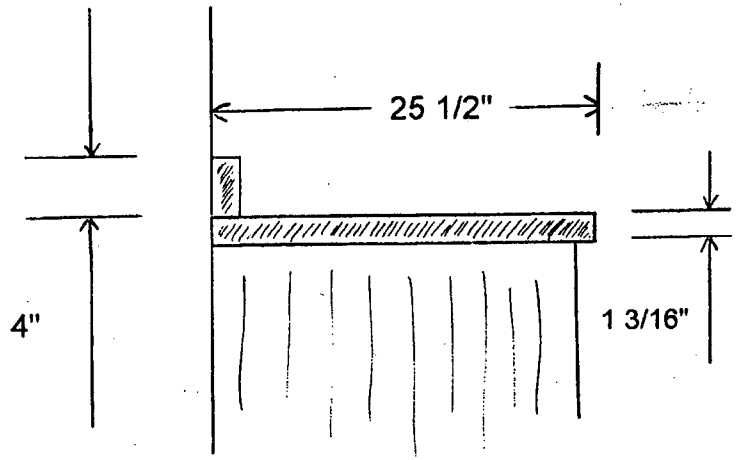
Signature: Kim Currie

Printed Name: Kim Currie

Position/Title: Sec. Tres.

Date: 12/12/06

SOLID SOLUTIONS OF CLAYTON INC.



GRANITE Countertops 1 3/16" thick. 25 1/2" Deep with a 4" backsplash

Silicone is used to secure the backsplash and the countertops.

finishing processes in thicknesses less than 1¼".

Determination of proper stone thickness must be evaluated using the following criteria:

1) Piece Size.
2) Final Face Finish.
3) Anchoring Detail.
4) Structural Design Load Requirements.
5) Flexural Strength of the Granite.

Minimum safety factors of 3 to 1 minimum on granite flexural stresses and 4 to 1 minimum on anchorage components in granite are recommended.

Ashlar or veneer used as a facing requires a setting space of at least 1", as measured from the nominal thickness of the piece.

Bed and Joint Width. The minimum recommended bed and joint width is 1/4" for exteriors and 1/8" for interiors.

Sawn Backs. Because of physical characteristics, most granites cannot be split to a thickness less than 1/3 of the lesser face dimension. Consequently, sawn backs (see 3.4 in this chapter) should be specified for most veneers, and are frequently specified also for thicker ashlar, because of design considerations.

Staining. Granite should be protected from wet (green) wood, oils, mud, construction waste, and asphalt compounds. Contact Fabricator or Granite Contractor for proper remedies to staining problems that occur.

PRODUCT DESCRIPTION - Granite

1. GEOLOGICAL CLASSIFICATION

The American Geological Institute (AGI) defines granite as an intrusive igneous rock (cooled slowly in the deep upper part of the Earth's crust) composed of 25 to 35% quartz and over 50% potassium- and sodium-rich feldspars, with a common accessory mineral of less than 20%, usually muscovite (clear mica), biotite (dark, iron-bearing mica), or hornblende (amphibole).

The commercial stone industry, depending on the supplier or organization, loosely accepts various granitelike stones under the label of "granite." These include, among others, banded or massive, nonbanded gneiss, and a few quartz-based stones. Such stones are marketed as "granitelike" or "granitoid," though they are not true granite.[1] Gneisses, high level metamorphic stone, are included in the granite category by commercial interests.

The quartz-based stones are definitely not granite, but rather the silica-cemented sedimentary stone quartzite or its metamorphic equivalent, orthoquartzite. Quartzite, and especially orthoquartzite, have a distinct cleft or cleavage at a mica-rich parting. Knowing the difference between true granite and granitelike stone helps the stone industry professional to understand the physical properties, performance, and ultimately, the comparative quality of these natural materials.

[1] The following terms are derivations of the word *granite* which are now obsolete because their definitions have become obscured and imprecise: *granide*, *granilite*, *granitelle*, *granitello*, *granitine*, and *granolite*. The use of these terms commercially is not recommended.

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Granite, as defined by the AGI, usually has three to four basic mineral components:

Quartz (SiO_2 ±25-35%), appears as irregular, watery-looking, or translucent grains.

Orthoclase feldspar ($KAlSi_3O_8$ ≈20-80%), In most, but not all, commercial, geologic granites, the light-colored minerals, white- to flesh-colored are orthoclase feldspar.

Plagioclase feldspar ($NaAlSi_3O_8$ to $CaAl_2Si_3O_8$ ≈20-80%), features darker gray to bluish grains, with some grains exhibiting fine, grooved lines and/or an iridescent sheen. Sometimes the mineral is a light, creamy color, nearly indistinguishable from orthoclase, except for the occasional presence of the fine lines.

Dark accessory minerals (→20%) biotite and hornblende are complex silicates with all the elements in quartz, orthoclase feldspar, and plagioclase feldspar, plus iron and magnesium, which gives these minerals their dark color. Magnetite (Fe_3O_4) is often a trace mineral (±2-4%) in granite, and easily recognized by its strongly magnetic property. It, too, is black and opaque. Magnetite has a hardness rating of H=6, polishes well, has a metallic appearance, and is opaque (i.e., it does not transmit light even when very thin).

All of these granitic minerals have a Mohs Scale[2] hardness rating of H=7 or H=6 with the exception of biotite, which has a variable hardness of 2.5 to 4.5, depending on the angle of the polished surface in relation to the edges of the "books" of sheets that biotite mica crystals exhibit. Thus, biotite does not polish well and appears as small, rough spots on a polished surface. This is not a flaw in either the stone or polishing, but simply the way biotite is—softer than all other minerals in granite. Biotite hardness makes little difference in most applications, as the overwhelmingly dominant feldspar and quartz minerals are much harder. Biotite "plucks" slightly in polishing, but generally not when in use.

Granitization. Earth scientists came to realize that much granite is associated with metamorphic stone of extremely high levels. These are often **massive, non-banded granites** with no noticeable mineral segregation into bands. Many examples come from, but are not limited to, some Far Eastern locations and Sri Lanka. These often have a strong presence of **red garnet**[3], a mineral indicative of metamorphism. Geologic granite, in terms of mineral content, can be formed by **granitization**, a true metamorphic process by which a solid rock is converted to granite by entry and/or exit of material or change of chemical components without going through a liquid or molten state.

Gneiss, a true metamorphic stone that exhibits strong mineral segregation in the form of contorted bands indicating metamorphic origin, is universally included in the granite group by the stone industry. **Banded gneiss** is a classical rock end member of the metamorphic process of high pressure, time, temperature, and the presence of fluids that begins with the sedimentary rock shale and proceeds through slate, to phyllite, then schist and finally, banded gneiss—from low to high levels of metamorphic rank.

2. COLOR AND VEINING

The color of a granite is governed largely by that of the feldspar, usually the most abundant mineral. However, it may be modified to

[2] See Appendix for information about the Mohs Scale of mineral hardness.

[3] Garnet is most often noticeable when red, but also occurs in light green and light yellow.

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ROA_01442

some extent by the quartz, hornblende, or mica, if considerable amounts are present. Almost white, light gray, dark gray, green, pink, and red granites are common. Uniform color distribution is usually a desirable feature. Lighter-colored granites are the average composition of continental crust, while darker granites are more likely associated with or influenced by nearby oceanic composition stone.

Dark, granular igneous rocks, classified petrographically as anorthosite, basalt, diabase, diorite, and gabbro, are also used as dimension stone, and are classed commercially as "black granite."

3. TEXTURE

The term "texture," as applied to granite, means size, degree of uniformity, and arrangement of constituent minerals.

The texture of granite is determined by the size and arrangement of mineral grains. Uniform grain size usually is demanded in commercial granites. Grain size varies greatly in different types of granite.

Uniform distribution of the minerals is as important as uniform grain size. Light and dark minerals should be distributed evenly throughout the rock mass, for this gives uniform color and texture. Many commercial deposits display remarkable homogeneity; the rock may not vary in color or texture for many feet, either vertically or horizontally.

4. FINISHES

Granite surfaces may be finished in a number of ways. See the listing of typical finishes on page 40 of this chapter.

5. THICKNESS

Standard nominal thicknesses for granite are generally 3/8", 3/4", 1-1/4", 1-1/2", 2", 3", 4", 6", and 8".

6. SIZES

Granite is a product of nature with hundreds of varieties available, each possessing unique characteristics. Little can be done to alter the condition in which nature presents these varieties to us. Therefore, size may become a limiting factor to consider in the selection of a particular granite.

A jointing scheme which permits the use of smaller sizes of granite will greatly facilitate selection and delivery. The MIA Member/Supplier should assist in final approval.

7. PRODUCT SAMPLING

Granites are formed by nature; thus there are variations in the tonal qualities of the stones. However, it is these natural differences that make granites unique, valuable, and highly desirable. Because of these variations, selection of a granite should never be made on the basis of one sample only. It is recommended that selection be based on viewing sufficient samples to show the complete range of colors of the desired stone. MIA Members can provide these range samples.

8. PROPER USAGE TIPS

Recommendation for commercial floors:

1) Minimum ¾" thickness.
2) A honed finish.
3) A minimum hardness value of 25 as measured by ASTM C241-90(1997)e1.

Avoid the use of gypsum or molding plaster setting spots for the installation of exterior stone.

9. VENEER CUTTING

Quarry blocks are reduced to slabs by a gang saw or wire saw. The gang saw consists of a series of steel blades set parallel in a frame

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that moves forward and backward. They are fed a cutting abrasive in a stream of water.

TECHNICAL DATA - Granite

1. PROPERTIES OF GRANITE DIMENSION STONE

In centuries past, relatively little importance was attached to the ultimate physical capabilities of most building materials. Rule of thumb was a common structural design criterion. As a result, the widely used materials of the day, for the most part natural rather than manmade materials, were seldom stressed to their ultimate limits.

In present-day construction, this is far from being true. Performance requirements are daily becoming more demanding. In striving for taller structures, greater spans, firmer foundations, thinner walls and floors, stronger frames, and generally more efficient buildings with more usable space, today's Architects and Engineers must get the most out of the materials with which they work.

Granite is a product of nature and not always subject to the rules of consistent behavior that may apply to manufactured building materials.

Physical property values of stone may, however, be measured using the standard test methods approved by the Dimension Stone Committee C18 of ASTM International. The MIA and Member companies are represented on the ASTM committee and are active in its technical work of establishing proper test methods and specifications consistent with the latest technology.

Final design should always be based on specific values for the stone variety ultimately to be installed. These values may be obtained from the Stone Supplier. All materials are not suitable for all uses. In order to avoid mistaken selections, tests for material values should be made prior to final material selection.

PHYSICAL PROPERTIES OF GRANITE

(This historical data and information is provided only as a guideline. Recommended minimums or maximums are established and provided by ASTM International.)*

Property	Range of Values
Compressive Strength	
Psi	4,700-60,000
Recommended (min): 19,000	
Flexural Strength**	
Psi	700-5,500
Recommended (min): 1,200	
Modulus of Elasticity*** (in millions)	
Psi	2.0-10.0
Density, lb/ft^3	150-190
Recommended (min): 160	
Coefficient of Thermal	
Expansion in/in/°F	4.7 average
Modulus of Rupture (C99)	1000-3000
Recommended (min): 1500	
Absorption % (C97)	0.02-0.40
Recommended (max): 0.40	
Abrasion (C241)	20-90
Recommended (min): 25	

* Test methods described in current ASTM standards.

** Flexural strength, transverse strength, and modulus of rupture are used interchangeably.

*** Also known as Young's Modulus.

2. STRENGTH (ASTM C99, C170, C880)

Values for modulus of rupture, compressive strength, and flexural strength are ascertained by testing specimens of granite under laboratory conditions until they fail.

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The C170-90(1999) procedure is used for determining the compressive strength of a granite specimen. A cube or cylinder of 2" to 3" in all dimensions is crushed under a hydraulic ram and the compressive strength is calculated as the total load divided by the area of the specimen. Compressive strength of granite is seldom a factor in design, as the compressive strength is many times the anticipated compressive stresses. This value is most often used for comparison of stone types or as a general strength benchmark for the material.

The C99-87(2000) and C880-98 procedures are both used for determining bending strength. The C99-87(2000) procedure is much older, and the test protocol is seldom modified, so data obtained from this test has some value for comparison to historical data or between different stone types. As a measure of resistance to bending loads, it is not considered to be a representative modeling of panel behaviors in building applications. The ratio of beam length to beam depth is very small, resulting in what is referred to as "thick beam behavior." The results of this test are usually artificially high due to the thick beam behavior and high shear stresses in the loaded specimen

The C880-98 procedure is much preferred when testing granite for resistance to bending stresses. The procedure calls for a span-to-depth ratio of 10:1, which eliminates the influence of thick beam behavior. Furthermore, the test allows specimen modification to allow the use of actual building cladding thickness and actual finish, which provides a better representation of the stone behavior in the cladding application. This procedure also uses a four-point bending fixture, which provides a constant stress region over approximately 50% of the specimen. This provides a greater chance that the weakest point of the specimen will fall within this region and produce more reliable data for design use.

3. FIRE RESISTANCE

Stone is not combustible according to underwriters' ratings, and therefore is considered a fire-resistant material. Because of its thermal conductivity, heat transfer is fairly rapid. Most stone is not considered a highly rated thermal insulator.

Underwriters' fire-resistance ratings evaluate whether or not a material will burn, as well as how long it will keep surrounding combustible materials from reaching temperatures which will cause them to ignite. Methods of estimating fire-resistance periods of masonry walls and partitions utilizing component laminae are given in "Fire Resistance Classifications of Building Construction," BMS92, National Bureau of Standards.

4. ABRASION RESISTANCE (ASTM C241)

Abrasion resistance is a property of stone that should be tested per ASTM C241-90(1997) to provide an indication of the stone's wearing qualities when exposed to foot traffic.

The hardness and uniform wearing qualities of most granites make them extremely desirable and economically practical for floors and stairs. Varieties with an abrasive hardness (Ha) of 25 or more, as measured by ASTM C241 tests, are recommended for use as flooring subject to normal foot traffic.

5. FACTORS AFFECTING PROPERTIES

The ultimate test of a building material is its ability to have and maintain the necessary structural strength, as well as beauty of appearance and low cost of maintenance, over the useful life of the structure. Experience has proven that stone meets this test as few other building materials can. Studies have shown

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that the durability of most stones is little affected by cycles of weather. This is because most have a low rate of moisture absorption.

6. SAFETY FACTORS

Good engineering practice requires that allowable design stress must provide a margin of safety in any structural element. As a necessary precaution against such conditions as wind, ice, snow, impact, temperature changes, and imperfect workmanship, these allowable stresses must be smaller than those which produce failure.

Within the accepted limits of safe design practice, the closer the allowable load is to the ultimate failure load in a structure, the more efficient is the use of the material and the less the cost of the construction.

Contemporary building design does not usually employ granite as part of the structural frame, but rather as an independent unit, a curtain wall, or veneer. Therefore, the primary concern in such cases is with wind or seismic loads. Safety factors of 3.0 for the granite and 4.0 for anchorage components in stone less than 2" thick, and 3.0 for stone 2" or greater in thickness, are recommended. Where the stone is to be subjected to concentrated loading, such as stair treads or lintels supported only at the ends, a factor of 4.0 or greater should be used.

These safety factors may be adjusted using sound engineering principles and judgment.

As buildings become taller and individual stone slab veneer becomes larger in area, the lateral forces due to wind loads must be considered. Wind tunnel tests are often used on major structures to determine wind dynamics and force magnitude.

7. SEISMIC CONSIDERATIONS

Seismic considerations generally require that low buildings be stiff, and that tall buildings be relatively flexible. Design of connections must account for seismically induced horizontal loading. Local building codes vary and must always be checked to determine specific requirements for each area. The National Bureau of Standards has published two documents on the topic: "Earthquake Resistant Masonry Construction," NBS Science Series 106; and "Abnormal Loading on Buildings and Progressive Collapse: An Annotated Bibliography," NBS Science Series 67. The U.S. Army Corps of Engineers has also published TM 5-809-10, "Seismic Design for Buildings."

8. EFFLORESCENCE AND STAINING

Efflorescence is a salt deposit, usually white in color, that appears on exterior surfaces of masonry walls. The efflorescence-producing salts found in masonry are usually sulfates of sodium, potassium, magnesium, calcium, and iron. Salts which are chlorides of sodium, calcium, and potassium will sometimes appear, but they are so highly soluble in water that they will be washed off by rain.

The water-soluble salts causing efflorescence come from other materials in the wall. The salts exist in small amounts and are leached to the surface by water percolating through the wall. The most feasible means of prevention is to stop the entrance of large amounts of water. Absorption from the face will not cause efflorescence unless there are open joints.

Some of the salt crystals may form in the stone's pores near the surface. Crystal growth (recrystallization) in the pores can cause stress on the walls of the pores and

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cause the stone to flake off. If the conditions bringing about this action persist, scaling may continue and flake off one layer after another. For this to happen, large amounts of water must enter the wall and contain large amounts of salts.

Research indicates that staining and discoloration occurring on new buildings are caused by the action of water percolating through cement, from which soluble alkali salts are leached. The salts are then carried by the water through the stone, where partially oxidized organic matter is picked up. This is then transported to the surface of the stone, where it is deposited as a stain as the water evaporates.

This staining phenomenon is similar to efflorescence, except that it involves organic material. It does not harm the stone other than leaving an objectional appearance during or soon after erection. However, if left alone, the stain is removed naturally by the action of the elements, usually in the course of a few months.

Granite is one of the most durable of all building materials because the quartz and feldspar in it are highly resistant to normal weathering. Feldspars will, however, disintegrate slowly if exposed to an acid-bearing atmosphere, as in regions where hydrocarbons are prevalent. All granites disintegrate very slowly under repeated contraction and expansion due to diurnal and seasonal temperature changes, but under ordinary atmospheric conditions granite will endure for years without significant change in color or durability.

9. PITTING IN GRANITE

Granites are made up of several different minerals, each having a different hardness. They can contain feldspars, biotites, amphiboles, ferrous titanium oxides, and other mineral combinations. For comparison, on the Mohs Scale, diamonds are the hardest substance, with a hardness of 10. By comparison, feldspars have a hardness of 6.5 to 7, which is still quite hard and durable. Biotites, the black minerals throughout the slab, are by contrast very soft (2.5) and flake easily. All true granites have biotite in their composition. Because biotites are soft and flaky, the first few layers are removed during the polishing process, causing pits. Some granites have more biotites throughout their composition than others. The higher the biotite content of the stone, the more pits it will have. All polished igneous/metamorphic rock will have varying degrees of pits, depending on the amount of biotites, muscovite, and phlogopite.

Pitting does not make the granite less durable or of inferior quality. Pits exist in all granites and should be expected when dealing with a natural, polished stone containing several types of minerals with different hardnesses.

10. BACTERIA

Bacteria requires several things in order to thrive and grow: oxygen, water, sunlight, nutrients, and a substrate to form on. The minerals in granite are toxic to bacteria. As a result, there is no habitable environment for the bacteria to live and grow on a granite surface.

11. RADON AND GRANITE

Radon is a naturally occurring gas generated by the decay of trace amounts of uranium found in the Earth's crust. It is an unstable gas that quickly breaks down and dissipates in the air.

Radon is measured in units called picocuries per liter (pCi/l). A picocurie is one trillionth (10^{-12}) of a curie, which is the amount of radioactivity emitted by a gram of radium. The U.S. Environmental Protection Agency has established 4 pCi/l as the standard for

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indoor air; 20 pCi/l represents the maximum amount of exposure to radium that is now allowed by U.S. regulations.

Measurements of Radon from Granite Countertops: There has been no direct measurement of radon release from granite countertops. Model calculations, using a standard, scientifically accepted approach and conservative assumptions, indicate that the radon release from a granite countertop is below detection by any known analytical method.

Radon Work Sheet. Use the following work sheet to calculate the contribution of radon to indoor air from a 10' by 7' granite countertop.

1a.	Dimensions of countertop (sq ft) = 70 sq ft.
1b.	Reactive thickness of countertop (sq in) = 10^{-6} in.
1c.	Multiply 1a by 1b, then multiply the result by 2360 to get the effective volume of the countertop in cubic centimeters, i.e., the volume that can release radon = 0.165 cm^3.
1d.	Multiply 1c by 2.6 g/cm^3 (the average density of granite) to get the total mass of the reactive portion of the countertop in grams = 0.429 g.
2a.	The average concentration of uranium in the countertop material in parts per million, or milligrams per kilogram = 4 mg/kg.
2b.	Multiply 2a by 1.47 to get the uranium concentration in picocuries per gram = 5.88 pCi/g.
3a.	Multiply 1d by 2b to get the total number of picocuries of uranium in the reactive thickness of the countertop. Assuming radioactive equilibrium in the rock, which is likely, this is also the total number of picocuries of radon-222 produced within the reactive thickness of the countertop = 2.52 pCi.
3b.	Multiply 3a by the emanation coefficient–the proportion of radon produced by the rock which escapes to the air. The highest possible value is 1, the lowest, 0. Extensive measurements of fractured rocks indicate a value of less than 0.5 is realistic. For most dry rocks, 0.2 is a good general figure = 0.504 pCi.
4a.	Square footage of house in which countertop is installed = 3000 sq ft.
4b.	Average ceiling height, in feet = 8 ft.
4c.	Multiply 4a by 4b, then multiply that result by 28.32 to get total volume of air in the house, in liters = 6.80 x 10^5 l.
5.	Divide 3b by 4c to get picoCuries per liter of radon in the indoor air of the house that is contributed from the countertop only = 7.4 x 10^{-7} pCi/l.

Summary: The typical granite countertop (as indicated in the work sheet example) will release 7.4 x 10^{-7} pCi/l of radon in the air. This corresponds to 2.7 x 10^{-5} atom decays per second (dps). This represents 0.85 decays per year–less than one atom of radon is produced by the countertop in one year.

There are certain properties of rocks that can increase their radon emanation efficiency, in other words, increase the release of radon from a given weight of rock. These are rock properties that maximize the exposure of internal or external rock surfaces to water or air, allowing any radon gas to escape. However, a granite with such properties would be too brittle to make into a countertop, and too open to take a polish, so it would not be marketable for this purpose, unless the rock pores were first filled with a chemical sealant. Such sealing would also eliminate any possible radon release problems.

The "Radon and Granite" section was taken from "Granite and Radon–The Truth" written by Dr. Donald Langmuir and published by the MIA on September 1, 1995.

12. CAUTION ABOUT ENHANCED GRANITE

Several methodologies are being used to enhance varieties of granite. Caution, in some cases avoidance, should be exercised for the following methodologies:

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CLEANING AND MAINTENANCE

1.0 INTRODUCTION

ASTM C1515-01 Standard Guide for Cleaning of Exterior Dimension Stone, Vertical and Horizontal Surfaces, New or Existing

1.1 Definition of Terms

Maintenance: Scheduled cleaning, specific procedures, and inspections performed on a daily, weekly, or other regular basis to keep the stone in proper condition.

Refinishing: Repolishing or honing of dull, once-polished marble, limestone, or granite floors and walls. Refinishing of traffic patterns, for example.

Renovation: Cleaning and repolishing of neglected dimension stone surfaces.

Restoration: Large-scale remedial actions taken to restore a structure or area to its original or acceptable "near original" condition. Generally applies to historic structures.

2.0 SLIP RESISTANCE OF STONE FLOOR SURFACES

The Americans With Disabilities Act (ADA) recommends that walking surfaces provide an adequate static coefficient of friction so as to provide a safe walking surface. Local building codes do take precedence. The MIA has had extensive ASTM C1028-96 Coefficient of Friction tests performed on a number of varieties of dimension stone. The results of those tests confirm that dimension stone used for paving provides an adequate walking surface when properly maintained. Proper maintenance includes prompt cleanup of spills and correcting other conditions that can cause a sudden reduction in the static coefficient of friction of the floor.

3.0 BAD WEATHER SAFETY RECOMMENDATIONS

Wet Flooring Surfaces. All flooring surfaces can become slippery when wet. It is common courtesy as well as prudent management to reduce the hazards caused by wet flooring surfaces.

Spread carpeted runners from each outside door into lobbies and corridors to help dry shoe soles.

Pylons. Place bright-colored "slippery when wet" pylons on walking surfaces in conspicuous places.

Mop or shovel walking surfaces as often as necessary to remove standing water, ice, or snow.

Maintenance Instructions. Issue standard instructions to building maintenance personnel and prominently post at all janitorial workstations.

Local Codes. Follow local building and safety codes.

4.0 MOISTURE DAMAGE

Efflorescence. Water penetrating exterior wall cavities through defective flashing or unsealed joints can cause efflorescence, a mineral salt residue left on the surface of masonry when water evaporates. In addition, condensation in wall cavities prevented from reaching the exterior surface because of blocked weep holes can dislodge masonry in a freeze-thaw climate.

Moisture coming up through a floor slab seeks the easiest possible pathway to evaporate into the atmosphere. Often, the veining or microcracks in the structures of

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some stones provide that path. The moisture dissolves all the salts from the ground, the substrate, and the stone, carries them to the surface, and deposits them as the moisture evaporates, giving the appearance of a faulty stone. Steps to eliminate this moisture can be implemented during the installation process (refer to chapters on Installation and Wet Areas.)

5.0 TOPICAL SEALERS AND IMPREGNATORS

Topical Sealers are coatings designed to protect the surface of stone against water, oil, and other contaminants. They are formulated from natural wax, acrylic, and other plastic compounds.

Impregnators (Penetrating Sealers). Impregnators penetrate below the surface and become repellents. They are generally hydrophobic (water-repelling), but are also oliophobic (oil-repelling). Impregnators keep contaminants out, but do not stop the interior moisture from escaping. These sealers are considered "breathable," meaning they have vapor transpiration.

Treatment Type. The type of treatment (i.e., impregnator or topical sealer) that is applied to the stone must be determined by the type of stone and the environment of the application. All treatments must be applied in accordance with the Manufacturer's specifications.

When to Use. A treatment may be used when a defined benefit can be determined. Situations in which a benefit may be derived from the use of surface treatments include:

- Where the risk of staining is present.
- As an aid in daily maintenance procedures.
- Where a coating may help to preserve the stone finish in excessively high wear conditions.
- Where weathering has or may affect the integrity of the surface of the stone.
- To prolong the aesthetic beauty of the original installation.
- Where the risk of graffiti or other vandalism is high.

6.0 MAINTENANCE OF INTERIOR STONE

Polished-finish stone has a glossy surface that reflects light and emphasizes the color and marking of the material. It is used in interiors as wall veneer, furniture and desk tops, counter and lavatory tops, tables, and tiles for commercial and residential installations.

Honed-finish stone has a satin-smooth surface with relatively little light reflection. It is generally preferred for floors, treads, thresholds, and other pedestrian traffic locations where heavy traffic would wear off a polished finish.

Normal Maintenance. All stone flooring should be dust mopped as necessary to remove debris and dirt. A dry, untreated dust mop should be used. Normal maintenance involves periodic washing with clean, potable water and neutral (pH 7) cleaners. Soapless cleaners are preferred because they minimize streaks and film. Mild, phosphate-free, biodegradable liquid dishwashing soaps or powders or stone soaps are acceptable if rinsing is thorough.

Wet the stone surfaces with clean water. Using the cleaner solution (following Manufacturer's directions), wash in small, overlapping sweeps. Work from the bottom up if it is a vertical surface. Rinse thoroughly with clean, potable water to remove all traces of soap or cleaner solution. Change the water in the rinse pail frequently. Dry with soft cloth and allow to thoroughly air dry.

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Safety Precautions. Any flooring surface, regardless of how it is finished, can be slippery when wet. Promptly remove liquids or foreign materials that might result in safety hazards before permitting pedestrian traffic.

For honed finishes, a neutral (pH 7), mildly abrasive cleaner may be used. Use only according to Manufacturer's directions.

For counter or table tops, use coasters under all glasses, particularly those containing alcohol or citrus juices. Many common foods, drinks, and cosmetics contain acids that will etch or dull the surface of many stones. Use trivets or mats under hot dishes and place mats under china, ceramics, silver, or other objects that can scratch the surface.

In food preparation areas, the stone may need to have an impregnator or topical sealer applied. If an impregnator or topical sealer is applied, it must be nontoxic and safe for use on food preparation surfaces.

Never use any acidic cleaner or chemical on marble or limestone surfaces. It is best to use a cleaner specifically formulated for stone cleaning.

7.0 EXTERIOR STONE

Exterior stone is a general term denoting stone installed in a place where temperature, moisture, and airborne contaminants are caused primarily or solely by the forces of nature. It can be used in a honed, textured, or polished finish in any mode in an exterior environment. Uses include building cladding, walkways, steps or stairs, retaining walls, paving, fountains, benches, planters, and decorative items such as sculptures.

Normal Maintenance. In accessible areas, routinely follow maintenance procedures as specified in Section 6.0 of this chapter, as applicable.

The large expanses of stone generally found on exterior applications may make it impractical to perform normal maintenance on a frequent basis. Large installations, however, should be given periodic overall cleaning as necessary to remove accumulated pollutants. Easily accessible stone surfaces such as steps, walkways, fountains, etc., should be kept free of debris and soiling by periodically sweeping and washing with water.

Normal maintenance should include periodic inspection of stone surfaces for structural defects, movement, deterioration, or staining.

8.0 STAIN REMOVAL

Surface stains can often be removed by cleaning with an appropriate commercial cleaning product or household chemical. Identifying the type of stain is the key to removing it. Look for color, shape, and environmental factors that could be causing the staining.

8.1 Types of Stains and Removal Procedures

Oil-Based Stains (grease, tar, cooking oil, cosmetics). An oil-based stain will darken the stone and normally must be chemically dissolved so the source of the stain can be flushed or rinsed away. Clean gently with a soft liquid cleanser, household detergent, ammonia, mineral spirits, or acetone.

Organic Stains (coffee, tea, fruit, tobacco, paper, food, urine, leaves, bark, bird droppings). May cause a pinkish-brown stain and may disappear after the source of the stain has been removed. Outdoors, with the sources removed, normal sun and rain action will generally bleach out the stains. Indoors, clean with 12% hydrogen peroxide and a few drops of ammonia.

Inorganic Metal Stains (iron, rust, copper, bronze). Iron or rust stains are orange to brown in color and leave the shape of the staining object, such as nails, bolts, screws, cans, flowerpots, or metal furniture. Copper and bronze stains appear as green or muddy brown and result from the action of moisture on nearby or embedded bronze, copper, or brass items. Metal stains must be removed with a poultice (see Section 9.0 of this chapter on Poultices). Deep-seated, rusty stains are extremely difficult to remove, and the stone may be permanently stained.

Biological Stains (algae, mildew, lichens, moss, fungi). Clean with dilute (1/2 cup in a gallon of water) ammonia, bleach, or hydrogen peroxide. WARNING: DO NOT MIX BLEACH AND AMMONIA! THIS COMBINATION CREATES A TOXIC GAS!

Ink Stains (magic marker, pen, ink). Clean light-colored stones with bleach or hydrogen peroxide. Use lacquer thinner or acetone for dark-colored stones.

Paint Stains. Small amounts can be removed with lacquer thinner or scraped off carefully with a razor blade. Heavy paint coverage should be removed with a commercial liquid paint stripper. DO NOT USE ACIDS OR FLAME TOOLS TO STRIP PAINT FROM STONE.

Water Spots and Rings (surface accumulation of hard water). Buff with dry 0000 steel wool.

Fire and Smoke Damage. Older stones and smoke- or fire-stained fireplaces may require a thorough cleaning to restore their original appearance. Commercially available smoke removal products may save time and effort.

Etch Marks. Caused by acids left on the surface of the stone, some will etch the finish but not leave a stain; others will both etch and stain. Once the stain has been removed, wet the surface with clear water and sprinkle with marble polishing powder. Rub the powder into the stone with a damp cloth or by using a buffing pad with a low-speed power drill or polisher. Continue buffing until the etch mark disappears and the marble surface shines. Honing may be required for deep etching. This process may require the services of a Professional Refinisher.

Efflorescence. A white powder that may appear on the surface of the stone, it is caused by water carrying mineral salts from below the surface of the stone to the surface and evaporating. When the water evaporates, it leaves the powdery salt residue. If the installation is new, dust mop or vacuum the powder. Repeat as necessary as the stone dries out. Do not use water to remove the powder. If the problem persists, contact the Contractor to identify and remove the cause of the moisture.

9.0 POULTICES

9.1 General Application

Definition and Use. Applied to stone to remove stains, a poultice is a chemical or mixture of chemicals combined with an absorbent material, forming a thick paste. The poultice is spread over the stained area to a thickness of about ¼" to ½" with a wood or plastic spatula or scraper, covered with plastic, and left to work for 24 to 48 hours. The chemical will draw out the stain into the absorbent material. Poultice applications may have to be repeated to thoroughly remove a stain, but some stains may never be completely removed.

9.2 Materials

Poultice materials include kaolin, fuller's earth, whiting, diatomaceous earth, powdered chalk, white molding plaster, and talc. Approximately one pound of prepared poultice material will cover one square foot.

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Do not use whiting or iron-type clays such as fuller's earth with acid chemicals; the reaction will cancel the effect of the poultice. A poultice can also be prepared using white cotton balls, white paper towels, or gauze pads. Premixed poultices that require adding only water are also available from stone maintenance supply companies.

9.3 Poultice Mixtures for Various Stains

Oil-Based Stains. Poultice with baking soda and water or one of the powdered poultice materials and mineral spirits or a commercial degreaser.

Organic Stains. Poultice with one of the powdered poultice materials and 12% hydrogen peroxide solution, or use acetone instead of hydrogen peroxide.

Iron Stains. Poultice with diatomaceous earth and a commercially available rust remover. Rust stains are particularly difficult to remove; professional assistance may be required. Many rust removers contain acids that will etch marble, limestone, and certain granites.

Copper Stains. Poultice with one of the powdered poultice materials and ammonia. These stains are difficult to remove; professional assistance may be required.

Paint Stains (water-based). Poultice with one of the powdered poultice materials and a commercial paint remover.

Paint Stains (oil-based). Poultice with one of the powdered poultice materials and mineral spirits. Deep stains may require methylene chloride.

Ink Stains. Poultice with one of the powdered poultice materials and mineral spirits or methylene chloride.

Biological Stains. Poultice with one of the poultice materials and dilute ammonia or bleach or hydrogen peroxide. WARNING: DO NOT MIX AMMONIA AND BLEACH! THIS COMBINATION CREATES A TOXIC GAS!

9.4 Applying the Poultice

Prepare the poultice. If using a powdered poultice material, mix with the cleaning agent or chemical to a paste with a thick, creamy consistency. If using paper, soak in the chemical and let drain. Don't let the liquid drip.

Prepare stain area. Wet the stained area with distilled water.

Apply the poultice to the stained area about ¼" to ½" thick, and extend the poultice beyond the stained area by about 1". Use a wood or plastic scraper to spread the poultice evenly.

Cover the poultice with plastic and tape the edges to seal it. Punch several small holes in the plastic to allow vapor to escape.

Allow the poultice to dry thoroughly, usually about 24 to 48 hours. The drying process draws the stain out of the stone and into the poultice material. After about 24 hours, remove the plastic and allow the poultice to dry.

Remove the poultice from the stain. Rinse with distilled water and buff dry with a soft cloth.

Repeat the poultice application if the stain is not removed. It may take five or more applications for difficult stains.

If the surface is etched by the chemical, apply polishing powder and buff with a polishing pad recommended by the Polishing Powder Manufacturer.

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10.0 EXTERIOR BUILDING CLEANING

General. The purpose of this section is to give the Specifying Authority the basic information to prepare a specification for the cleaning of exterior building stone.

Exterior building stone is considered in this section to be all stone used on the exterior of a structure, either as a structural component or as a facing material, with the exception of polished, finished marble. Even though polished marble is not recommended for exterior use, it is occasionally used on storefronts, column facings, and similar treatments.

Regular Cleaning. The ideal in maintaining exterior building stone is to clean it at periodic intervals (at least annually, depending on atmospheric conditions) by simply hosing down with clean water. This will prevent accumulation of dirt and impurities.

Sporadic Cleaning. If cleaning the stone is not done regularly, one of the water systems (hydraulic, hydro-air, plain water) will be the most effective method at the lowest cost.

Dirt on Older Buildings. Where dirt has accumulated on older structures over a long period of time, a combination of methods may have to be employed to properly clean the stone. Plain waterjet is satisfactory for removing most accumulation. No chemicals should be used which would be injurious to the stone.

Brushes may be necessary for the removal of certain surface impurities. Soft-fiber brushes are recommended.

Test Panels. By cleaning and inspecting test panels, the Specifying Authority can determine if the method is satisfactory. This procedure eliminates the possibility of improper cleaning, since the Owner and Specifying Authority can see what results will be obtained prior to commencement of the total contract. It also gives the Cleaning Contractor a standard to work toward, making definition of the cleaning more specific for all parties concerned.

Further Reading Suggestions:

Cleaning Masonry – Review of the Literature
by Grimm, Clayford T., P.E.
Construction Research Center,
University of Texas at Arlington, 1988.

Cleaning Stone and Masonry
Clifton, James R., Editor.
ASTM Special Technical Publication 935,
American Society for Testing and Materials, 1983.

Keeping It Clean
by Grimmer, Anne E.
U.S. Department of the Interior,
National Park Service, Washington, DC: U.S. Government Printing Office, 1988.

"Cleaning of Masonry Interiors of Public Buildings," Cleaning Stone and Masonry by Roth, J.W., ASTM STP 935, 1986.

"Chemical Cleaning of Historical Structures – A Practical Approach," Cleaning Stone and Masonry by Rudder, T.H., ASTM STP 935, 1986.

"A Case Study of the Cleaning of Marble at the Schenectady, New York, City Hall," Cleaning Stone and Masonry, by Waite, J.C. and R.J. Chen, ASTM STP 935, 1986.

"A Macrosteriogrammetric Technique for Measuring Surface Erosion Losses on Stone," Cleaning Stone and Masonry by Winkler, E.M., ASTM STP 935, 1986.

Stain Removal Guide for Stone and Masonry
by Hueston, Frederick M., NTC Enterprises Inc.

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Historic Stone & Tile Restoration Manual
by Hueston, Frederick M., NTC Enterprises Inc., 1998.

11.0 SPECIFICATIONS BUILDING CLEANING

11.1 General

Information to be shown on drawings:

Location, size, or area and items to be cleaned..

Location, size, and number of test panels.

Areas not included in cleaning contract.

Location, size, and description of materials requiring protection.

Building and property boundaries.

11.2 Description

General. This section pertains to the furnishing of all labor, materials, equipment, and services necessary for the complete cleaning of exterior building stone as indicated on the plans and described in the specifications.

Repointing, Sealing, and Replacement. Repointing or sealing of joints and replacement of stone are not included in the cleaning contract.

Related Sections. To be determined by design requirements.

11.3 Requirements

General. The Plans, General Conditions, Supplementary General Conditions, and Executed Agreement are all a part of this section as if written out in full.

Certification. Furnish certified statements, as required, attesting that all materials to be used meet the requirements specified and approved.

Scheduling. Furnish Specifying Authority with schedule of cleaning operations indicating time of day work will be performed. The "wet method" of cleaning shall not be performed when temperatures reach 35°F or lower.

Test Area(s). Clean for approval by Specifying Authority at least a 4' x 4' test area for each type of soiling, stone variety, and finish required to be cleaned. Test panels shall be so located to include intersection of horizontal and vertical joints. The approved panel(s) shall be the standard for cleaning methods and finish of all areas to be cleaned.

Protection. Furnish for approval by Specifying Authority types of materials and methods to be used in the protection of adjacent materials and surfaces from damage, moisture, and staining. If other refurbishing operations are being conducted, protect cleaned stone areas with an approved nonstaining covering.

Cleaning. After the surface has been cleaned, it shall be rinsed with potable water applied at the temperature and pressure of the municipal water supply.

11.4 Materials

Water shall be potable, nonstaining, and free of materials detrimental to the surface being cleaned.

11.5 Methods

To be determined by approved test area(s).

Hydraulic. Water at varying pressures between 300 and 600 psi and at municipal supply temperatures shall be jetted against the surface to be cleaned. Care must be exercised

in selecting nozzle tip degree; 0 (zero) nozzle tips are never to be used.

Water Misting. Cleaning the surface with water. Misting heads are set up on scaffolding and water is misted onto the surface of the building. The misting heads may be set on a timer so that they go on and off intermittently. The intermittent cycle allows the building to dry and prevents over-saturation of the stone. This method is the safest for cleaning and is widely used on historical buildings.

Pressure washing employs the use of high-pressure waterjets of up to 2500 psi or more. Pressure washing works by blasting the dirt off the surface of the stone, and can cause irreversible damage to the stone surface. Pressure should never exceed 1000 psi and only a fan-tip spray nozzle should be used. This method should be employed only by highly trained technicians.

Chemical Cleaning is used in combination with one or several of the water washing methods to dislodge soiled particles. Chemicals can be dangerous to the stone, the Operator, and the surrounding landscape; therefore, all chemicals used must be tested and monitored.

Acids. Chemicals with a pH less than 7 should not be used on calcareous or dolomitic stones.

Alkalis. Chemicals with a pH greater than 7 are safe for use on most stones. These are usually followed with a mild acid wash to neutralize the alkaline salts.

Neutral Cleaners. Chemicals containing surfactants with a pH equal to 7 are safe for most stones.

Solvents. Waterless chemicals such as mineral spirits and acetone. Rarely used for building cleaning due to their high flammability.

Bacteria. Application of special bacteria to "eat" dirt and salts.

J.O.S. System for removal of dirt and graffiti. Uses low-pressure washer and milled glass or dolomite powder. Prerinse required.

Dry Cleaning. Uses organic powder or mineral powder (aluminum silicate) crystals sized between 10 and 90 microns.

Sandblasting should never be used to clean stone surfaces.

Safety Requirements. All of these methods require specialized equipment. Adherence to OSHA safety requirements by highly skilled technicians is mandatory.

Testing. All methods must be tested for potential damage to the stone.

<u>MIA Bookstore Resources</u>:
A consumer brochure, "Care & Cleaning of Natural Stone Surfaces," can be purchased separately from the MIA Bookstore.

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DIVISION 15 – MECHANICAL & PLUMBING

FIRE PROTECTION – CENTURY FIRE PROTECTION

WARRANTY AGREEMENT

Project: Belle Hall Condominiums

Owner: Belle Hall Direct 101, LP
Contractor: TCR NC Construction I Limited Partnership

Subcontractor: Century Fire

Subcontractor hereby expressly warrants and guarantees that all labor, materials, and equipment furnished and work performed in conjunction with the above referenced project are in accordance with the plans, specifications, the Subcontract Agreement and authorized modifications thereto. All labor, materials and equipment shall be free from defects, due to defective materials and/or workmanship, for a period of one (1) year from the date of Certificate of Occupancy for each building/structure, unless otherwise stated in the Subcontract Agreement.

Should any defects develop during the warranty period due to improper workmanship and/or arrangement, the same shall, upon notice, be made good by this Subcontractor at no expense to the Contractor, Owner, or Owner's Representative. Nothing in the above shall be deemed to apply to work or equipment which has been abused, neglected or altered by the Contractor, Owner, or Owner's Representative.

Unless otherwise stated in the Subcontract Agreement, warranty work shall be responded to within twenty-four (24) hours of notification by the Contractor, Owner, or Owner's Representative, including weekends and holidays. Warranty notices received before 10:00 am shall be responded to on the same day. Should Subcontractor fail to respond within twenty-four (24) hours of notification or correct the defective work or equipment within seventy-two (72) hours, the Contractor, Owner, or Owner's Representative shall proceed with the correction of the defective work. All costs associated with this corrective action shall be reimbursed by this Subcontractor or charged against its account. Subcontractor shall remit payment for such charges within five (5) calendar days of notification by the Contractor, Owner, or Owner's Representative.

Signature: Scott Tutterow

Printed Name: Scott Tutterow

Position/Title: President

Date: 12-11-06

Test Certificate For Aboveground Piping

Century Fire Protection, LLC
2625-F Pinemeadow Court
Duluth, Georgia 30096

BDS #1

PROCEDURE: Upon completion of work, inspection and tests shall be made by the contractor's representative and witnessed by an owner's representative. All defects shall be corrected and system left in service before contractor's personnel finally leave the job. A certificate shall be filled out and signed by both representatives. Copies shall be prepared for approving authorities, owners, and contractor. It is understood the owner's representative's signature in no way prejudices any claim against contractor for faulty material, poor workmanship, or failure to comply with approving authority's requirements or local ordinances.

PROPERTY NAME: BELLE HALL CONDOS — **DATE:** May 1, 2006

PROPERTY ADDRESS: 1000 S. EGYPT RD.; MT. PLEASANT, SC 29464

PLANS

ACCEPTED BY APPROVING A.H.J. (NAME): CITY OF MT. PLEASANT
AHJ ADDRESS: 100 ANN EDWARDS LN.; MT. PLEASANT, SC 29464

INSTALLATION CONFORMS TO ACCEPTED PLANS	☒ YES	☐ NO
EQUIPMENT USED IS APPROVED	☒ YES	☐ NO
IF NO, STATE DEVIATIONS		

INSTRUCTIONS

HAS PERSON IN CHARGE OF FIRE EQUIPMENT BEEN INSTRUCTED AS TO LOCATION OF CONTROL VALVES AND CARE AND MAINTENANCE OF THE NEW EQUIPMENT?	☒ YES	☐ NO
IF NO, EXPLAIN:		
HAVE COPIES OF THE FOLLOWING BEEN LEFT ON THE PREMISES:		
SYSTEM COMPONENTS INSTRUCTIONS	☒ YES	☐ NO
CARE AND MAINTENANCE INSTRUCTIONS	☒ YES	☐ NO
NFPA 13	☒ YES	☐ NO

LOCATION: SUPPLIES BUILDINGS: BUILDING #1

SPRINKLERS

MAKE	MODEL	YEAR OF MANUFACTURE	ORIFICE SIZE	QUANTITY	TEMPERATURE RATING
TYCO	TY2234	2005	½"	224	155
TYCO	TY3231	2005	½"	36	200
TYCO	TY3131	2005	½"	1	155
VIKING	VK188	2005	½"	44	155

PIPE AND FITTINGS

TYPE OF PIPE: SCH7 AND SCH30 BLACK STEEL
TYPE OF FITTINGS: CAST IRON AND GROOVED

ALARM VALVE OR FLOW INDICATOR

ALARM DEVICE			MAXIMUM TIME TO OPERATE THROUGH TEST CONNECTION	
TYPE	MAKE	MODEL	MINUTES	SECONDS
FLOW SWITCH	SYSTEM SENSOR	WFD-25		

DRY PIPE OPERATING TEST

DRY VALVE			Q.O.D.		
MAKE	MODEL	SERIAL #	MAKE	MODEL	SERIAL #
N/A	N/A	N/A			

	TIME TO TRIP THRU TEST CONNECTION		WATER PRESSURE	AIR PRESSURE	TRIP POINT AIR PRESSURE	TIME WATER REACHED TEST OUTLET		ALARM OPERATED PROPERLY	
	MIN.	SEC.	PSI	PSI	PSI	MIN.	SEC.	YES	NO
WITHOUT Q.O.D.								☐	☐
WITH Q.O.D.								☐	☐

IF NO, EXPLAIN:

DELUGE AND PREACTION VALVES

OPERATION ☐ PNEUMATIC ☐ ELECTRIC ☐ HYDRAULIC

PIPING SUPERVISED ☐ YES ☐ NO — DETECTING MEDIA SUPERVISED	☐ YES	☐ NO
DOES VALVE OPERATE FROM THE MANUAL TRIP AND/OR REMOTE CONTROL STATIONS	☐ YES	☐ NO
IS THERE AN ACCESSIBLE FACILITY IN EACH CIRCUIT FOR TESTING	☐ YES	☐ NO
IF NO, EXPLAIN:		
DOES EACH CIRCUIT OPERATE SUPERVISION LOSS ALARM	☐ YES	☐ NO
DOES EACH CIRCUIT OPERATE VALVE RELEASE	☐ YES	☐ NO
MAXIMUM TIME TO OPERATE RELEASE	MIN.	SEC.

PRESSURE REDUCING VALVE TEST

LOCATION & FLOOR	MAKE	MODEL	SETTING	STATIC PRESSURE (PSI)		RESIDUAL PRESSURE (PSI)		FLOW RATE (GPM)
				INLET	OUTLET	INLET	OUTLET	FLOW

TEST DESCRIPTION

HYDROSTATIC: Hydrostatic tests shall be made at not less than 200 psi (13.6 bars) for two hours or 50 psi (3.4 bars) above static pressure in excess of 150 psi (10.2 bars) for two hours. Differential dry-pipe valve clappers shall be left open during test to prevent damage. All aboveground piping leakage shall be stopped.

PNEUMATIC: Establish 40 psi (2.7 bars) air pressure and measure drop which shall not exceed 1-1/2 psi (0.1 bars) in 24 hours. Test pressure tanks at normal water level and air pressure and measure air pressure drop which shall not exceed 1-1/2 psi (0.1 bars) in 24 hours.

TESTS

ALL PIPING HYDROSTATICALLY TESTED AT 200 PSI FOR 2 HOURS

DRY PIPING PNEUMATICALLY TESTED ☐ YES ☐ NO

EQUIPMENT OPERATES PROPERLY ☒ YES ☐ NO

DO YOU CERTIFY AS THE SPRINKLER CONTRACTOR THAT ADDITIVES AND CORROSIVE CHEMICALS, SODIUM SILICATE OR DERIVATIVES OF SODIUM SILICATE, BRINE, OR OTHER CORROSIVE CHEMICALS WERE NOT USED FOR TESTING SYSTEMS OR STOPPING LEAKS? ☐ YES ☐ NO

DRAIN TEST	READING OF GAUGE LOCATED NEAR WATER SUPPLY TEST CONNECTION: PSI	RESIDUAL PRESSURE WITH VALVE IN TEST CONNECTION WIDE OPEN: PSI

UNDERGROUND MAINS AND LEAD IN CONNECTIONS TO SYSTEM RISERS FLUSHED BEFORE CONNECTION MADE TO SPRINKLER PIPING VERIFIED BY COPY OF THE U FORM NO. 858 ☐ YES ☐ NO

FLUSHED BY INSTALLER OF UNDERGROUND SPRINKLER PIPING ☐ YES ☐ NO

IF POWER DRIVEN FASTENERS ARE USED IN CONCRETE, HAS REPRESENTATIVE SAMPLE TESTING BEEN SATISFACTORILY COMPLETED? ☐ YES ☐ NO

IF NO, PLEASE EXPLAIN:

BLANK TESTING GASKETS

NUMBER USED	LOCATIONS	NUMBER REMOVED

WELDING

WELDED PIPING ☒ YES ☐ NO IF YES, ANSWER THE FOLLOWING:

DO YOU CERTIFY AS THE SPRINKLER CONTRACTOR THAT WELDING PROCEDURES COMPLY WITH THE REQUIREMENTS OF AT LEAST AWS D10.9 LEVEL AR-3? ☒ YES ☐ NO

DO YOU CERTIFY THAT THE WELDING WAS PERFORMED BY WELDERS QUALIFIED IN COMPLIANCE WITH THE REQUIREMENTS OF AT LEAST AWS D10.9, LEVELAR -3? ☒ YES ☐ NO

DO YOU CERTIFY THAT WELDING WAS CARRIED OUT IN COMPLIANCE WITH A DOCUMENTED QUALITY CONTROL PROCEDURE TO INSURE THAT ALL DISCS ARE RETRIEVED, THAT OPENINGS IN PIPING ARE SMOOTH, THAT SLAG AND OTHER WELDING RESIDUE ARE REMOVED, AND THAT THE INTERNAL DIAMETERS OF PIPING ARE NOT PENETRATED? ☒ YES ☐ NO

CUTOUTS (DISCS)

DO YOU CERTIFY THAT YOU HAVE A CONTROL FEATURE TO ENSURE THAT ALL CUTOUT (DISCS) ARE RETRIEVED? ☐ YES ☐ NO

HYDRAULIC NAMEPLATE

NAME PLATE PROVIDED? ☒ YES ☐ NO

IF NO, EXPLAIN:

REMARKS

DATE LEFT IN SERVICE WITH ALL CONTROL VALVES OPEN:

SIGNATURES

NAME OF SPRINKLER CONTRACTOR: CENTURY FIRE PROTECTION

TEST WITNESSED BY:

FOR PROPERTY OWNER:	TITLE:	DATE:
[signature]	Fire Marshal	5.2.06
FOR SPRINKLER CONTRACTOR:	TITLE:	DATE:
[signature]	Foreman	6-1-06

Test Certificate For Aboveground Piping

Century Fire Protection, LLC
2625-F Pinemeadow Court
Duluth, Georgia 30096

Bldg 7

PROCEDURE: Upon completion of work, inspection and tests shall be made by the contractor's representative and witnessed by an owner's representative. All defects shall be corrected and system left in service before contractor's personnel finally leave the job. A certificate shall be filled out and signed by both representatives. Copies shall be prepared for approving authorities, owners, and contractor. It is understood the owner's representative's signature in no way prejudices any claim against contractor for faulty material, poor workmanship, or failure to comply with approving authority's requirements or local ordinances.

PROPERTY NAME: BELLE HALL CONDOS — **DATE:** May 1, 2006

PROPERTY ADDRESS: 1000 S. EGYPT RD.; MT. PLEASANT, SC 29464

PLANS

ACCEPTED BY APPROVING A.H.J. (NAME): CITY OF MT. PLEASANT
AHJ ADDRESS: 100 ANN EDWARDS LN.; MT. PLEASANT, SC 29464

INSTALLATION CONFORMS TO ACCEPTED PLANS	☒ YES	☐ NO
EQUIPMENT USED IS APPROVED	☒ YES	☐ NO
IF NO, STATE DEVIATIONS		

INSTRUCTIONS

HAS PERSON IN CHARGE OF FIRE EQUIPMENT BEEN INSTRUCTED AS TO LOCATION OF CONTROL VALVES AND CARE AND MAINTENANCE OF THE NEW EQUIPMENT?	☒ YES	☐ NO
IF NO, EXPLAIN:		
HAVE COPIES OF THE FOLLOWING BEEN LEFT ON THE PREMISES:		
SYSTEM COMPONENTS INSTRUCTIONS	☒ YES	☐ NO
CARE AND MAINTENANCE INSTRUCTIONS	☒ YES	☐ NO
NFPA 13	☒ YES	☐ NO

LOCATION

SUPPLIES BUILDINGS: BUILDING #2

SPRINKLERS

MAKE	MODEL	YEAR OF MANUFACTURE	ORIFICE SIZE	QUANTITY	TEMPERATURE RATING
TYCO	TY2234	2005	½"	211	155
TYCO	TY3231	2005	½"	34	200
TYCO	TY3131	2005	½"	1	155
VIKING	VK188	2005	½"	44	155

PIPE AND FITTINGS

TYPE OF PIPE: SCH7 AND SCH30 BLACK STEEL
TYPE OF FITTINGS: CAST IRON AND GROOVED

ALARM VALVE OR FLOW INDICATOR

ALARM DEVICE			MAXIMUM TIME TO OPERATE THROUGH TEST CONNECTION	
TYPE	MAKE	MODEL	MINUTES	SECONDS
FLOW SWITCH	SYSTEM SENSOR	WFD-25		

DRY PIPE OPERATING TEST

DRY VALVE			Q.O.D.		
MAKE	MODEL	SERIAL #	MAKE	MODEL	SERIAL #
N/A	N/A	N/A			

	TIME TO TRIP THRU TEST CONNECTION		WATER PRESSURE	AIR PRESSURE	TRIP POINT AIR PRESSURE	TIME WATER REACHED TEST OUTLET		ALARM OPERATED PROPERLY	
	MIN.	SEC.	PSI	PSI	PSI	MIN.	SEC.	YES	NO
WITHOUT Q.O.D.								☐	☐
WITH Q.O.D.								☐	☐

IF NO, EXPLAIN:

DELUGE AND PREACTION VALVES

OPERATION ☐ PNEUMATIC ☐ ELECTRIC ☐ HYDRAULIC

PIPING SUPERVISED	☐ YES	☐ NO	DETECTING MEDIA SUPERVISED	☐ YES ☐ NO
DOES VALVE OPERATE FROM THE MANUAL TRIP AND/OR REMOTE CONTROL STATIONS				☐ YES ☐ NO
IS THERE AN ACCESSIBLE FACILITY IN EACH CIRCUIT FOR TESTING				☐ YES ☐ NO
IF NO, EXPLAIN:				
DOES EACH CIRCUIT OPERATE SUPERVISION LOSS ALARM			☐ YES	☐ NO
DOES EACH CIRCUIT OPERATE VALVE RELEASE			☐ YES	☐ NO
MAXIMUM TIME TO OPERATE RELEASE			MIN.	SEC.

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Bldg #2

PRESSURE REDUCING VALVE TEST

LOCATION & FLOOR	MAKE	MODEL	SETTING	STATIC PRESSURE (PSI) INLET	STATIC PRESSURE (PSI) OUTLET	RESIDUAL PRESSURE (PSI) INLET	RESIDUAL PRESSURE (PSI) OUTLET	FLOW RATE (GPM) FLOW

TEST DESCRIPTION

HYDROSTATIC: Hydrostatic tests shall be made at not less than 200 psi (13.6 bars) for two hours or 50 psi (3.4 bars) above static pressure in excess of 150 psi (10.2 bars) for two hours. Differential dry-pipe valve clappers shall be left open during test to prevent damage. All aboveground piping leakage shall be stopped.

PNEUMATIC: Establish 40 psi (2.7 bars) air pressure and measure drop which shall not exceed 1-1/2 psi (0.1 bars) in 24 hours. Test pressure tanks at normal water level and air pressure and measure air pressure drop which shall not exceed 1-1/2 psi (0.1 bars) in 24 hours.

TESTS

ALL PIPING HYDROSTATICALLY TESTED AT 200 PSI FOR 2 HOURS

DRY PIPING PNEUMATICALLY TESTED ☐ YES ☐ NO

EQUIPMENT OPERATES PROPERLY ☒ YES ☐ NO

DO YOU CERTIFY AS THE SPRINKLER CONTRACTOR THAT ADDITIVES AND CORROSIVE CHEMICALS, SODIUM SILICATE OR DERIVATIVES OF SODIUM SILICATE, BRINE, OR OTHER CORROSIVE CHEMICALS WERE NOT USED FOR TESTING SYSTEMS OR STOPPING LEAKS? ☐ YES ☐ NO

DRAIN TEST	READING OF GAUGE LOCATED NEAR WATER SUPPLY TEST CONNECTION: PSI	RESIDUAL PRESSURE WITH VALVE IN TEST CONNECTION WIDE OPEN: PSI

UNDERGROUND MAINS AND LEAD IN CONNECTIONS TO SYSTEM RISERS FLUSHED BEFORE CONNECTION MADE TO SPRINKLER PIPING VERIFIED BY COPY OF THE U FORM NO. 85B ☐ YES ☐ NO

FLUSHED BY INSTALLER OF UNDERGROUND SPRINKLER PIPING ☐ YES ☐ NO

IF POWER DRIVEN FASTENERS ARE USED IN CONCRETE, HAS REPRESENTATIVE SAMPLE TESTING BEEN SATISFACTORILY COMPLETED? ☐ YES ☐ NO

IF NO, PLEASE EXPLAIN:

BLANK TESTING GASKETS

NUMBER USED	LOCATIONS	NUMBER REMOVED

WELDING

WELDED PIPING ☒ YES ☐ NO IF YES, ANSWER THE FOLLOWING:

DO YOU CERTIFY AS THE SPRINKLER CONTRACTOR THAT WELDING PROCEDURES COMPLY WITH THE REQUIREMENTS OF AT LEAST AWS D10.9 LEVEL AR-3? ☒ YES ☐ NO

DO YOU CERTIFY THAT THE WELDING WAS PERFORMED BY WELDERS QUALIFIED IN COMPLIANCE WITH THE REQUIREMENTS OF AT LEAST AWS D10.9, LEVELAR -3? ☒ YES ☐ NO

DO YOU CERTIFY THAT WELDING WAS CARRIED OUT IN COMPLIANCE WITH A DOCUMENTED QUALITY CONTROL PROCEDURE TO INSURE THAT ALL DISCS ARE RETRIEVED, THAT OPENINGS IN PIPING ARE SMOOTH, THAT SLAG AND OTHER WELDING RESIDUE ARE REMOVED, AND THAT THE INTERNAL DIAMETERS OF PIPING ARE NOT PENETRATED? ☒ YES ☐ NO

CUTOUTS (DISCS)

DO YOU CERTIFY THAT YOU HAVE A CONTROL FEATURE TO ENSURE THAT ALL CUTOUT (DISCS) ARE RETRIEVED? ☐ YES ☐ NO

HYDRAULIC NAMEPLATE

NAME PLATE PROVIDED? ☒ YES ☐ NO

IF NO, EXPLAIN:

REMARKS

DATE LEFT IN SERVICE WITH ALL CONTROL VALVES OPEN:

SIGNATURES

NAME OF SPRINKLER CONTRACTOR: CENTURY FIRE PROTECTION

TEST WITNESSED BY:

FOR PROPERTY OWNER:	TITLE:	DATE:
[signature]	Fire Marshal	6-1-06
FOR SPRINKLER CONTRACTOR:	**TITLE:**	**DATE:**
Jamie Setzer	Foreman	6-1-06

ROA_01462

Test Certificate For Aboveground Piping

Century Fire Protection, LLC
2625-F Pinemeadow Court
Duluth, Georgia 30096

B1823

PROCEDURE: Upon completion of work, inspection and tests shall be made by the contractor's representative and witnessed by an owner's representative. All defects shall be corrected and system left in service before contractor's personnel finally leave the job. A certificate shall be filled out and signed by both representatives. Copies shall be prepared for approving authorities, owners, and contractor. It is understood the owner's representative's signature in no way prejudices any claim against contractor for faulty material, poor workmanship, or failure to comply with approving authority's requirements or local ordinances.

PROPERTY NAME: BELLE HALL CONDOS

DATE: May 1, 2006

PROPERTY ADDRESS: 1000 S. EGYPT RD.; MT. PLEASANT, SC 29464

PLANS

ACCEPTED BY APPROVING A.H.J. (NAME): CITY OF MT. PLEASANT
AHJ ADDRESS: 100 ANN EDWARDS LN.; MT. PLEASANT, SC 29464
INSTALLATION CONFORMS TO ACCEPTED PLANS — ☒ YES ☐ NO
EQUIPMENT USED IS APPROVED — ☒ YES ☐ NO
IF NO, STATE DEVIATIONS

INSTRUCTIONS

HAS PERSON IN CHARGE OF FIRE EQUIPMENT BEEN INSTRUCTED AS TO LOCATION OF CONTROL VALVES AND CARE AND MAINTENANCE OF THE NEW EQUIPMENT? — ☒ YES ☐ NO
IF NO, EXPLAIN:

HAVE COPIES OF THE FOLLOWING BEEN LEFT ON THE PREMISES:
SYSTEM COMPONENTS INSTRUCTIONS — ☒ YES ☐ NO
CARE AND MAINTENANCE INSTRUCTIONS — ☒ YES ☐ NO
NFPA 13 — ☒ YES ☐ NO

LOCATION

SUPPLIES BUILDINGS: BUILDING #3

SPRINKLERS

MAKE	MODEL	YEAR OF MANUFACTURE	ORIFICE SIZE	QUANTITY	TEMPERATURE RATING
TYCO	TY2234	2005	½"	117	155
TYCO	TY3231	2005	½"	18	200
TYCO	TY3131	2005	½"	1	155
VIKING	VK188	2005	½"	23	155

PIPE AND FITTINGS

TYPE OF PIPE: SCH7 AND SCH30 BLACK STEEL
TYPE OF FITTINGS: CAST IRON AND GROOVED

ALARM VALVE OR FLOW INDICATOR

ALARM DEVICE			MAXIMUM TIME TO OPERATE THROUGH TEST CONNECTION	
TYPE	MAKE	MODEL	MINUTES	SECONDS
FLOW SWITCH	SYSTEM SENSOR	WFD-25		

DRY PIPE OPERATING TEST

DRY VALVE			Q.O.D.		
MAKE	MODEL	SERIAL #	MAKE	MODEL	SERIAL #
N/A	N/A	N/A			

	TIME TO TRIP THRU TEST CONNECTION		WATER PRESSURE	AIR PRESSURE	TRIP POINT AIR PRESSURE	TIME WATER REACHED TEST OUTLET		ALARM OPERATED PROPERLY	
	MIN.	SEC.	PSI	PSI	PSI	MIN.	SEC.	YES	NO
WITHOUT Q.O.D.								☐	☐
WITH Q.O.D.								☐	☐

IF NO, EXPLAIN:

DELUGE AND PREACTION VALVES

OPERATION — ☐ PNEUMATIC ☐ ELECTRIC ☐ HYDRAULIC
PIPING SUPERVISED ☐ YES ☐ NO — DETECTING MEDIA SUPERVISED — ☐ YES ☐ NO
DOES VALVE OPERATE FROM THE MANUAL TRIP AND/OR REMOTE CONTROL STATIONS — ☐ YES ☐ NO
IS THERE AN ACCESSIBLE FACILITY IN EACH CIRCUIT FOR TESTING — ☐ YES ☐ NO
IF NO, EXPLAIN:

DOES EACH CIRCUIT OPERATE SUPERVISION LOSS ALARM — ☐ YES ☐ NO
DOES EACH CIRCUIT OPERATE VALVE RELEASE — ☐ YES ☐ NO
MAXIMUM TIME TO OPERATE RELEASE — MIN. SEC.

PRESSURE REDUCING VALVE TEST

LOCATION & FLOOR	MAKE	MODEL	SETTING	STATIC PRESSURE (PSI)		RESIDUAL PRESSURE (PSI)		FLOW RATE (GPM)
				INLET	OUTLET	INLET	OUTLET	FLOW

TEST DESCRIPTION

HYDROSTATIC: Hydrostatic tests shall be made at not less than 200 psi (13.6 bars) for two hours or 50 psi (3.4 bars) above static pressure in excess of 150 psi (10.2 bars) for two hours. Differential dry-pipe valve clappers shall be left open during test to prevent damage. All aboveground piping leakage shall be stopped.

PNEUMATIC: Establish 40 psi (2.7 bars) air pressure and measure drop which shall not exceed 1-1/2 psi (0.1 bars) in 24 hours. Test pressure tanks at normal water level and air pressure and measure air pressure drop which shall not exceed 1-1/2 psi (0.1 bars) in 24 hours.

TESTS

ALL PIPING HYDROSTATICALLY TESTED AT 200 PSI FOR 2 HOURS

DRY PIPING PNEUMATICALLY TESTED

EQUIPMENT OPERATES PROPERLY ☐ YES ☒ YES ☐ NO ☐ NO

DO YOU CERTIFY AS THE SPRINKLER CONTRACTOR THAT ADDITIVES AND CORROSIVE CHEMICALS, SODIUM SILICATE OR DERIVATIVES OF SODIUM SILICATE, BRINE, OR OTHER CORROSIVE CHEMICALS WERE NOT USED FOR TESTING SYSTEMS OR STOPPING LEAKS? ☐ YES ☐ NO

DRAIN TEST	READING OF GAUGE LOCATED NEAR WATER SUPPLY TEST CONNECTION: PSI	RESIDUAL PRESSURE WITH VALVE IN TEST CONNECTION WIDE OPEN: PSI

UNDERGROUND MAINS AND LEAD IN CONNECTIONS TO SYSTEM RISERS FLUSHED BEFORE CONNECTION MADE ☐ YES ☐ NO

TO SPRINKLER PIPING VERIFIED BY COPY OF THE U FORM NO. 858 ☐ YES ☐ NO

FLUSHED BY INSTALLER OF UNDERGROUND SPRINKLER PIPING ☐ YES ☐ NO

IF POWER DRIVEN FASTENERS ARE USED IN CONCRETE, HAS REPRESENTATIVE SAMPLE TESTING BEEN SATISFACTORILY COMPLETED? ☐ YES ☐ NO

IF NO, PLEASE EXPLAIN:

BLANK TESTING GASKETS

NUMBER USED	LOCATIONS	NUMBER REMOVED

WELDING

WELDED PIPING ☒ YES ☐ NO IF YES, ANSWER THE FOLLOWING:

DO YOU CERTIFY AS THE SPRINKLER CONTRACTOR THAT WELDING PROCEDURES COMPLY WITH THE REQUIREMENTS OF AT LEAST AWS D10.9 LEVEL AR-3? ☒ YES ☐ NO

DO YOU CERTIFY THAT THE WELDING WAS PERFORMED BY WELDERS QUALIFIED IN COMPLIANCE WITH THE REQUIREMENTS OF AT LEAST AWS D10.9, LEVELAR -3? ☒ YES ☐ NO

DO YOU CERTIFY THAT WELDING WAS CARRIED OUT IN COMPLIANCE WITH A DOCUMENTED QUALITY CONTROL PROCEDURE TO INSURE THAT ALL DISCS ARE RETRIEVED, THAT OPENINGS IN PIPING ARE SMOOTH, THAT SLAG AND OTHER WELDING RESIDUE ARE REMOVED, AND THAT THE INTERNAL DIAMETERS OF PIPING ARE NOT PENETRATED? ☒ YES ☐ NO

CUTOUTS (DISCS)

DO YOU CERTIFY THAT YOU HAVE A CONTROL FEATURE TO ENSURE THAT ALL CUTOUT (DISCS) ARE RETRIEVED? ☐ YES ☐ NO

HYDRAULIC NAMEPLATE

NAME PLATE PROVIDED? ☒ YES ☐ NO

IF NO, EXPLAIN:

REMARKS

DATE LEFT IN SERVICE WITH ALL CONTROL VALVES OPEN:

SIGNATURES

NAME OF SPRINKLER CONTRACTOR: CENTURY FIRE PROTECTION

TEST WITNESSED BY:

FOR PROPERTY OWNER: [signature] TITLE: Fire Marshal DATE: 6-1-06

FOR SPRINKLER CONTRACTOR: [signature] TITLE: Foreman DATE: 6-1-06

Test Certificate For Aboveground Piping

Century Fire Protection, LLC
2626-F Pinemeadow Court
Duluth, Georgia 30096

3103 X

PROCEDURE: Upon completion of work, inspection and tests shall be made by the contractor's representative and witnessed by an owner's representative. All defects shall be corrected and system left in service before contractor's personnel finally leave the job. A certificate shall be filled out and signed by both representatives. Copies shall be prepared for approving authorities, owners, and contractor. It is understood the owner's representative's signature in no way prejudices any claim against contractor for faulty material, poor workmanship, or failure to comply with approving authority's requirements or local ordinances.

PROPERTY NAME: BELLE HALL CONDOS — **DATE:** May 1, 2006

PROPERTY ADDRESS: 1000 S. EGYPT RD.; MT. PLEASANT, SC 29464

PLANS

ACCEPTED BY APPROVING A.H.J. (NAME): CITY OF MT. PLEASANT
AHJ ADDRESS: 100 ANN EDWARDS LN.; MT. PLEASANT, SC 29464
INSTALLATION CONFORMS TO ACCEPTED PLANS — ☒ YES ☐ NO
EQUIPMENT USED IS APPROVED — ☒ YES ☐ NO
IF NO, STATE DEVIATIONS

INSTRUCTIONS

HAS PERSON IN CHARGE OF FIRE EQUIPMENT BEEN INSTRUCTED AS TO LOCATION OF CONTROL VALVES AND CARE AND MAINTENANCE OF THE NEW EQUIPMENT? — ☒ YES ☐ NO
IF NO, EXPLAIN:

HAVE COPIES OF THE FOLLOWING BEEN LEFT ON THE PREMISES:
SYSTEM COMPONENTS INSTRUCTIONS — ☒ YES ☐ NO
CARE AND MAINTENANCE INSTRUCTIONS — ☒ YES ☐ NO
NFPA 13 — ☒ YES ☐ NO

LOCATION

SUPPLIES BUILDINGS: BUILDING #4

SPRINKLERS

MAKE	MODEL	YEAR OF MANUFACTURE	ORIFICE SIZE	QUANTITY	TEMPERATURE RATING
TYCO	TY2234	2005	½"	190	155
TYCO	TY3231	2005	½"	30	200
TYCO	TY3131	2005	½"	1	155
VIKING	VK188	2005	½"	38	155

PIPE AND FITTINGS

TYPE OF PIPE: SCH7 AND SCH30 BLACK STEEL
TYPE OF FITTINGS: CAST IRON AND GROOVED

ALARM VALVE OR FLOW INDICATOR

ALARM DEVICE			MAXIMUM TIME TO OPERATE THROUGH TEST CONNECTION	
TYPE	MAKE	MODEL	MINUTES	SECONDS
FLOW SWITCH	SYSTEM SENSOR	WFD-25		

DRY PIPE OPERATING TEST

DRY VALVE			Q.O.D.		
MAKE	MODEL	SERIAL #	MAKE	MODEL	SERIAL #
N/A	N/A	N/A			

	TIME TO TRIP THRU TEST CONNECTION		WATER PRESSURE	AIR PRESSURE	TRIP POINT AIR PRESSURE	TIME WATER REACHED TEST OUTLET		ALARM OPERATED PROPERLY	
	MIN.	SEC.	PSI	PSI	PSI	MIN.	SEC.	YES	NO
WITHOUT Q.O.D.								☐	☐
WITH Q.O.D.								☐	☐

IF NO, EXPLAIN:

DELUGE AND PREACTION VALVES

OPERATION — ☐ PNEUMATIC ☐ ELECTRIC ☐ HYDRAULIC
PIPING SUPERVISED — ☐ YES ☐ NO
DETECTING MEDIA SUPERVISED — ☐ YES ☐ NO
DOES VALVE OPERATE FROM THE MANUAL TRIP AND/OR REMOTE CONTROL STATIONS — ☐ YES ☐ NO
IS THERE AN ACCESSIBLE FACILITY IN EACH CIRCUIT FOR TESTING — ☐ YES ☐ NO
IF NO, EXPLAIN:

DOES EACH CIRCUIT OPERATE SUPERVISION LOSS ALARM — ☐ YES ☐ NO
DOES EACH CIRCUIT OPERATE VALVE RELEASE — ☐ YES ☐ NO
MAXIMUM TIME TO OPERATE RELEASE — MIN. — SEC.

PRESSURE REDUCING VALVE TEST

LOCATION & FLOOR	MAKE	MODEL	SETTING	STATIC PRESSURE (PSI)		RESIDUAL PRESSURE (PSI)		FLOW RATE (GPM)
				INLET	OUTLET	INLET	OUTLET	FLOW

TEST DESCRIPTION

HYDROSTATIC: Hydrostatic tests shall be made at not less than 200 psi (13.6 bars) for two hours or 50 psi (3.4 bars) above static pressure in excess of 150 psi (10.2 bars) for two hours. Differential dry-pipe valve clappers shall be left open during test to prevent damage. All aboveground piping leakage shall be stopped.

PNEUMATIC: Establish 40 psi (2.7 bars) air pressure and measure drop which shall not exceed 1-1/2 psi (0.1 bars) in 24 hours. Test pressure tanks at normal water level and air pressure and measure air pressure drop which shall not exceed 1-1/2 psi (0.1 bars) in 24 hours.

ALL PIPING HYDROSTATICALLY TESTED AT 200 PSI FOR 2 HOURS
DRY PIPING PNEUMATICALLY TESTED ☐ YES ☐ NO
EQUIPMENT OPERATES PROPERLY ☒ YES ☐ NO

TESTS

DO YOU CERTIFY AS THE SPRINKLER CONTRACTOR THAT ADDITIVES AND CORROSIVE CHEMICALS, SODIUM SILICATE OR DERIVATIVES OF SODIUM SILICATE, BRINE, OR OTHER CORROSIVE CHEMICALS WERE NOT USED FOR TESTING SYSTEMS OR STOPPING LEAKS? ☐ YES ☐ NO

DRAIN TEST	READING OF GAUGE LOCATED NEAR WATER SUPPLY TEST CONNECTION: PSI	RESIDUAL PRESSURE WITH VALVE IN TEST CONNECTION WIDE OPEN: PSI

UNDERGROUND MAINS AND LEAD IN CONNECTIONS TO SYSTEM RISERS FLUSHED BEFORE CONNECTION MADE TO SPRINKLER PIPING VERIFIED BY COPY OF THE U FORM NO. 85B ☐ YES ☐ NO

FLUSHED BY INSTALLER OF UNDERGROUND SPRINKLER PIPING ☐ YES ☐ NO

IF POWER DRIVEN FASTENERS ARE USED IN CONCRETE, HAS REPRESENTATIVE SAMPLE TESTING BEEN SATISFACTORILY COMPLETED? ☐ YES ☐ NO

IF NO, PLEASE EXPLAIN:

BLANK TESTING GASKETS

NUMBER USED	LOCATIONS	NUMBER REMOVED

WELDING

WELDED PIPING ☒ YES ☐ NO IF YES, ANSWER THE FOLLOWING:

DO YOU CERTIFY AS THE SPRINKLER CONTRACTOR THAT WELDING PROCEDURES COMPLY WITH THE REQUIREMENTS OF AT LEAST AWS D10.9 LEVEL AR-3? ☒ YES ☐ NO

DO YOU CERTIFY THAT THE WELDING WAS PERFORMED BY WELDERS QUALIFIED IN COMPLIANCE WITH THE REQUIREMENTS OF AT LEAST AWS D10.9, LEVELAR -3? ☒ YES ☐ NO

DO YOU CERTIFY THAT WELDING WAS CARRIED OUT IN COMPLIANCE WITH A DOCUMENTED QUALITY CONTROL PROCEDURE TO INSURE THAT ALL DISCS ARE RETRIEVED, THAT OPENINGS IN PIPING ARE SMOOTH, THAT SLAG AND OTHER WELDING RESIDUE ARE REMOVED, AND THAT THE INTERNAL DIAMETERS OF PIPING ARE NOT PENETRATED? ☒ YES ☐ NO

CUTOUTS (DISCS)

DO YOU CERTIFY THAT YOU HAVE A CONTROL FEATURE TO ENSURE THAT ALL CUTOUT (DISCS) ARE RETRIEVED? ☐ YES ☐ NO

HYDRAULIC NAMEPLATE

NAME PLATE PROVIDED? ☒ YES ☐ NO
IF NO, EXPLAIN:

REMARKS

DATE LEFT IN SERVICE WITH ALL CONTROL VALVES OPEN:

SIGNATURES

NAME OF SPRINKLER CONTRACTOR: CENTURY FIRE PROTECTION

TEST WITNESSED BY:

FOR PROPERTY OWNER:	TITLE:	DATE:
[signature]	Fire Marshal	6-1-06
FOR SPRINKLER CONTRACTOR:	TITLE:	DATE:
Jamie Setzer	Foreman	6-1-06

Century
Fire Protection, LLC

Operations & Maintenance Manuals

Belle Hall

Condominiums
CFP Project #WB1122

■ Georgia
2625-F Pinemeadow Court
Duluth, GA 30096
Phone: 770-945-2330
Fax: 770-945-2651

□ Florida
3018 Highway 71 North
Marianna, FL 32446
Phone: 850-482-7366
Fax: 850-482-7660

□ Tennessee
3903 Volunteer Dr., Ste. 4
Chattanooga, TN 37416
Phone: 423-899-7434
Fax: 423-899-1204

NFPA 25

Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems

2002 Edition

NFPA, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101
An International Codes and Standards Organization

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NFPA 25

Standard for the

Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems

2002 Edition

This edition of NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*, was prepared by the Technical Committee on Inspection, Testing, and Maintenance of Water-Based Systems and acted on by NFPA at its November Association Technical Meeting held November 10–14, 2001, in Dallas, TX. It was issued by the Standards Council on January 11, 2002, with an effective date of January 31, 2002, and supersedes all previous editions.

This edition of NFPA 25 was approved as an American National Standard on January 31, 2002.

Origin and Development of NFPA 25

The first edition of NFPA 25 was a collection of inspection, testing, and maintenance provisions that helped ensure the successful operation of water-based fire protection systems. NFPA 25 was developed as an extension of existing documents such as NFPA 13A, *Recommended Practice for the Inspection, Testing, and Maintenance of Sprinkler Systems*, and NFPA 14A, *Recommended Practice for the Inspection, Testing, and Maintenance of Standpipe and Hose Systems*, which have successfully assisted authorities having jurisdiction and building owners with routine inspections of sprinkler systems and standpipes. These documents have since been withdrawn from the NFPA standards system. NFPA 25 became the main document governing sprinkler systems as well as related systems, including underground piping, fire pumps, storage tanks, water spray systems, and foam-water sprinkler systems.

This document provides instruction on how to conduct inspection, testing, and maintenance activities. It also stipulates how often such activities are required to be completed. Requirements are provided for impairment procedures, notification processes, and system restoration. This type of information, where incorporated into a building maintenance program, enhances the demonstrated favorable experience of all water-based fire protection systems.

The second edition incorporated several improvements that reflected the initial experience with the standard. A new chapter was added that addresses obstructions in pipe as well as appropriate corrective actions.

The third edition refined testing requirements and frequencies and provided additional guidance for preplanned impairment programs. The document scope was expanded to include marine systems.

This fourth edition continues to refine testing frequencies for water-flow devices and evaluation of the annual fire pump test data. This edition also includes additional information regarding evaluation and test methods for microbiologically influenced corrosion (MIC).

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Committee Scope: This Committee shall have primary responsibility for documents on inspection, testing, and maintenance of systems utilizing water as a method of extinguishment. These include sprinkler systems, standpipe and hose systems, fire service piping and appurtenances, fire pumps, water storage tanks, fixed water spray systems, foam-water systems, valves, and allied equipment. This Committee shall also develop procedures for the conduct and reporting of routine system impairments.

This list represents the membership at the time the Committee was balloted on the final text of this edition. Since that time, changes in the membership may have occurred. A key to classifications is found at the back of the document.

NOTE: Membership on a committee shall not in and of itself constitute an endorsement of the Association or any document developed by the committee on which the member serves.

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NFPA 25

Standard for the

Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems

2002 Edition

NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates that explanatory material on the paragraph can be found in Annex A.

Changes other than editorial are indicated by a vertical rule beside the paragraph, table, or figure in which the change occurred. These rules are included as an aid to the user in identifying changes from the previous edition. Where one or more complete paragraphs have been deleted, the deletion is indicated by a bullet between the paragraphs that remain.

A reference in brackets [ ] following a section or paragraph indicates material that has been extracted from another NFPA document. As an aid to the user, Annex D lists the complete title and edition of the source documents for both mandatory and nonmandatory extracts. Editorial changes to extracted material consist of revising references to an appropriate division in this document or the inclusion of the document number with the division number when the reference is to the original document. Requests for interpretations or revisions of extracted text shall be sent to the appropriate technical committee.

Information on referenced publications can be found in Chapter 2 and Annex D.

Chapter 1 Administration

1.1 Scope. This document establishes the minimum requirements for the periodic inspection, testing, and maintenance of water-based fire protection systems, including land-based and marine applications. The types of systems addressed by this standard include, but are not limited to, sprinkler, standpipe and hose, fixed water spray, and foam water. Included are the water supplies that are part of these systems, such as private fire service mains and appurtenances, fire pumps and water storage tanks, and valves that control system flow. The document also addresses impairment handling and reporting. This standard applies to fire protection systems that have been properly installed in accordance with generally accepted practices. Where a system has not been installed in accordance with generally accepted practices, the corrective action is beyond the scope of this standard. The corrective action to ensure that the system performs in a satisfactory manner shall be in accordance with the appropriate installation standard.

1.1.1 This standard shall not apply to sprinkler systems designed and installed in accordance with NFPA 13D, *Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes.*

1.2* Purpose. The purpose of this document is to provide requirements that ensure a reasonable degree of protection for life and property from fire through minimum inspection, testing, and maintenance methods for water-based fire protection systems. In those cases where it is determined that an existing situation involves a distinct hazard to life or property, the authority having jurisdiction shall be permitted to require inspection, testing, and maintenance methods in excess of those required by the standard.

1.3* Application. It is not the intent of this document to limit or restrict the use of other inspection, testing, or maintenance programs that provide an equivalent level of system integrity and performance to that detailed in this document. The authority having jurisdiction shall be consulted and approval obtained for such alternative programs.

1.4* Units. Metric units of measurement in this standard are in accordance with the modernized metric system known as the International System of Units (SI).

1.4.1 If a value for measurement as given in this standard is followed by an equivalent value in other units, the first stated shall be regarded as the requirement. A given equivalent value shall be considered to be approximate.

1.4.2 SI units have been converted by multiplying the quantity by the conversion factor and then rounding the result to the appropriate number of significant digits. Where nominal or trade sizes exist, the nominal dimension has been recognized in each unit.

Chapter 2 Referenced Publications

2.1 General. The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

2.2 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 11, *Standard for Low-Expansion Foam*, 1998 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 1999 edition.

NFPA 13D, *Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes*, 1999 edition.

NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection*, 2001 edition.

NFPA 16, *Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems*, 1999 edition.

NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection*, 1999 edition.

NFPA 22, *Standard for Water Tanks for Private Fire Protection*, 1998 edition.

NFPA 72®, *National Fire Alarm Code®*, 1999 edition.

NFPA 110, *Standard for Emergency and Standby Power Systems*, 2002 edition.

NFPA 307, *Standard for the Construction and Fire Protection of Marine Terminals, Piers, and Wharves*, 2000 edition.

NFPA 409, *Standard on Aircraft Hangars*, 2001 edition.

NFPA 1962, *Standard for the Care, Use, and Service Testing of Fire Hose Including Couplings and Nozzles*, 1998 edition.

2.3 Other Publications.

2.3.1 ASTM Publication. American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM D 3359, *Standard Test Methods for Measuring Adhesion by Tape Test*, 1997.

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Chapter 3 Definitions

3.1 General. The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not included, common usage of the terms shall apply.

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

3.2.2* Authority Having Jurisdiction (AHJ). The organization, office, or individual responsible for approving equipment, materials, an installation, or a procedure.

3.2.3* Listed. Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.

3.2.4 Shall. Indicates a mandatory requirement.

3.2.5 Should. Indicates a recommendation or that which is advised but not required.

3.2.6 Standard. A document, the main text of which contains only mandatory provisions using the word "shall" to indicate requirements and which is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions shall be located in an appendix or annex, footnote, or fine-print note and are not to be considered a part of the requirements of a standard.

3.3 General Definitions.

3.3.1 Alarm Receiving Facility. The place where alarm or supervisory signals are received. This can include proprietary or remote locations, central station, or fire departments.

3.3.2* Automatic Detection Equipment. Equipment that automatically detects heat, flame, products of combustion, flammable gases, or other conditions likely to produce fire or explosion and cause other automatic actuation of alarm and protection equipment.

3.3.3 Automatic Fire Detector. A device that detects abnormally high temperature, rate of temperature rise, visible or invisible particles, infrared or visible radiation, or gases produced by a fire.

3.3.4 Automatic Operation. Operation without human intervention. This operation includes, but is not limited to, heat, rate of heat rise, smoke, or pressure change.

3.3.5 Class of Service. Standpipe systems are grouped into three general classes of service for intended use in the extinguishment of fire.

3.3.5.1 Class I. A Class I standpipe system provides 65-mm (2½-in.) hose connections or 65-mm (2½-in.) hose stations supplied from a standpipe or combined riser in order to supply water for use by fire departments and those trained in handling heavy fire streams. No hose is provided.

3.3.5.2 Class II. A Class II standpipe system that provides 40-mm (1½-in.) hose stations to supply water for use primarily by the building occupants or by the fire department during initial response.

3.3.5.3 Class III. A Class III standpipe system that provides 40-mm (1½-in.) and 65-mm (2½-in.) hose connections or 40-mm (1½-in.) and 65-mm (2½-in.) hose stations supplied from a standpipe or combination riser in order to supply water for use by building occupants and a larger volume of water for use by fire departments and those trained in handling heavy fire streams.

3.3.6 Discharge Device. A device designed to discharge water or foam-water solution in a predetermined, fixed, or adjustable pattern. Examples include, but are not limited to, sprinklers, spray nozzles, and hose nozzles.

3.3.7 Double Check Valve Assembly (DCVA). This assembly consists of two internally loaded check valves, either spring-loaded or internally weighted, installed as a unit between two tightly closing resilient-seated shutoff valves as an assembly, and fittings with properly located resilient-seated test cocks.

3.3.8 Drain.

3.3.8.1 Main Drain. The primary drain connection located on the system riser and also utilized as a flow test connection.

3.3.8.2 Sectional Drain. A drain located beyond a sectional control valve that drains only a portion of the system (e.g., a drain located beyond a floor control valve on a multi-story building).

3.3.9 Fire Department Connection. A connection through which the fire department can pump supplemental water into the sprinkler system, standpipe, or other system furnishing water for fire extinguishment to supplement existing water supplies.

3.3.10* Fire Hydrant. A valved connection on a water main for the purpose of supplying water to fire hose or other fire protection apparatus. [1141:2.1]

3.3.10.1* Dry Barrel Hydrant (Frostproof Hydrant). This is the most common type of hydrant; it has a control valve below the frost line between the footpiece and the barrel. A drain is located at the bottom of the barrel above the control valve seat for proper drainage after operation.

3.3.10.2* Monitor Nozzle Hydrant. A hydrant equipped with a monitor nozzle capable of delivering more than 946 L/min (250 gpm).

3.3.10.3* Wall Hydrant. A hydrant mounted on the outside of a wall of a building, fed from interior piping, and equipped with control valves located inside the building that normally are key-operated from the building's exterior.

3.3.10.4* Wet Barrel Hydrant. A type of hydrant that sometimes is used where there is no danger of freezing weather. Each outlet on a wet barrel hydrant is provided with a valved outlet threaded for fire hose.

3.3.11 Foam Concentrate. A liquid that is stored in a containment vessel and is metered into a flowing water stream at a specified concentration by the proportioning system.

3.3.12 Foam Discharge Device. Any device that, when fed with a foam-water solution, produces foam. These devices shall be permitted to be non-air-aspirating (e.g., sprinklers, water nozzles) or air-aspirating (e.g., foam-water sprinklers, directional foam-water nozzles, foam nozzles). All discharge

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devices have a special pattern of distribution peculiar to the particular device.

3.3.13 Hose Connection. A combination of equipment provided for connection of a hose to the standpipe system that includes a hose valve with a threaded outlet. [14:1.4]

3.3.14* Hose House. An enclosure located over or adjacent to a hydrant or other water supply designed to contain the necessary hose nozzles, hose wrenches, gaskets, and spanners to be used in fire fighting in conjunction with and to provide aid to the local fire department.

3.3.15 Hose Nozzle. A device intended for discharging water for manual suppression or extinguishment of a fire.

3.3.16 Hose Station. A combination of a hose rack, hose nozzle, hose, and hose connection. [14:1.4]

3.3.17 Hose Storage Devices.

3.3.17.1* Conventional Pin Rack. A hose rack where the hose is folded vertically and attached over the pins.

3.3.17.2* Horizontal Rack. A hose rack where the hose is connected to the valve, then stack-folded horizontally to the top of the rack.

3.3.17.3* Hose Reel. A circular device used to store hose.

3.3.17.4* Semiautomatic Hose Rack Assembly. The same as a "conventional" pin rack or hose reel except that, after the valve is opened, a retaining device holds the hose and water until the last few feet are removed.

3.3.18 Impairment. A shutdown of a system or portion thereof.

3.3.18.1 Emergency Impairment. A condition where a water-based fire protection system or portion thereof is out of order due to an unexpected occurrence, such as a ruptured pipe, an operated sprinkler, or an interruption of the water supply to the system.

3.3.18.2 Preplanned Impairment. A condition where a water-based fire protection system or a portion thereof is out of service due to work that has been planned in advance, such as revisions to the water supply or sprinkler system piping.

3.3.19 Inspection. A visual examination of a system or portion thereof to verify that it appears to be in operating condition and is free of physical damage. [820:1.5]

3.3.20 Inspection, Testing, and Maintenance Service. A service program provided by a qualified contractor or qualified owner's representative in which all components unique to the property's systems are inspected and tested at the required times and necessary maintenance is provided. This program includes logging and retention of relevant records.

3.3.21 Interior Cabinet. A cabinet that contains hose rack assemblies; Class I, II, or III fire department valves; fire extinguishers; or various combinations of these.

3.3.22 Maintenance. Work performed to keep equipment operable or to make repairs.

3.3.23 Manual Operation. Operation of a system or its components through human action.

3.3.24 Nozzles.

3.3.24.1* Monitor Nozzle. A device specifically designed with large, clear waterways to provide a powerful, far-reaching stream for the protection of large amounts of combustible materials, aircraft, tank farms, and any other special hazard locations where large amounts of water need to be instantly available without the delay of laying hose lines. The nozzle is normally fitted with one of three interchangeable tips that measure 40 mm, 45 mm, and 50 mm (1½ in., 1¾ in., and 2 in.) in diameter.

3.3.24.2* Water Spray Nozzle. An open or automatic water discharge device that, when discharging water under pressure, will distribute the water in a specific, directional pattern. [15:1.4]

3.3.25 Orifice Plate Proportioning. This system utilizes an orifice plate(s) through which passes a specific amount of foam concentrate at a specific pressure drop across the orifice plate(s).

3.3.26 Pressure Regulating Device. A device designed for the purpose of reducing, regulating, controlling, or restricting water pressure. Examples include pressure reducing valves, pressure control valves, and pressure restricting devices. [14:1.4]

3.3.27 Pressure Restricting Device. A valve or device designed for the purpose of reducing the downstream water pressure under flowing (residual) conditions only. [14:1.4]

3.3.28* Pressure Vacuum Vent. A venting device mounted on atmospheric foam concentrate storage vessels to allow for concentrate expansion and contraction and for tank breathing during concentrate discharge or filling. At rest (static condition), this device is closed to prevent free breathing of the foam concentrate storage tank.

3.3.29* Proportioners.

3.3.29.1* Bladder Tank Proportioner. This system is similar to a standard pressure proportioner, except the foam concentrate is contained inside a diaphragm bag that is contained inside a pressure vessel. Operation is the same as a standard pressure proportioner, except that, because of the separation of the foam concentrate and water, this system can be used with all foam concentrates, regardless of specific gravity.

3.3.29.2* In-Line Balanced Pressure Proportioner. This system is similar to a standard balanced pressure system, except the pumped concentrate pressure is maintained at a fixed preset value. Balancing of water and liquid takes place at individual proportioners located in the system riser or in segments of multiple systems.

3.3.29.3* Line Proportioner. This system uses a venturi pickup-type device where water passing through the unit creates a vacuum, thereby allowing foam concentrate to be picked up from an atmospheric storage container.

3.3.29.4* Standard Balanced Pressure Proportioner. This system utilizes a foam concentrate pump. Foam concentrate is drawn from an atmospheric storage tank, is pressurized by the pump, and passes back through a diaphragm balancing valve to the storage tank. Water- and foam concentrate-sensing lines are directed to the balancing valve and maintain the foam liquid at a pressure equal to that of the water pressure. The two equal pressures are fed to the proportioner proper and are mixed at a predetermined rate.

3.3.29.5* Standard Pressure Proportioner. This system uses a pressure vessel containing foam concentrate. Water is supplied to the proportioner, which directs an amount of the supply downward onto the contained concentrate, thereby pres-

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surizing the tank. Pressurized concentrate then is forced through an orifice back into the flowing water stream. This type of system is applicable for use with foam concentrates having a specific gravity substantially higher than water. It is not applicable for use with foam concentrates with a specific gravity at or near that of water.

3.3.30 Qualified. Having knowledge of the installation, construction, or operation of apparatus and the hazards involved.

3.3.31 Reduced-Pressure Principle Backflow Prevention Assembly (RPBA). Two independently acting check valves together with a hydraulically operating, mechanically independent pressure differential relief valve located between the check valves and below the first check valve. These units are located between two tightly closed resilient-seated shutoff valves, as an assembly, and are equipped with properly located resilient-seated test cocks.

3.3.32 Sprinklers.

3.3.32.1 Concealed Sprinkler. A recessed sprinkler with cover plates. [13:1.4]

3.3.32.2 Corrosion-Resistant Sprinkler. A sprinkler fabricated with corrosion-resistant material, or with special coatings or platings, to be used in an atmosphere that would normally corrode sprinklers. [13:1.4]

3.3.32.3 Dry Sprinkler. A sprinkler secured in an extension nipple that has a seal at the inlet end to prevent water from entering the nipple until the sprinkler operates. [13:1.4]

3.3.32.4 Early Suppression Fast-Response (ESFR) Sprinkler. A type of fast-response sprinkler that meets the criteria of 1.4.5.1(a)(1) of NFPA 13-1999 and is listed for its capability to provide fire suppression of specific high-challenge fire hazards. [13:1.4]

3.3.32.5 Extended Coverage Sprinkler. A type of spray sprinkler with maximum coverage areas as specified in Sections 5.8 and 5.9 of NFPA 13-1999. [13:1.4]

3.3.32.6 Flush Sprinkler. A sprinkler in which all or part of the body, including the shank thread, is mounted above the lower plane of the ceiling. [13:1.4]

3.3.32.7 Intermediate Level Sprinkler/Rack Storage Sprinkler. A sprinkler equipped with integral shields to protect its operating elements from the discharge of sprinklers installed at higher elevations. [13:1.4]

3.3.32.8 Large Drop Sprinkler. A type of sprinkler that is capable of producing characteristic large water droplets and that is listed for its capability to provide fire control of specific high-challenge fire hazards. [13:1.4]

3.3.32.9 Nozzles. A device for use in applications requiring special water discharge patterns, directional spray, or other unusual discharge characteristics. [13:1.4]

3.3.32.10 Old-Style/Conventional Sprinkler. A sprinkler that directs from 40 percent to 60 percent of the total water initially in a downward direction and that is designed to be installed with the deflector either upright or pendent. [13:1.4]

3.3.32.11 Open Sprinkler. A sprinkler that does not have actuators or heat-responsive elements. [13:1.4]

3.3.32.12 Ornamental/Decorative Sprinkler. A sprinkler that has been painted or plated by the manufacturer. [13:1.4]

3.3.32.13 Pendent Sprinkler. A sprinkler designed to be installed in such a way that the water stream is directed downward against the deflector. [13:1.4]

3.3.32.14 Quick-Response Early Suppression (QRES) Sprinkler. A type of quick-response sprinkler that meets the criteria of 1.4.5.1(a)(1) of NFPA 13-1999 and is listed for its capability to provide fire suppression of specific fire hazards. [13:1.4]

3.3.32.15 Quick-Response Extended Coverage Sprinkler. A type of quick-response sprinkler that meets the criteria of 1.4.5.1(a)(1) of NFPA 13-1999 and complies with the extended protection areas defined in Chapter 5 of NFPA 13-1999. [13:1.4]

3.3.32.16 Quick-Response (QR) Sprinkler. A type of spray sprinkler that meets the criteria of 1.4.5.1(a)(1) of NFPA 13-1999 and is listed as a quick-response sprinkler for its intended use. [13:1.4]

3.3.32.17 Recessed Sprinkler. A sprinkler in which all or part of the body, other than the shank thread, is mounted within a recessed housing. [13:1.4]

3.3.32.18 Residential Sprinkler. A type of fast-response sprinkler that meets the criteria of 1.4.5.1(a)(1) of NFPA 13-1999 that has been specifically investigated for its ability to enhance survivability in the room of fire origin and is listed for use in the protection of dwelling units. [13:1.4]

3.3.32.19 Sidewall Sprinkler. A sprinkler having special deflectors that are designed to discharge most of the water away from the nearby wall in a pattern resembling one-quarter of a sphere, with a small portion of the discharge directed at the wall behind the sprinkler. [13:1.4]

3.3.32.20 Special Sprinkler. A sprinkler that has been tested and listed as prescribed in 5.4.9 of NFPA 13-1999. [13:1.4]

3.3.32.21 Spray Sprinkler. A type of sprinkler listed for its capability to provide fire control for a wide range of fire hazards. [13:1.4]

3.3.32.22 Standard Spray Sprinkler. A spray sprinkler with maximum coverage areas as specified in Sections 5.6 and 5.7 of NFPA 13-1999. [13:1.4]

3.3.32.23 Upright Sprinkler. A sprinkler designed to be installed in such a way that the water spray is directed upwards against the deflector. [13:1.4]

3.3.33 Standpipe System.

3.3.33.1 Standpipe System. An arrangement of piping, valves, hose connections, and allied equipment installed in a building or structure, with the hose connections located in such a manner that water can be discharged in streams or spray patterns through attached hose and nozzles, for the purpose of extinguishing a fire, thereby protecting a building or structure and its contents in addition to protecting the occupants. This is accomplished by means of connections to water supply systems or by means of pumps, tanks, and other equipment necessary to provide an adequate supply of water to the hose connections. [14:1.4]

3.3.33.2 Dry Standpipe System. A system that shall be arranged as follows: (1) includes devices to admit water to the system automatically by opening a hose valve; (2) admits water to the system through manual operation of remote control devices located at each hose station; (3) has no permanent water supply (a filled standpipe having a small water supply

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connection to keep the piping filled by requiring water to be pumped into the system shall be considered to be a dry standpipe). [14:1.4]

3.3.33.3 Wet Standpipe. A standpipe system having piping containing water at all times. [14:1.4]

3.3.34* Strainer. A device capable of removing from the water all solids of sufficient size that are obstructing water spray nozzles.

3.3.35 Supervision. A means of monitoring system status and indicating abnormal conditions.

3.3.36 Testing. A procedure used to determine the status of a system as intended by conducting periodic physical checks on water-based fire protection systems such as water-flow tests, fire pump tests, alarm tests, and trip tests of dry pipe, deluge, or preaction valves. These tests follow up on the original acceptance test at intervals specified in the appropriate chapter of this standard.

3.3.37 Water Spray. The use of water in a form having a predetermined pattern, particle size, velocity, and density discharged from specially designed nozzles or devices. Water spray fixed systems are usually applied to special fire protection problems, since the protection can be specifically designed to provide for fire control, extinguishment, or exposure protection. Water spray fixed systems shall be permitted to be independent of, or supplementary to, other forms of protection.

3.3.38 Water Supply. A source of water that provides the flows (L/min) and pressures (bar) required by the water-based fire protection system.

3.4 Deluge Foam-Water Sprinkler and Foam-Water Spray Systems Definitions.

3.4.1 Foam-Water Spray System. A special system that is pipe-connected to a source of foam concentrate and to a water supply. The system is equipped with foam-water spray nozzles for extinguishing agent discharge (foam followed by water or in reverse order) and for distribution over the area to be protected. System operation arrangements parallel those for foam-water sprinkler systems as described in the definition of Foam-Water Sprinkler System. [16:1.3]

3.4.2 Foam-Water Sprinkler System. A special system pipe connected to a source of foam concentrate and to a water supply and equipped with appropriate discharge devices for fire protection agent discharge and for distribution over the area to be protected. The piping system is connected to the water supply through a control valve that usually is actuated by operation of automatic detection equipment installed in the same areas as the sprinklers. When this valve opens, water flows into the piping system and foam concentrate is injected into the water. The resulting foam solution discharging through the discharge devices generates and distributes foam. Upon exhaustion of the foam concentrate supply, water discharge follows and continues until shut off manually. Systems also can be used for discharge of water first, followed by discharge of foam for a specific period, and then followed by water until manually shut off. Existing deluge sprinkler systems that have been converted to the use of aqueous film-forming foam are classed as foam-water sprinkler systems. [16:1.3]

3.5 Valve Definitions.

3.5.1* Control Valve. A valve controlling flow to water-based fire protection systems. Control valves do not include hose valves, inspector's test valves, drain valves, trim valves for dry pipe, preaction and deluge valves, check valves, or relief valves.

3.5.2 Deluge Valve. A water supply control valve intended to be operated by actuation of an automatic detection system that is installed in the same area as the water spray nozzles. Each control valve also shall be capable of manual operation.

3.5.3 Hose Valve. The control valve to an individual hose connection. [14:1.4]

3.5.4 Pressure Control Valve. A pilot-operated pressure reducing valve designed for the purpose of reducing the downstream water pressure to a specific value under both flowing (residual) and nonflowing (static) conditions. [14:1.4]

3.5.5 Pressure Reducing Valve. A valve designed for the purpose of reducing the downstream water pressure under both flowing (residual) and nonflowing (static) conditions.

3.6 Water-Based Fire Protection System Definitions.

3.6.1 Combined Standpipe and Sprinkler System. A system where the water piping services both 65-mm (2½-in.) outlets for fire department use and outlets for automatic sprinklers.

3.6.2 Fire Pump. A pump supplying water at the flow and pressure required by water-based fire protection systems.

3.6.3 Private Fire Service Main. The pipe and its appurtenances located on private property between a source of water and the base of the riser (i.e., the flange, the flange and spigot piece, or the base tee) for automatic sprinkler systems, open sprinkler systems, water spray fixed systems, standpipe systems, inlets to foam-making systems, or the base elbow of private hydrants or monitor nozzles. Where connected to a public water system, the private service main begins at a point designated by the public water utility, usually at a manually operated valve near the property line. Where connected to fire pumps, the main begins at the fire-protection-system side of the pump discharge valve. Where connected to a gravity or pressure tank, the main begins at the inlet side of the tank's check valve. Private fire service mains can include supply and distribution piping installed above ground, in trenches, and inside or outside of buildings. The provisions of this definition also apply to pipeline strainers. [13:1.4]

3.6.4* Sprinkler System. For fire protection purposes, an integrated system of underground and overhead piping designed in accordance with fire protection engineering standards. The installation includes one or more automatic water supplies. The portion of the sprinkler system aboveground is a network of specially sized or hydraulically designed piping installed in a building, structure, or area, generally overhead, and to which sprinklers are attached in a systematic pattern. The valve controlling each system riser is located in the system riser or its supply piping. Each sprinkler system riser includes a device for actuating an alarm when the system is in operation. The system is usually activated by heat from a fire and discharges water over the fire area. [13:1.4]

3.6.4.1 Antifreeze Sprinkler System. A wet pipe sprinkler system employing automatic sprinklers that are attached to a piping system that contains an antifreeze solution and that are connected to a water supply. The antifreeze solution is dis-

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charged, followed by water, immediately upon operation of sprinklers opened by heat from a fire. [13:1.4]

3.6.4.2 Combined Dry Pipe-Preaction System. A sprinkler system employing automatic sprinklers attached to a piping system containing air under pressure, with a supplemental detection system installed in the same areas as the sprinklers. Operation of the detection system actuates tripping devices that open dry pipe valves simultaneously and without loss of air pressure in the system. Operation of the detection system also opens listed air exhaust valves at the end of the feed main, which usually precedes the opening of sprinklers. The detection system also serves as an automatic fire alarm system. [13:1.4]

3.6.4.3 Deluge Sprinkler System. A sprinkler system employing open sprinklers that are attached to a piping system that is connected to a water supply through a valve that is opened by the operation of a detection system installed in the same areas as the sprinklers. When this valve opens, water flows into the piping system and discharges from all sprinklers attached thereto. [13:1.4]

3.6.4.4 Dry Pipe Sprinkler System. A sprinkler system employing automatic sprinklers that are attached to a piping system containing air or nitrogen under pressure, the release of which (as from the opening of a sprinkler) permits the water pressure to open a valve known as a dry pipe valve, and the water then flows into the piping system and out the opened sprinklers. [13:1.4]

3.6.4.5 Preaction Sprinkler System. A sprinkler system employing automatic sprinklers attached to a piping system that contains air that might or might not be under pressure, with a supplemental detection system installed in the same areas as the sprinklers. [13:1.4]

3.6.4.6* Wet Pipe Sprinkler System. A sprinkler system employing automatic sprinklers attached to a piping system containing water and connected to a water supply so that water discharges immediately from sprinklers opened by heat from a fire. [13:1.4]

3.6.5 Water Spray Fixed System. A special fixed pipe system connected to a reliable fire protection water supply and equipped with water spray nozzles for specific water discharge and distribution over the surface or area to be protected. The piping system is connected to the water supply through an automatically or manually actuated valve that initiates the flow of water. An automatic valve is actuated by operation of automatic detection equipment installed in the same areas as the water spray nozzles. (In special cases, the automatic detection system also is located in another area.)

3.6.6 Water Tank. A tank supplying water for water-based fire protection systems.

Chapter 4 General Requirements

4.1 Responsibility of the Owner or Occupant.

4.1.1* The owner or occupant shall provide ready accessibility to components of water-based fire protection systems that require inspection, testing, or maintenance.

4.1.2* The responsibility for properly maintaining a water-based fire protection system shall be that of the owner of the property.

4.1.2.1 By means of periodic inspections, tests, and maintenance, the equipment shall be shown to be in good operating condition, or any defects or impairments shall be revealed.

4.1.2.2 Inspection, testing, and maintenance shall be implemented in accordance with procedures meeting or exceeding those established in this document and in accordance with the manufacturer's instructions.

4.1.2.3 These tasks shall be performed by personnel who have developed competence through training and experience.

4.1.2.4 Where the owner is not the occupant, the owner shall be permitted to pass on the authority for inspecting, testing, and maintaining the fire protection systems to the occupant, management firm, or managing individual through specific provisions in the lease, written use agreement, or management contract.

4.1.3 The owner or occupant shall notify the authority having jurisdiction, the fire department, if required, and the alarm-receiving facility before testing or shutting down a system or its supply.

4.1.3.1 The notification shall include the purpose for the shutdown, the system or component involved, and the estimated time of shutdown.

4.1.3.2 The authority having jurisdiction, the fire department, and the alarm-receiving facility shall be notified when the system, supply, or component is returned to service.

4.1.3.3 Where an occupant, management firm, or managing individual has received the authority for inspection, testing, and maintenance in accordance with 4.1.2.4, the occupant, management firm, or managing individual shall comply with 4.1.3.

4.1.4* The owner or occupant shall promptly correct or repair deficiencies, damaged parts, or impairments found while performing the inspection, test, and maintenance requirements of this standard.

4.1.4.1 Corrections and repairs shall be performed by qualified maintenance personnel or a qualified contractor.

4.1.4.2 Where an occupant, management firm, or managing individual has received the authority for inspection, testing, and maintenance in accordance with 4.1.2.4, the occupant, management firm, or managing individual shall comply with 4.1.4.

4.1.5* The building owner or occupant shall not make changes in the occupancy, the use or process, or the materials used or stored in the building without evaluation of the fire protection systems for their capability to protect the new occupancy, use, or materials.

4.1.5.1 The evaluation shall consider factors that include, but are not limited to, the following:

(1) Occupancy changes such as converting office or production space into warehousing
(2) Process or material changes such as metal stamping of molded plastics
(3) Building revisions such as relocated walls, added mezzanines, and ceilings added below sprinklers
(4) Removal of heating systems in spaces with piping subject to freezing

4.1.5.2 Where an occupant, management firm, or managing individual has received the authority for inspection, testing,

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and maintenance in accordance with 4.1.2.4, the occupant, management firm, or managing individual shall comply with 4.1.5.

4.1.6 Where changes in the occupancy, hazard, water supply, storage commodity, storage arrangement, building modification, or other condition that affects the installation criteria of the system are identified, the owner or occupant shall promptly take steps, such as contacting a qualified contractor, consultant, or engineer, to evaluate the adequacy of the installed system in order to protect the building or hazard in question.

4.1.6.1 Where the evaluation reveals a deficiency causing a threat to life or property, the owner shall make appropriate corrections. All requirements of the authority having jurisdiction shall be followed.

4.1.6.2 Where an occupant, management firm, or managing individual has received the authority for inspection, testing, and maintenance in accordance with 4.1.2.4, the occupant, management firm, or managing individual shall comply with 4.1.6.

4.1.7 Where a water-based fire protection system is returned to service following an impairment, the system shall be verified to be working properly.

4.2 Impairments. Where an impairment to a water-based fire protection system occurs, the procedures outlined in Chapter 14 of this standard shall be followed, including the attachment of a tag to the impaired system.

4.3 Records.

4.3.1* Records of inspections, tests, and maintenance of the system and its components shall be made available to the authority having jurisdiction upon request.

4.3.2 Records shall indicate the procedure performed (e.g., inspection, test, or maintenance), the organization that performed the work, the results, and the date.

4.3.3 Records shall be maintained by the owner.

4.3.4 Original records shall be retained for the life of the system.

4.3.5 Subsequent records shall be retained for a period of 1 year after the next inspection, test, or maintenance required by the standard.

4.4* Inspection. System components shall be inspected at intervals specified in the appropriate chapters.

4.5 Testing.

4.5.1 All components and systems shall be tested to verify that they function as intended.

4.5.1.1 The frequency of tests shall be in accordance with this standard.

4.5.1.2 Fire protection system components shall be restored to full operational condition following testing including reinstallation of plugs and caps for auxiliary drains and test valves.

4.5.2 During all testing and maintenance, water supplies including fire pumps shall remain in service unless all impairment procedures contained in Chapter 14 are followed.

4.5.3 Test results shall be compared with those of the original acceptance test (if available) and with the most recent test results.

4.5.4 The types of tests required for each protection system and its components are detailed in the appropriate chapter.

4.5.5 Specialized equipment required for testing is defined in the appropriate chapter.

4.5.6* When a major component or subsystem is rebuilt or replaced, the subsystem shall be tested in accordance with the original acceptance test required for that subsystem.

4.5.6.1 Sprinkler systems in accordance with 5.4.3 shall be tested.

4.6* Maintenance. Maintenance shall be performed to keep the system equipment operable or to make repairs.

4.6.1 As-built system installation drawings, original acceptance test records, and device manufacturer's maintenance bulletins shall be retained to assist in the proper care of the system and its components.

4.7 Safety. Inspection, testing, and maintenance activities shall be conducted in a safe manner.

4.7.1 Confined Spaces. Legally required precautions shall be taken prior to entering confined spaces such as tanks, valve pits, or trenches.

4.7.2 Fall Protection. Legally required equipment shall be worn or used to prevent injury from falls to personnel.

4.7.3 Special Hazards. Precautions shall be taken to address any special hazards, such as protection against drowning where working on the top of a filled embankment or a supported, rubberized fabric tank, or over open water or other liquids.

4.7.4* Hazardous Materials.

4.7.4.1 Legally required equipment shall be used where working in an environment with hazardous materials present.

4.7.4.2 The owner shall advise anyone performing inspection, testing, and maintenance on any system under the scope of this document, with regard to hazardous materials stored on the premises.

4.8* Electrical Safety. Legally required precautions shall be taken when testing or maintaining electric controllers for motor-driven fire pumps.

4.9 Corrective Action. Manufacturers shall be permitted to make modifications to their own listed product in the field with listed devices that restore the original performance as intended by the listing, where acceptable to the authority having jurisdiction.

Chapter 5 Sprinkler Systems

5.1 General. This chapter shall provide the minimum requirements for the routine inspection, testing, and maintenance of sprinkler systems. Table 5.1 shall be used to determine the minimum required frequencies for inspection, testing, and maintenance.

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Table 5.1 Summary of Sprinkler System Inspection, Testing, and Maintenance

Item	Activity	Frequency	Reference
Gauges (dry, preaction, and deluge systems)	Inspection	Weekly/monthly	5.2.4.2, 5.2.4.3
Control valves	Inspection	Weekly/monthly	Table 12.1
Alarm devices	Inspection	Quarterly	5.2.6
Gauges (wet pipe systems)	Inspection	Monthly	5.2.4.1
Hydraulic nameplate	Inspection	Quarterly	5.2.7
Buildings	Inspection	Annually (prior to freezing weather)	5.2.5
Hanger/seismic bracing	Inspection	Annually	5.2.3
Pipe and fittings	Inspection	Annually	5.2.2
Sprinklers	Inspection	Annually	5.2.1
Spare sprinklers	Inspection	Annually	5.2.1.3
Fire department connections	Inspection	Quarterly	Table 12.1
Valves (all types)	Inspection		Table 12.1
Alarm devices	Test	Quarterly/semiannually	5.3.3
Main drain	Test	Annually	Table 12.1
Antifreeze solution	Test	Annually	5.3.4
Gauges	Test	5 years	5.3.2
Sprinklers — extra-high temperature	Test	5 years	5.3.1.1.1.3
Sprinklers — fast response	Test	At 20 years and every 10 years thereafter	5.3.1.1.1.2
Sprinklers	Test	At 50 years and every 10 years thereafter	5.3.1.1.1
Valves (all types)	Maintenance	Annually or as needed	Table 12.1
Obstruction investigation	Maintenance	5 years or as needed	13.2.1, 13.2.2
Low point drains (dry pipe system)	Maintenance	Annually prior to freezing and as needed	12.4.4.3.3

5.1.1 Valves and Connections. Valves and fire department connections shall be inspected, tested, and maintained in accordance with Chapter 12.

5.1.2 Impairments. The procedures outlined in Chapter 14 shall be followed where an impairment to protection occurs.

5.1.3 Notification to Supervisory Service. To avoid false alarms where a supervisory service is provided, the alarm receiving facility shall be notified by the owner or designated representative as follows:

(1) Before conducting any test or procedure that could result in the activation of an alarm
(2) After such tests or procedures are concluded

5.1.4 Records. Records shall be maintained in accordance with Section 4.3.

5.2* Inspection.

5.2.1 Sprinklers.

5.2.1.1* Sprinklers shall be inspected from the floor level annually.

5.2.1.1.1 Sprinklers shall not show signs of leakage; shall be free of corrosion, foreign materials, paint, and physical damage; and shall be installed in the proper orientation (e.g., upright, pendent, or sidewall).

5.2.1.1.2 Any sprinkler shall be replaced that has signs of leakage; is painted, corroded, damaged, or loaded; or in the improper orientation.

5.2.1.1.3 Glass bulb sprinklers shall be replaced if the bulbs have emptied.

5.2.1.1.4* Sprinklers installed in concealed spaces such as above suspended ceilings shall not require inspection.

5.2.1.1.5 Sprinklers installed in areas that are inaccessible for safety considerations due to process operations shall be inspected during each scheduled shutdown.

5.2.1.2* Unacceptable obstructions to spray patterns shall be corrected.

5.2.1.3 The supply of spare sprinklers shall be inspected annually for the following:

(1) The proper number and type of sprinklers
(2) A sprinkler wrench for each type of sprinkler

5.2.2* Pipe and Fittings. Sprinkler pipe and fittings shall be inspected annually from the floor level.

5.2.2.1 Pipe and fittings shall be in good condition and free of mechanical damage, leakage, corrosion, and misalignment.

5.2.2.2 Sprinkler piping shall not be subjected to external loads by materials either resting on the pipe or hung from the pipe.

5.2.2.3* Pipe and fittings installed in concealed spaces such as above suspended ceilings shall not require inspection.

5.2.2.4 Pipe installed in areas that are inaccessible for safety considerations due to process operations shall be inspected during each scheduled shutdown.

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5.2.3* Hangers and Seismic Braces. Sprinkler pipe hangers and seismic braces shall be inspected annually from the floor level.

5.2.3.1 Hangers and seismic braces shall not be damaged or loose.

5.2.3.2 Hangers and seismic braces that are damaged or loose shall be replaced or refastened.

5.2.3.3* Hangers and seismic braces installed in concealed spaces such as above suspended ceilings shall not require inspection.

5.2.3.4 Hangers installed in areas that are inaccessible for safety considerations due to process operations shall be inspected during each scheduled shutdown.

5.2.4 Gauges.

5.2.4.1* Gauges on wet pipe sprinkler systems shall be inspected monthly to ensure that they are in good condition and that normal water supply pressure is being maintained.

5.2.4.2 Gauges on dry, preaction, and deluge systems shall be inspected weekly to ensure that normal air and water pressures are being maintained.

5.2.4.3 Where air pressure supervision is connected to a constantly attended location, gauges shall be inspected monthly.

5.2.4.4* For dry pipe or preaction systems protecting freezers, in accordance with Figure A.5.2.4.4 the air pressure gauge near the compressor shall be compared weekly to the pressure gauge above the dry pipe or preaction valve. When the gauge near the compressor is reading higher than the gauge near the dry pipe valve, the air line in service shall be taken out of service, and the alternate air line opened to equalize the pressure. The air line taken out of service shall be internally inspected, have all ice blockage removed, and shall be reassembled for use as a future alternate air line.

5.2.5 Buildings. Annually, prior to the onset of freezing weather, buildings with wet pipe systems shall be inspected to verify that windows, skylights, doors, ventilators, other openings and closures, blind spaces, unused attics, stair towers, roof houses, and low spaces under buildings do not expose water-filled sprinkler piping to freezing and to verify that adequate heat [minimum 4.4°C (40°F)] is available.

5.2.6 Alarm Devices. Alarm devices shall be inspected quarterly to verify that they are free of physical damage.

5.2.7* Hydraulic Nameplate. The hydraulic nameplate for hydraulically designed systems shall be inspected quarterly to verify that it is attached securely to the sprinkler riser and is legible.

5.2.8 Hose Connections. Hose connections and hose shall be inspected in accordance with the requirements of Chapter 6 and Chapter 12.

5.3 Testing.

5.3.1* Sprinklers.

5.3.1.1* Where required by this section, sample sprinklers shall be submitted to a recognized testing laboratory acceptable to the authority having jurisdiction for field service testing.

5.3.1.1.1 Where sprinklers have been in service for 50 years, they shall be replaced or representative samples from one or more sample areas shall be tested. Test procedures shall be repeated at 10-year intervals.

5.3.1.1.1.1 Sprinklers manufactured prior to 1920 shall be replaced.

5.3.1.1.1.2 Sprinklers manufactured using fast-response elements that have been in service for 20 years shall be tested. They shall be retested at 10-year intervals.

5.3.1.1.1.3* Representative samples of solder-type sprinklers with a temperature classification of extra high 163°C (325°F) or greater that are exposed to semicontinuous to continuous maximum allowable ambient temperature conditions shall be tested at 5-year intervals.

5.3.1.1.1.4 Where sprinklers have been in service for 75 years, they shall be replaced or representative samples from one or more sample areas shall be submitted to a recognized testing laboratory acceptable to the authority having jurisdiction for field service testing. Test procedures shall be repeated at 5-year intervals.

5.3.1.1.1.5 Dry sprinklers that have been in service for 10 years shall be tested or replaced. If maintained and serviced, they shall be retested at 10-year intervals.

5.3.1.1.2* Where sprinklers are subjected to harsh environments, including corrosive atmospheres and corrosive water supplies, on a 5-year basis, sprinklers shall either be replaced or representative sprinkler samples shall be tested.

5.3.1.1.3 Where historical data indicates, longer intervals between testing shall be permitted.

5.3.1.2* A representative sample of sprinklers for testing per 5.3.1.1.1 shall consist of a minimum of not less than 4 sprinklers or 1 percent of the number of sprinklers per individual sprinkler sample, whichever is greater.

5.3.1.3 Where one sprinkler within a representative sample fails to meet the test requirement, all sprinklers represented by that sample shall be replaced.

5.3.1.3.1 Manufacturers shall be permitted to make modifications to their own sprinklers in the field with listed devices that restore the original performance as intended by the listing, where acceptable to the authority having jurisdiction.

5.3.2* Gauges. Gauges shall be replaced every 5 years or tested every 5 years by comparison with a calibrated gauge. Gauges not accurate to within 3 percent of the full scale shall be recalibrated or replaced.

5.3.3* Alarm Devices.

5.3.3.1 Water-flow devices including, but not limited to, mechanical water motor gongs and pressure switch type shall be tested quarterly.

5.3.3.2* Vane-type waterflow devices shall be tested semiannually.

5.3.3.3* Testing the water-flow alarms on wet pipe systems shall be accomplished by opening the inspector's test connection.

5.3.3.3.1 Where freezing weather conditions or other circumstances prohibit use of the inspector's test connection, the bypass connection shall be permitted to be used.

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5.3.3.4 Fire pumps shall not be turned off during testing unless all impairment procedures contained in Chapter 14 are followed.

5.3.3.5* Testing the water-flow alarm on dry pipe, preaction, or deluge systems shall be accomplished by using the bypass connection.

5.3.4* Antifreeze Systems. The freezing point of solutions in antifreeze shall be tested annually by measuring the specific gravity with a hydrometer or refractometer and adjusting the solutions if necessary.

5.3.4.1 Solutions shall be in accordance with Table 5.3.4.1(a) and Table 5.3.4.1(b).

5.3.4.2 The use of antifreeze solutions shall be in accordance with any state or local health regulations.

5.3.5 Hose Connections. Hose connections and hose shall be tested in accordance with the requirements of Chapter 6 and Chapter 12.

5.4 Maintenance.

5.4.1 Sprinklers.

5.4.1.1 Replacement sprinklers shall have the proper characteristics for the application intended. These shall include the following:

(1) Style
(2) Orifice size and *K*-factor
(3) Temperature rating
(4) Coating, if any
(5) Deflector type (e.g., upright, pendent, sidewall)
(6) Design requirements

5.4.1.1.1* Spray sprinklers shall be permitted to replace old-style sprinklers.

5.4.1.1.2 Replacement sprinklers for piers and wharves shall comply with NFPA 307, *Standard for the Construction and Fire Protection of Marine Terminals, Piers, and Wharves.*

5.4.1.2 Only new, listed sprinklers shall be used to replace existing sprinklers.

5.4.1.3* Special and quick-response sprinklers as defined by NFPA 13, *Standard for the Installation of Sprinkler Systems,* shall be replaced with sprinklers of the same make, model, orifice, size, temperature range and thermal response characteristics, and *K*-factor.

5.4.1.3.1 If the special or quick-response sprinkler is no longer manufactured, a special or quick-response sprinkler with comparable performance characteristics shall be installed.

5.4.1.4* A supply of spare sprinklers (never fewer than six) shall be maintained on the premises so that any sprinklers that have operated or been damaged in any way can be promptly replaced.

Table 5.3.4.1(a) Antifreeze Solutions to Be Used If Nonpotable Water Is Connected to Sprinklers

Material	Solution (by volume)	Specific Gravity at 60°F (15.6°C)	Freezing Point (°C)	Freezing Point (°F)
Glycerine*				
Diethylene glycol	50% water	1.078	−25.0	−13
	45% water	1.081	−32.8	−27
	40% water	1.086	−41.1	−42
	Hydrometer scale 1.000 to 1.120 (subdivisions 0.002)			
Ethylene glycol	61% water	1.056	−23.3	−10
	56% water	1.063	−28.9	−20
	51% water	1.069	−34.4	−30
	47% water	1.073	−40.0	−40
	Hydrometer scale 1.000 to 1.120 (subdivisions 0.002)			
Propylene glycol*				
Calcium chloride 80% "flake"	lb $CaCl_2$/gal of water			
Fire protection grade**				
Add corrosion	2.83	1.183	−17.8	0
inhibitor of sodium	3.38	1.212	−23.3	−10
bichromate	3.89	1.237	−28.9	−20
¾ oz/gal water	4.37	1.258	−34.4	−30
	4.73	1.274	−40.0	−40
	4.93	1.283	−45.6	−50

*If used, see Table 5.3.4.1(b).
**Free from magnesium chloride and other impurities.

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Table 5.3.4.1(b) Antifreeze Solutions to Be Used If Potable Water Is Connected to Sprinklers

Material	Solution (by volume)	Specific Gravity at 60°F (15.6°C)	Freezing Point (°C)	Freezing Point (°F)
Glycerine C.P. or U.S.P. grade*	50% water	1.133	–26.1	–15
	40% water	1.151	–30.0	–22
	30% water	1.165	–40.0	–40
	Hydrometer scale 1.000 to 1.200			
Propylene glycol	70% water	1.027	–12.8	+9
	60% water	1.034	–21.1	–6
	50% water	1.041	–32.2	–26
	40% water	1.045	–51.1	–60
	Hydrometer scale 1.000 to 1.200			

*C.P. = Chemically pure; U.S.P. = United States Pharmacopoeia 96.9%.

5.4.1.4.1 The sprinklers shall correspond to the types and temperature ratings of the sprinklers in the property.

5.4.1.4.2 The sprinklers shall be kept in a cabinet located where the temperature in which they are subjected will at no time exceed 38°C (100°F).

5.4.1.4.2.1 Where dry sprinklers of different lengths are installed, spare dry sprinklers shall not be required, provided that a means of returning the system to service is furnished.

5.4.1.5 The stock of spare sprinklers shall include all types and ratings installed and shall be as follows:

(1) For protected facilities having under 300 sprinklers — no fewer than 6 sprinklers
(2) For protected facilities having 300 to 1000 sprinklers — no fewer than 12 sprinklers
(3) For protected facilities having over 1000 sprinklers — no fewer than 24 sprinklers

5.4.1.6* A special sprinkler wrench shall be provided and kept in the cabinet to be used in the removal and installation of sprinklers. One sprinkler wrench shall be provided for each type of sprinkler installed.

5.4.1.7 Sprinklers protecting spray coating areas shall be protected against overspray residue.

5.4.1.7.1 Sprinklers subject to overspray accumulations shall be protected using plastic bags having a maximum thickness of 0.076 mm (0.003 in.) or shall be protected with small paper bags.

5.4.1.7.2 Coverings shall be replaced when deposits or residue accumulate.

5.4.1.8* Sprinklers shall not be altered in any respect or have any type of ornamentation, paint, or coatings applied after shipment from the place of manufacture.

5.4.1.9 Sprinklers and automatic spray nozzles used for protecting commercial-type cooking equipment and ventilating systems shall be replaced annually.

5.4.1.9.1 Where automatic bulb-type sprinklers or spray nozzles are used and annual examination shows no buildup of grease or other material on the sprinklers or spray nozzles, such sprinklers and spray nozzles shall not be required to be replaced.

5.4.2* Dry Pipe Systems. Dry pipe systems shall be kept dry at all times.

5.4.2.1 During nonfreezing weather, a dry pipe system shall be permitted to be left wet if the only other option is to remove the system from service while waiting for parts or during repair activities.

5.4.2.2 Air driers shall be maintained in accordance with the manufacturer's instructions.

5.4.2.3 Compressors used in conjunction with dry pipe sprinkler systems shall be maintained in accordance with the manufacturer's instructions.

5.4.3* Installation and Acceptance Testing. Where maintenance or repair requires the replacement of sprinkler system components affecting more than 20 sprinklers, those components shall be installed and tested in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems.*

5.4.4* Marine Systems. Sprinkler systems that are normally maintained using fresh water as a source shall be drained and refilled, then drained and refilled again with fresh water following the introduction of raw water into the system.

Chapter 6 Standpipe and Hose Systems

6.1 General. This chapter shall provide the minimum requirements for the routine inspection, testing, and maintenance of standpipe and hose systems. Table 6.1 shall be used to determine the minimum required frequencies for inspection, testing, and maintenance.

6.1.1 Valves and Connections. Valves and fire department connections shall be inspected, tested, and maintained in accordance with Chapter 12.

6.1.2 Impairments. Where the inspection, testing, and maintenance of standpipe and hose systems results or involves a system that is out of service, the procedures outlined in Chapter 14 shall be followed.

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Table 6.1 Summary of Standpipe and Hose Systems Inspection, Testing, and Maintenance

Item	Activity	Frequency	Reference
Control valves	Inspection	Weekly/monthly	Table 12.1
Pressure regulating devices	Inspection	Quarterly	Table 12.1
Piping	Inspection	Quarterly	6.2.1
Hose connections	Inspection	Quarterly	Table 12.1
Cabinet	Inspection	Annually	NFPA 1962
Hose	Inspection	Annually	NFPA 1962
Hose storage device	Inspection	Annually	NFPA 1962
Alarm device	Test	Quarterly	Table 12.1
Hose nozzle	Test	Annually	NFPA 1962
Hose storage device	Test	Annually	NFPA 1962
Hose	Test	5 years/3 years	NFPA 1962
Pressure control valve	Test	5 years	Table 12.1
Pressure reducing valve	Test	5 years	Table 12.1
Hydrostatic test	Test	5 years	6.3.2
Flow test	Test	5 years	6.3.1
Main drain test	Test	Annually	Table 12.1
Hose connections	Maintenance	Annually	Table 6.2.2
Valves (all types)	Maintenance	Annually/as needed	Table 12.1

6.2 Inspection.

6.2.1 Components of standpipe and hose systems shall be visually inspected quarterly or as specified in Table 6.1.

6.2.2 Table 6.2.2 shall be used for the inspection, testing, and maintenance of all classes of standpipe and hose systems.

6.2.3 Checkpoints and corrective actions outlined in Table 6.2.2 shall be followed to determine that components are free of corrosion, foreign material, physical damage, tampering, or other conditions that adversely affect system operation.

6.3 Testing. The tests shall be conducted by a qualified person. Where water damage is a possibility, an air test shall be conducted on the system at 1.7 bar (25 psi) prior to introducing water to the system.

6.3.1 Flow Tests.

6.3.1.1* A flow test shall be conducted every 5 years at the hydraulically most remote hose connection of each zone of an automatic standpipe system to verify the water supply still provides the design pressure at the required flow.

6.3.1.2 Where a flow test of the hydraulically most remote outlet(s) is not practical, the authority having jurisdiction shall be consulted for the appropriate location for the test.

6.3.1.3 All systems shall be flow tested and pressure tested at the requirements in effect at the time of the installation.

6.3.1.3.1 The actual test method(s) and performance criteria shall be discussed in advance with the authority having jurisdiction.

6.3.1.4 Standpipes, sprinkler connections to standpipes, or hose stations equipped with pressure reducing valves or pressure regulating valves shall have these valves inspected, tested, and maintained in accordance with the requirements of Chapter 12.

6.3.1.5 A main drain test shall be performed on all standpipe systems with automatic water supplies in accordance with the requirements of Chapter 12.

6.3.1.5.1 The test shall be performed at the low point drain for each standpipe or the main drain test connection where the supply main enters the building (when provided).

6.3.1.5.2 Pressure gauges shall be provided for the test and shall be maintained in accordance with 5.3.2.

6.3.2 Hydrostatic Tests.

6.3.2.1 Hydrostatic tests at not less than 13.8-bar (200-psi) pressure for 2 hours, or at 3.4 bar (50 psi) in excess of the maximum pressure, where maximum pressure is in excess of 10.3 bar (150 psi), shall be conducted every 5 years on dry standpipe systems and dry portions of wet standpipe systems.

6.3.2.2* Hydrostatic tests shall be conducted in manual standpipe systems in accordance with 6.3.2.1 or on any system that has been modified or repaired.

6.3.2.2.1 Manual wet standpipes that are part of a combined sprinkler/standpipe system shall not be required to be tested in accordance with 6.3.2.2.

6.3.2.3 The hydrostatic test pressure shall be measured at the low elevation point of the individual system or zone being tested. The inside standpipe piping shall show no leakage.

6.3.3 Alarm Devices. Where provided, waterflow alarm and supervisory devices shall be tested on a quarterly basis.

6.3.3.1 Where freezing conditions necessitate a delay in testing, tests shall be performed as soon as weather allows.

6.4 Maintenance. Maintenance and repairs shall be in accordance with 6.2.3 and Table 6.2.2.

6.4.1 Hose Connections. After each use, all hose connected to sprinkler systems shall be cleaned, drained, and thoroughly dried before being placed in service. Hose that has been exposed to hazardous materials shall be disposed of in an approved manner or shall be decontaminated by a method approved for the contaminant and by the hose manufacturer's recommendation. Equipment that does not pass the inspection requirements of 5.2.8 or the testing requirements of 5.3.5 shall be repaired and tested again or replaced.

6.5 Records. Records shall be maintained in accordance with Section 4.3.

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Table 6.2.2 Standpipe and Hose Systems

Component/Checkpoint	Corrective Action
Hose Connections	
Cap missing	Replace
Fire hose connection damaged	Repair
Valve handles missing	Replace
Cap gaskets missing or deteriorated	Replace
Valve leaking	Close or repair
Visible obstructions	Remove
Restricting device missing	Replace
Manual, semiautomatic, or dry standpipe — valve does not operate smoothly	Lubricate or repair
Piping	
Damaged piping	Repair
Control valves damaged	Repair or replace
Missing or damaged pipe support device	Repair or replace
Damaged supervisory devices	Repair or replace
Hose	
Inspect	Remove and inspect the hose, including gaskets, and rerack or rereel at intervals in accordance with NFPA 1962, *Standard for the Care, Use, and Service Testing of Fire Hose Including Couplings and Nozzles*
Mildew, cuts, abrasions, and deterioration evident	Replace with listed, lined, jacketed hose
Coupling damaged	Replace or repair
Gaskets missing or deteriorated	Replace
Incompatible threads on coupling	Replace or provide thread adapter
Hose not connected to hose rack nipple or valve	Connect
Hose test outdated	Retest or replace in accordance with NFPA 1962, *Standard for the Care, Use, and Service Testing of Fire Hose Including Couplings and Nozzles*
Hose Nozzle	
Hose nozzle missing	Replace with listed nozzle
Gasket missing or deteriorated	Replace
Obstructions	Remove
Nozzle does not operate smoothly	Repair or replace
Hose Storage Device	
Difficult to operate	Repair or replace
Damaged	Repair or replace
Obstruction	Remove
Hose improperly racked or rolled	Remove
Nozzle clip in place and nozzle correctly contained?	Replace if necessary
If enclosed in cabinet, will hose rack swing out at least 90 degrees?	Repair or remove any obstructions
Cabinet	
Check overall condition for corroded or damaged parts	Repair or replace parts; replace entire cabinet if necessary
Difficult to open	Repair
Cabinet door will not open fully	Repair or move obstructions
Door glazing cracked or broken	Replace
If cabinet is break-glass type, is lock functioning properly?	Repair or replace
Glass break device missing or not attached	Replace or attach
Not properly identified as containing fire equipment	Provide identification
Visible obstructions	Remove
All valves, hose, nozzles, fire extinguisher, etc., easily accessible	Remove any material not related

Chapter 7 Private Fire Service Mains

7.1 General. This chapter shall provide the minimum requirements for the routine inspection, testing, and maintenance of private fire service mains and their appurtenances. Table 7.1 shall be used to determine the minimum required frequencies for inspection, testing, and maintenance.

7.1.1 These functions shall be permitted to be carried out simultaneously.

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Table 7.1 Summary of Private Fire Service Main Inspection, Testing, and Maintenance

Item	Activity	Frequency	Reference
Hose houses	Inspection	Quarterly	7.2.2.7
Hydrants (dry barrel and wall)	Inspection	Annually and after each operation	7.2.2.4
Monitor nozzles	Inspection	Semiannually	7.2.2.6
Hydrants (wet barrel)	Inspection	Annually and after each operation	7.2.2.5
Mainline strainers	Inspection	Annually and after each significant flow	7.2.2.3
Piping (exposed)	Inspection	Annually	7.2.2.1
Piping (underground)	Inspection	See 7.2.2.2	7.2.2.2
Monitor nozzles	Test	Flow annually (range and operation)	7.3.3
Hydrants	Test	Flow annually	7.3.2
Piping (exposed and underground)	Flow test	5 years	7.3.1
Mainline strainers	Maintenance	Annually and after each operation	7.4.2
Hose houses	Maintenance	Annually	7.4.5
Hydrants	Maintenance	Annually	7.4.3
Monitor nozzles	Maintenance	Annually	7.4.4

7.1.2 Valves and Connections. Valves and fire department connections shall be inspected, tested, and maintained in accordance with Chapter 12.

7.1.3 Fire Hose. Fire hose shall be maintained in accordance with NFPA 1962, *Standard for the Care, Use, and Service Testing of Fire Hose Including Couplings and Nozzles.*

7.1.4 Impairments. The procedures outlined in Chapter 14 shall be followed wherever such an impairment to protection occurs.

7.1.5 Notification to Supervisory Service. To avoid false alarms where a supervisory service is provided, the alarm receiving facilities always shall be notified by the owner or designated representative as follows:

(1) Before conducting any test or procedure that could result in the activation of an alarm
(2) After such tests or procedures are concluded

7.2 Inspection.

7.2.1 General. Private fire service mains and their appurtenances shall be inspected at the intervals specified in Table 7.1.

7.2.2* Procedures. All procedures shall be carried out in accordance with the manufacturer's instructions, where applicable.

7.2.2.1 Exposed Piping.

7.2.2.1.1 Exposed piping shall be inspected annually.

7.2.2.1.2 Piping shall be inspected, and the necessary corrective action shall be taken as shown in Table 7.2.2.1.2.

7.2.2.1.3 Piping installed in areas that are inaccessible for safety considerations due to process operations shall be inspected during each scheduled shutdown.

7.2.2.2 Underground Piping. Generally, underground piping cannot be inspected on a routine basis. However, flow testing can reveal the condition of underground piping and shall be conducted in accordance with Section 7.3.

Table 7.2.2.1.2 Exposed Piping

Condition	Corrective Action
Leaks	Repair
Physical damage	Repair or replace
Corrosion	Clean or replace and coat with corrosion protection
Restraint methods	Repair or replace

7.2.2.3* Mainline Strainers. Mainline strainers shall be inspected and cleaned after each system flow exceeding that of a nominal 50-mm (2-in.) orifice and shall be removed and inspected annually for failing, damaged, and corroded parts with the necessary corrective action taken as shown in Table 7.2.2.3.

Table 7.2.2.3 Mainline Strainers

Condition	Corrective Action
Plugging or fouling	Clean
Corrosion	Replace or repair

7.2.2.4 Dry Barrel and Wall Hydrants. Dry barrel and wall hydrants shall be inspected annually and after each operation with the necessary corrective action taken as shown in Table 7.2.2.4.

7.2.2.5 Wet Barrel Hydrants. Wet barrel hydrants shall be inspected annually and after each operation with the necessary corrective action taken as shown in Table 7.2.2.5.

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Table 7.2.2.4 Dry Barrel and Wall Hydrants

Condition	Corrective Action
Inaccessible	Make accessible
Barrel contains water or ice (presence of water or ice could indicate a faulty drain, a leaky hydrant valve, or high groundwater table)	Repair and drain; for high groundwater it could be necessary to plug the drain and pump out the barrel after each use
Improper drainage from barrel	Repair drain
Leaks in outlets or at top of hydrant	Repair or replace gaskets, packing, or parts as necessary
Cracks in hydrant barrel	Repair or replace
Tightness of outlets	Lubricate if necessary; tighten if necessary
Worn nozzle threads	Repair or replace
Worn hydrant operating nut	Repair or replace
Availability of operating wrench	Make sure wrench is available

Table 7.2.2.5 Wet Barrel Hydrants

Condition	Corrective Action
Inaccessible	Make accessible
Leaks in outlets or at top of hydrant	Repair or replace gaskets, packing, or parts as necessary
Cracks in hydrant barrel	Repair or replace
Tightness of outlets	Lubricate if necessary; tighten if necessary
Worn nozzle threads	Repair or replace
Worn hydrant operating nut	Repair or replace
Availability of operating wrench	Make sure wrench is available

7.2.2.6 Monitor Nozzles. Monitor nozzles shall be inspected semiannually with the necessary corrective action taken as shown in Table 7.2.2.6.

Table 7.2.2.6 Monitor Nozzles

Condition	Corrective Action
Leakage	Repair
Physical damage	Repair or replace
Corrosion	Clean or replace, and lubricate or protect as necessary

7.2.2.7 Hose Houses. Hose houses shall be inspected quarterly with the necessary corrective action taken as shown in Table 7.2.2.7.

7.3 Testing.

7.3.1* Underground and Exposed Piping Flow Tests. Underground and exposed piping shall be flow tested to determine the internal condition of the piping at minimum 5-year intervals.

Table 7.2.2.7 Hose Houses

Condition	Corrective Action
Inaccessible	Make accessible
Physical damage	Repair or replace
Missing equipment	Replace equipment

7.3.1.1 Flow tests shall be made at flows representative of those expected during a fire for the purpose of comparing the friction loss characteristics of the pipe with those expected for the particular type of pipe involved, with due consideration given to the age of the pipe and to the results of previous flow tests.

7.3.1.2 Any flow test results that indicate deterioration of available water flow and pressure shall be investigated to the complete satisfaction of the authority having jurisdiction to ensure that the required flow and pressure are available for fire protection.

7.3.1.3 Where underground piping supplies individual fire sprinkler, standpipe, water spray, or foam-water sprinkler systems and there are no means to conduct full flow tests, tests generating the maximum available flows shall be permitted.

7.3.2 Hydrants. Hydrants shall be tested annually to ensure proper functioning.

7.3.2.1 Each hydrant shall be opened fully and waterflowed until all foreign material has cleared.

7.3.2.2 Flow shall be maintained for not less than 1 minute.

7.3.2.3 After operation, dry barrel and wall hydrants shall be observed for proper drainage from the barrel.

7.3.2.4 Full drainage shall take no longer than 60 minutes.

7.3.2.5 Where soil conditions or other factors are such that the hydrant barrel does not drain within 60 minutes, or where the groundwater level is above that of the hydrant drain, the hydrant drain shall be plugged and the water in the barrel shall be pumped out.

7.3.2.6 Dry barrel hydrants that are located in areas subject to freezing weather and that have plugged drains shall be identified clearly as needing pumping after operation.

7.3.3 Monitor Nozzles.

7.3.3.1 Monitor nozzles that are mounted on hydrants shall be tested as specified in 7.3.2.

7.3.3.2 All monitor nozzles shall be oscillated and moved throughout their full range annually to ensure proper operability.

7.3.4 Hose Houses. All fire hose shall be tested in accordance with NFPA 1962, *Standard for the Care, Use, and Service Testing of Fire Hose Including Couplings and Nozzles.*

7.4 Maintenance.

7.4.1 General. All equipment shall be maintained in proper working condition, consistent with the manufacturer's recommendations.

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7.4.2 Mainline Strainers. Mainline strainers shall be cleaned annually and after each operation.

7.4.3 Hydrants.

7.4.3.1 Hydrants shall be lubricated annually to ensure that all stems, caps, plugs, and threads are in proper operating condition.

7.4.3.2* Hydrants shall be kept free of snow, ice, or other materials and protected against mechanical damage so that free access is ensured.

7.4.4 Monitor Nozzles. Monitor nozzles shall be lubricated annually to ensure proper operating condition.

7.4.5 Hose Houses. Hose houses shall be maintained annually in a condition to ensure that all fire hose and required components are in usable condition.

7.5 Records. Records shall be maintained in accordance with Section 4.3.

Chapter 8 Fire Pumps

8.1* General. This chapter shall provide the minimum requirements for the routine inspection, testing, and maintenance of fire pump assemblies. Table 8.1 shall be used to determine the minimum required frequencies for inspection, testing, and maintenance.

8.1.1 Valves and Connections. Valves and fire department connections shall be inspected, tested, and maintained in accordance with Chapter 12.

8.1.2* Auxiliary Equipment. The pump assembly auxiliary equipment shall include the following:

(1) Pump accessories as follows:
   (a) Pump shaft coupling
   (b) Automatic air release valve
   (c) Pressure gauges
   (d) Circulation relief valve (not used in conjunction with diesel engine drive with heat exchanger)
(2) Pump test device(s)
(3) Pump relief valve and piping (where maximum pump discharge pressure exceeds the rating of the system components or the driver is of variable speed)
(4) Alarm sensors and indicators
(5) Right-angle gear sets (for engine-driven vertical shaft turbine pumps)
(6) Pressure maintenance (jockey) pump and accessories

8.1.3 Water Supply to Pump Suction. The suction supply for the fire pump shall provide the required flow at a gauge pressure of zero (0) bar [zero (0) psi] or higher at the pump suction flange to meet the system demand.

8.1.3.1 Those installations for which NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection*, permitted negative suction gauge pressures at the time of pump installation, where the system demand still can be met by the pump and water supply, shall be considered to be in compliance with 8.1.3.

8.1.4 Energy Source. The energy sources for the pump driver shall supply the necessary brake horsepower of the driver so that the pump meets system demand.

8.1.5 Driver. The pump driver shall not overload beyond its rating (including any service factor allowance) when delivering the necessary brake horsepower.

8.1.6* Controller. Automatic and manual controllers for applying the energy source to the driver shall be capable of providing this operation for the type of pump used.

8.1.7 Impairments. The procedures outlined in Chapter 14 shall be followed where an impairment to protection occurs.

8.1.8 Notification to Supervisory Service. To avoid false alarms where a supervisory service is provided, the alarm receiving facility always shall be notified by the owner or designated representative as follows:

(1) Before conducting any test or procedure that could result in the activation of an alarm
(2) After such tests or procedures are concluded

8.2 Inspection.

8.2.1 The purpose of inspection shall be to verify that the pump assembly appears to be in operating condition and is free from physical damage.

Table 8.1 Summary of Fire Pump Inspection, Testing, and Maintenance

Item	Activity	Frequency	Reference
Pump house, heating ventilating louvers	Inspection	Weekly	8.2.2(1)
Fire pump system	Inspection	Weekly	8.2.2(2)
Pump operation			
No-flow condition	Test	Weekly	8.3.1
Flow condition	Test	Annually	8.3.3.1
Hydraulic	Maintenance	Annually	8.5
Mechanical transmission	Maintenance	Annually	8.5
Electrical system	Maintenance	Varies	8.5
Controller, various components	Maintenance	Varies	8.5
Motor	Maintenance	Annually	8.5
Diesel engine system, various components	Maintenance	Varies	8.5

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8.2.2* The pertinent visual observations specified in the following checklists shall be performed weekly:

(1) Pump house conditions:
  (a) Heat is adequate, not less than 4.4°C (40°F) [21°C (70°F) for pump room with diesel pumps without engine heaters].
  (b) Ventilating louvers are free to operate.

(2) Pump system conditions:
  (a) Pump suction and discharge and bypass valves are fully open.
  (b) Piping is free of leaks.
  (c) Suction line pressure gauge reading is normal.
  (d) System line pressure gauge reading is normal.
  (e) Suction reservoir is full.
  (f) Wet pit suction screens are unobstructed and in place.

(3) Electrical system conditions:
  (a) Controller pilot light (power on) is illuminated.
  (b) Transfer switch normal pilot light is illuminated.
  (c) Isolating switch is closed — standby (emergency) source.
  (d) Reverse phase alarm pilot light is off or normal phase rotation pilot light is on.
  (e) Oil level in vertical motor sight glass is normal.

(4) Diesel engine system conditions:
  (a) Fuel tank is two-thirds full.
  (b) Controller selector switch is in auto position.
  (c) Batteries' (2) voltage readings are normal.
  (d) Batteries' (2) charging current readings are normal.
  (e) Batteries' (2) pilot lights are on or battery failure (2) pilot lights are off.
  (f) All alarm pilot lights are off.
  (g) Engine running time meter is reading.
  (h) Oil level in right angle gear drive is normal.
  (i) Crankcase oil level is normal.
  (j) Cooling water level is normal.
  (k) Electrolyte level in batteries is normal.
  (l) Battery terminals are free from corrosion.
  (m) Water-jacket heater is operating.

(5)*Steam system conditions: Steam pressure gauge reading is normal.

8.3* Testing.

8.3.1 A weekly test of fire pump assemblies shall be conducted without flowing water.

8.3.1.1 This test shall be conducted by starting the pump automatically.

8.3.1.2 The electric pump shall run a minimum of 10 minutes.

8.3.1.3 The diesel pump shall run a minimum of 30 minutes.

8.3.1.4 A valve installed to open as a safety feature shall be permitted to discharge water.

8.3.1.5 The automatic weekly test timer shall be permitted to be substituted for the starting procedure.

8.3.2 Weekly Tests.

8.3.2.1* Qualified operating personnel shall be in attendance during the weekly pump operation.

8.3.2.2 The pertinent visual observations or adjustments specified in the following checklists shall be conducted while the pump is running:

(1) Pump system procedure:
  (a) Record the system suction and discharge pressure gauge readings
  (b) Check the pump packing glands for slight discharge
  (c) Adjust gland nuts if necessary
  (d) Check for unusual noise or vibration
  (e) Check packing boxes, bearings, or pump casing for overheating
  (f) Record the pump starting pressure

(2) Electrical system procedure:
  (a) Observe the time for motor to accelerate to full speed
  (b) Record the time controller is on first step (for reduced voltage or reduced current starting)
  (c) Record the time pump runs after starting (for automatic stop controllers)

(3) Diesel engine system procedure:
  (a) Observe the time for engine to crank
  (b) Observe the time for engine to reach running speed
  (c) Observe the engine oil pressure gauge, speed indicator, water, and oil temperature indicators periodically while engine is running
  (d) Record any abnormalities
  (e) Check the heat exchanger for cooling water flow

(4) Steam system procedure:
  (a) Record the steam pressure gauge reading
  (b) Observe the time for turbine to reach running speed

8.3.3 Annual Tests.

8.3.3.1 An annual test of each pump assembly shall be conducted under minimum, rated, and peak flows of the fire pump by controlling the quantity of water discharged through approved test devices.

8.3.3.1.1* If available suction supplies do not allow flowing of 150 percent of the rated pump capacity, the fire pump shall be permitted to operate at maximum allowable discharge.

8.3.3.1.2* This test shall be conducted as described in 8.3.3.1.2.1, 8.3.3.1.2.2, or 8.3.3.1.2.3.

8.3.3.1.2.1 Use of the Pump Discharge Via the Hose Streams. Pump suction and discharge pressures and the flow measurements of each hose stream shall determine the total pump output. Care shall be taken to prevent water damage by verifying there is adequate drainage for the high-pressure water discharge from hoses.

8.3.3.1.2.2 Use of the Pump Discharge Via the Bypass Flowmeter to Drain or Suction the Reservoir. Pump suction and discharge pressures and the flowmeter measurements shall determine the total pump output.

8.3.3.1.2.3 Use of the Pump Discharge Via the Bypass Flowmeter to Pump Suction (Closed-Loop Metering). Pump suction and discharge pressures and the flowmeter measurements shall determine the total pump output.

8.3.3.1.3 Where the annual test is conducted periodically in accordance with 8.3.3.1.2.3, a test shall be conducted every 3 years in accordance with 8.3.3.1.2.1 or 8.3.3.1.2.2 in lieu of the method described in 8.3.3.1.2.3.

8.3.3.1.4 Where 8.3.3.1.2.2 or 8.3.3.1.2.3 is used, the flow meter shall be adjusted immediately prior to conducting the test in accordance with the manufacturer's instructions. If the test results are not consistent with the previous annual test, 8.3.3.1.2.1 shall be used. If testing in accordance with

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8.3.3.1.2.1 is not possible, a flowmeter calibration shall be performed and the test shall be repeated.

8.3.3.2 The pertinent visual observations, measurements, and adjustments specified in the following checklists shall be conducted annually while the pump is running and flowing water under the specified output condition:

(1) At no-flow condition (churn):
   (a) Check the circulation relief valve for operation to discharge water
   (b) Check the pressure relief valve (if installed) for proper operation
   (c) Continue the test for ½ hour
(2) At each flow condition:
   (a) Record the electric motor voltage and current (all lines)
   (b) Record the pump speed in rpm
   (c) Record the simultaneous (approximately) readings of pump suction and discharge pressures and pump discharge flow

8.3.3.3* For installations having a pressure relief valve, the operation of the relief valve shall be closely observed during each flow condition to determine if the pump discharge pressure exceeds the normal operating pressure of the system components.

8.3.3.3.1 The pressure relief valve shall also be observed during each flow condition to determine if the pressure relief valve closes at the proper pressure.

8.3.3.3.2 A pressure relief valve that is open during a flow condition will affect test results.

8.3.3.3.3 The pressure relief valve shall be closed during flow conditions if necessary to achieve minimum rated characteristics for the pump and reset to normal position at the conclusion of the pump test.

8.3.3.4 For installations having an automatic transfer switch, the following test shall be performed to ensure that the overcurrent protective devices (i.e., fuses or circuit breakers) do not open:

(1) Simulate a power failure condition while the pump is operating at peak load
(2) Verify that the transfer switch transfers power to the alternate power source
(3) Verify that the pump continues to perform at peak load
(4) Remove the power failure condition and verify that after a time delay, the pump is reconnected to the normal power source

8.3.3.5 Alarm conditions shall be simulated by activating alarm circuits at alarm sensor locations, and all such local or remote alarm indicating devices (visual and audible) shall be observed for operation.

8.3.3.6 **Safety.** Section 4.7 shall be followed for safety requirements while working near electric motor-driven fire pumps.

8.3.3.7* **Suction Screens.** After the water-flow portions of the annual test or fire protection system activations, the suction screens shall be inspected and cleared of any debris or obstructions.

8.3.4 Other Tests.

8.3.4.1 Engine generator sets supplying emergency or standby power to fire pump assemblies shall be tested routinely in accordance with NFPA 110, *Standard for Emergency and Standby Power Systems.*

8.3.4.2 Automatic transfer switches shall be tested routinely and exercised in accordance with NFPA 110, *Standard for Emergency and Standby Power Systems.*

8.3.4.3 Tests of appropriate environmental pump room space conditions (e.g., heating, ventilation, illumination) shall be made to ensure proper manual or automatic operation of the associated equipment.

8.3.4.4* Parallel and angular alignment of the pump and driver shall be checked during the annual test. Any misalignment shall be corrected.

8.3.5 **Test Results and Evaluation.**

8.3.5.1* **Interpretation.**

8.3.5.1.1 The interpretation of the test results shall be the basis of determination of performance of the pump assembly.

8.3.5.1.2 Qualified individuals shall make interpretation of the test results.

8.3.5.2 **Engine Speed.**

8.3.5.2.1 Theoretical factors for correction to the rated speed shall not be applied where determining the compliance of the pump per the test.

8.3.5.2.2 Increasing the engine speed beyond the rated speed of the pump at rated condition is not an acceptable method for meeting the rated pump performance.

8.3.5.3 The fire pump assembly shall be considered acceptable if either of the following conditions is shown during the test:

(1)*The test matches the initial unadjusted field acceptance test curve.
(2) The fire pump matches the performance characteristics as indicated on the pump nameplate.

8.3.5.4* Degradation in excess of 5 percent of the pressure of the initial unadjusted acceptance test curve or nameplate shall require an investigation to reveal the cause of degraded performance.

8.3.5.5 Current and voltage readings whose product does not exceed the product of the rated voltage and rated full-load current multiplied by the permitted motor service factor shall be considered acceptable. Voltage readings at the motor within 5 percent below or 10 percent above the rated (i.e., nameplate) voltage shall be considered acceptable.

8.4 Reports.

8.4.1 Any abnormality observed during inspection or testing shall be reported promptly to the person responsible for correcting the abnormality.

8.4.2* Test results shall be recorded and retained for comparison purposes in accordance with Section 4.3.

8.4.2.1 All time delay intervals associated with the pump's starting, stopping, and energy source transfer shall be recorded.

8.5 Maintenance.

8.5.1* A preventive maintenance program shall be established on all components of the pump assembly in accordance with the manufacturer's recommendations.

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8.5.2 Records shall be maintained on all work performed on the pump, driver, controller, and auxiliary equipment.

8.5.3 In the absence of manufacturer's recommendations for preventive maintenance, Table 8.5.3 shall be used for alternative requirements.

Table 8.5.3 Summary of Fire Pump Inspection, Testing, and Maintenance

Complete as Applicable	Visual Inspection	Check	Change	Clean	Test	Frequency
A. Pump System						
1. Lubricate pump bearings			X			Annually
2. Check pump shaft end play		X				Annually
3. Check accuracy of pressure gauges and sensors		X	X			Annually (change or recalibrate when 5% out of calibration)
4. Check pump coupling alignment		X				Annually
5. Wet pit suction screens		X		X		After each pump operation
B. Mechanical Transmission						
1. Lubricate coupling			X			Annually
2. Lubricate right-angle gear drive			X			Annually
C. Electrical System						
1. Exercise isolating switch and circuit breaker					X	Monthly
2. Trip circuit breaker (if mechanism provided)					X	Annually
3. Operate manual starting means (electrical)					X	Semiannually
4. Inspect and operate emergency manual starting means (without power)	X				X	Annually
5. Tighten electrical connections as necessary		X				Annually
6. Lubricate mechanical moving parts (excluding starters and relays)		X				Annually
7. Calibrate pressure switch settings		X				Annually
8. Grease motor bearings			X			Annually
D. Diesel Engine System						
1. Fuel						
(a) Tank level	X	X				Weekly
(b) Tank float switch	X				X	Weekly
(c) Solenoids valve operation	X				X	Weekly
(d) Strainer, filter, or dirt leg, or combination thereof				X		Quarterly
(e) Water and foreign material in tank				X		Annually
(f) Water in system		X		X		Weekly
(g) Flexible hoses and connectors	X					Weekly
(h) Tank vents and overflow piping unobstructed		X			X	Annually
(i) Piping	X					Annually
2. Lubrication System						
(a) Oil level	X	X				Weekly
(b) Oil change			X			50 hours or annually
(c) Oil filter(s)			X			50 hours or annually
(d) Lube oil heater		X				Weekly
(e) Crankcase breather	X		X	X		Quarterly

(continues)

Table 8.5.3 *Continued*

Complete as Applicable	Visual Inspection	Check	Change	Clean	Test	Frequency
3. Cooling System						
(a) Level	X	X				Weekly
(b) Antifreeze protection level					X	Semiannually
(c) Antifreeze			X			Annually
(d) Adequate cooling water to heat exchanger		X				Weekly
(e) Rod out heat exchanger				X		Annually
(f) Water pump(s)	X					Weekly
(g) Condition of flexible hoses and connections	X	X				Weekly
(h) Jacket water heater		X				Weekly
(i) Inspect duct work, clean louvers (combustion air)	X	X	X			Annually
(j) Water strainer				X		Quarterly
4. Exhaust System						
(a) Leakage	X	X				Weekly
(b) Drain condensate trap		X				Weekly
(c) Insulation and fire hazards	X					Quarterly
(d) Excessive back pressure					X	Annually
(e) Exhaust system hangers and supports	X					Annually
(f) Flexible exhaust section	X					Semiannually
5. Battery System						
(a) Electrolyte level		X				Weekly
(b) Terminals clean and tight	X	X				Quarterly
(c) Remove corrosion, case exterior clean and dry	X		X			Monthly
(d) Specific gravity or state of charge					X	Monthly
(e) Charger and charge rate	X					Monthly
(f) Equalize charge		X				Monthly
6. Electrical System						
(a) General inspection	X					Weekly
(b) Tighten control and power wiring connections		X				Annually
(c) Wire chafing where subject to movement	X	X				Quarterly
(d) Operation of safeties and alarms		X			X	Semiannually
(e) Boxes, panels, and cabinets				X		Semiannually
(f) Circuit breakers or fuses	X	X				Monthly
(g) Circuit breakers or fuses			X			Biennially

8.5.4 The preventive maintenance program shall be initiated immediately after the pump assembly has passed acceptance tests.

Chapter 9 Water Storage Tanks

9.1* General. This chapter shall provide the minimum requirements for the routine inspection, testing, and maintenance of water storage tanks. Table 9.1 shall be used to determine the minimum required frequencies for inspection, testing, and maintenance.

9.1.1 Valves and Connections. Valves and fire department connections shall be inspected, tested, and maintained in accordance with Chapter 12.

9.1.2 Impairments. The procedures outlined in Chapter 14 shall be followed where an impairment to protection occurs.

9.1.3* Notification to Supervisory Service. To avoid false alarms where a supervisory service is provided, the alarm receiving facility always shall be notified by the owner or designated representative as follows:

(1) Before conducting any test or procedure that could result in the activation of an alarm
(2) After such tests or procedures are concluded

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Table 9.1 Summary of Water Storage Tank Inspection, Testing, and Maintenance

Item	Activity	Frequency	Reference
Condition of water in tank	Inspection	Monthly/quarterly*	9.2.1
Water temperature	Inspection	Daily/weekly*	9.2.4
Heating system	Inspection	Daily/weekly*	9.2.6.6
Control valves	Inspection	Weekly/monthly	Table 12.1
Water — level	Inspection	Monthly/quarterly	9.2.1
Air pressure	Inspection	Monthly/quarterly	9.2.2
Tank — exterior	Inspection	Quarterly	9.2.5.1
Support structure	Inspection	Quarterly	9.2.5.1
Catwalks and ladders	Inspection	Quarterly	9.2.5.1
Surrounding area	Inspection	Quarterly	9.2.5.2
Hoops and grillage	Inspection	Annually	9.2.5.4
Painted/coated surfaces	Inspection	Annually	9.2.5.5
Expansion joints	Inspection	Annually	9.2.5.3
Interior	Inspection	5 years/3 years	9.2.6
Check valves	Inspection	5 years	Table 12.1
Temperature alarms	Test	Monthly*	9.2.4.2, 9.2.4.3
High temperature limit switches	Test	Monthly*	9.3.4
Water level alarms	Test	Semiannually	9.3.5
Level indicators	Test	5 years	9.3.1
Pressure gauges	Test	5 years	9.3.6
Water level	Maintenance	—	9.4.1
Drain silt	Maintenance	Semiannually	9.4.5
Control valves	Maintenance	Annually	Table 12.1
Embankment-supported coated fabric (ESCF)	Maintenance	—	9.4.6
Check valves	Maintenance	—	12.4.2.2

*Cold weather/heating season only.

9.2 Inspection.

9.2.1 Water Level.

9.2.1.1* Tanks equipped with supervised water level alarms that are connected to a constantly attended location shall be inspected quarterly.

9.2.1.2 Tanks not equipped with supervised water level alarms connected to a constantly attended location shall be inspected monthly.

9.2.2 Air Pressure.

9.2.2.1 Pressure tanks that have their air pressure source supervised in accordance with *NFPA 72®, National Fire Alarm Code®*, shall be inspected quarterly.

9.2.2.2 The air pressure in pressure tanks with a nonsupervised air pressure source shall be inspected monthly.

9.2.3 Heating System.

9.2.3.1 Tank heating systems installed on tanks equipped with a supervised low water temperature alarm that are connected to a constantly attended location shall be inspected weekly.

9.2.3.2 Tank heating systems without a supervised low temperature alarm connected to a constantly attended location shall be inspected daily during the heating season.

9.2.4 Water Temperature.

9.2.4.1 The temperature of water tanks shall not be less than 4°C (40°F).

9.2.4.2 The temperature of water in tanks with low temperature alarms connected to a constantly attended location shall be inspected and recorded weekly during the heating season.

9.2.4.3 The temperature of water in tanks without low temperature alarms connected to a constantly attended location shall be inspected and recorded daily during the heating season.

9.2.5 Exterior Inspection.

9.2.5.1* The exterior of the tank, supporting structure, vents, foundation, and catwalks or ladders, where provided, shall be inspected quarterly for signs of obvious damage or weakening.

9.2.5.2 The area surrounding the tank and supporting structure, where provided, shall be inspected quarterly to ensure that the following conditions are met:

(1) The area is free of combustible storage, trash, debris, brush, or material that could present a fire exposure hazard.
(2) The area is free of the accumulation of material on or near parts that could result in accelerated corrosion or rot.
(3) The tank and support are free of ice buildup.
(4) The exterior sides and top of embankments supporting coated fabric tanks are free of erosion.

9.2.5.3 Expansion joints, where provided, shall be inspected annually for leaks and cracks.

9.2.5.4 The hoops and grillage of wooden tanks shall be inspected annually.

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9.2.5.5 Exterior painted, coated, or insulated surfaces of the tank and supporting structure, where provided, shall be inspected annually for signs of degradation.

9.2.6 Interior Inspection.

9.2.6.1 Frequency.

9.2.6.1.1* The interior of steel tanks without corrosion protection shall be inspected every 3 years.

9.2.6.1.2 The interior of all other types of tanks shall be inspected every 5 years.

9.2.6.2 Where interior inspection is made by means of underwater evaluation, silt shall first be removed from the tank floor.

9.2.6.3 The tank interior shall be inspected for signs of pitting, corrosion, spalling, rot, other forms of deterioration, waste materials and debris, aquatic growth, and local or general failure of interior coating.

9.2.6.4 Steel tanks exhibiting signs of interior pitting, corrosion, or failure of coating shall be tested in accordance with 9.2.7.

9.2.6.5* Tanks on ring-type foundations with sand in the middle shall be inspected for evidence of voids beneath the floor.

9.2.6.6 The heating system and components including piping shall be inspected.

9.2.6.7 The anti-vortex plate shall be inspected for deterioration or blockage.

9.2.7 Interior Inspection. Where a drained interior inspection of a steel tank is conducted in accordance with 9.2.6.4, the following tests shall be conducted:

(1) Evaluation of tank coatings shall be made in accordance with the adhesion test of ASTM D 3359, *Standard Test Methods for Measuring Adhesion by Tape Test*, generally referred to as the "cross-hatch test."
(2) Dry film thickness measurements shall be taken at random locations to determine the overall coating thickness.
(3) Nondestructive ultrasonic readings shall be taken to evaluate the wall thickness where there is evidence of pitting or corrosion.
(4) Interior surfaces shall be spot wet-sponge tested to detect pinholes, cracks, or other compromises in the coating. Special attention shall be given to sharp edges such as ladder rungs, nuts, and bolts.
(5) Tank bottoms shall be tested for metal loss and/or rust on the underside by use of ultrasonic testing where there is evidence of pitting or corrosion. Removal, visual inspection, and replacement of random floor coupons shall be an acceptable alternative to ultrasonic testing.
(6) Tanks with flat bottoms shall be vacuum-box tested at bottom seams in accordance with test procedures found in NFPA 22, *Standard for Water Tanks for Private Fire Protection.*

9.3 Testing.

9.3.1* Level indicators shall be tested every 5 years for accuracy and freedom of movement.

9.3.2 The tank heating system, where provided, shall be tested prior to the heating season to make certain it is in the proper working order.

9.3.3 Low water temperature alarms, where provided, shall be tested monthly (cold weather only).

9.3.4* High water temperature limit switches on tank heating systems, where provided, shall be tested monthly whenever the heating system is in service.

9.3.5* High and low water level alarms shall be tested semiannually.

9.3.6* Pressure gauges shall be tested every 5 years with a calibrated gauge in accordance with the manufacturer's instructions. Gauges not accurate to within 3 percent of the scale of the gauge being tested shall be recalibrared or replaced.

9.4 Maintenance. Voids discovered beneath the floors of tanks shall be filled by pumping in grout or accessing the sand and replenishing.

9.4.1 The tank shall be maintained full or at the designed water level.

9.4.2 The hatch covers in the roofs and the door at the top of the frostproof casing shall always be kept securely fastened with substantial catches as a protection against freezing and windstorm damage.

9.4.3 No waste materials, such as boards, paint cans, trim, or loose material, shall be left in the tank or on the surface of the tank.

9.4.4 The exposed surfaces of embankment-supported coated fabric (ESCF) tanks shall be cleaned and painted every 2 years or in accordance with the manufacturer's instructions.

9.4.5 Silt shall be removed during interior inspections or more frequently as needed to avoid accumulation to the level of the tank outlet.

9.4.6 Maintenance of Embankment-Supported Coated Fabric (ESCF) Suction Tanks. The maintenance of ESCF tanks shall be completed in accordance with this section and the tank manufacturer's instructions.

9.5 Records. Records shall be maintained in accordance with Section 4.3.

Chapter 10 Water Spray Fixed Systems

10.1* General. This chapter shall provide the minimum requirements for the routine inspection, testing, and maintenance of water spray protection from fixed nozzle systems only. Table 10.1 shall be used to determine the minimum required frequencies for inspection, testing, and maintenance.

10.1.1 This chapter shall not cover water spray protection from portable nozzles, sprinkler systems, monitor nozzles, or other means of application.

10.1.2* NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection,* shall be consulted to determine the requirements for design and installation, including acceptance testing.

10.1.3 Valves and Connections. Valves and fire department connections shall be inspected, tested, and maintained in accordance with Chapter 12.

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Table 10.1 Summary of Water Spray Fixed System Inspection, Testing, and Maintenance

Item	Activity	Frequency	Reference
Backflow preventer	Inspection		Chapter 12
Check valves	Inspection		Chapter 12
Control valves	Inspection	Weekly (sealed)	Chapter 12
Control valves	Inspection	Monthly (locked, supervised)	Chapter 12
Deluge valve	Inspection		10.2.2, Chapter 12
Detection systems	Inspection		*NFPA 72*
Detector check valves	Inspection		Chapter 12
Drainage	Inspection	Quarterly	10.2.8
Electric motor	Inspection		10.2.9, Chapter 8
Engine drive	Inspection		10.2.9, Chapter 8
Fire pump	Inspection		10.2.9, Chapter 8
Fittings	Inspection	Quarterly	10.2.4, 10.2.4.1
Fittings (rubber-gasketed)	Inspection	Quarterly	10.2.4.1, A.10.2.4.1
Gravity tanks	Inspection		10.2.10, Chapter 9
Hangers	Inspection	Quarterly	10.2.4.2
Heat (deluge valve house)	Inspection	Daily/weekly	10.2.1.5, Chapter 12
Nozzles	Inspection	Monthly	10.2.1.1, 10.2.1.2, 10.2.1.6, 10.2.5.1, 10.2.5.2
Pipe	Inspection	Quarterly	10.2.1.1, 10.2.1.2, 10.2.4, 10.2.4.1
Pressure tank	Inspection		10.2.10, Chapter 9
Steam driver	Inspection		10.2.9, Chapter 8
Strainers	Inspection	Mfg. instruction	10.2.7
Suction tanks	Inspection		10.2.10, Chapter 9
Supports	Inspection	Quarterly	10.2.1.1, 10.2.1.2, 10.2.4.2
Water supply piping	Inspection		10.2.6.1, 10.2.6.2
UHSWSS — detectors	Inspection	Monthly	10.4.2
UHSWSS — controllers	Inspection	Each shift	10.4.3
UHSWSS — valves	Inspection	Each shift	10.4.4
Backflow preventer	Operational test		Chapter 12
Check valves	Operational test		Chapter 12
Control valves	Operational test	Quarterly	Chapter 12
Deluge valve	Operational test		10.2.2, Chapter 12
Detection systems	Operational test		*NFPA 72*
Detector check valve	Operational test		Chapter 12
Electric motor	Operational test		10.2.9, Chapter 8
Engine drive	Operational test		10.2.9, Chapter 8
Fire pump	Operational test		10.2.9, Chapter 8
Flushing	Operational test	Annually	10.2.1.3, Section 10.3 (flushing of connection to riser, part of annual test)
Gravity tanks	Operational test		10.2.10, Chapter 9
Main drain test	Operational test	Quarterly	Chapter 12
Manual release	Operational test	Annually	10.2.1.3, 10.3.6
Nozzles	Operational test	Annually	10.2.1.3, 10.2.1.6, Section 10.3
Pressure tank	Operational test		Section 10.2, Chapter 9
Steam driver	Operational test		10.2.9, Chapter 8
Strainers	Operational test	Annually	10.2.1.3, 10.2.1.7, 10.2.7
Suction tanks	Operational test		10.2.10, Chapter 9
Water-flow alarm	Operational test	Quarterly	Chapter 5
Water spray system test	Operational test	Annually	Section 10.3, Chapter 12
Water supply flow test	Operational test		7.3.2
UHSWSS	Operational test	Annually	Section 10.4
Backflow preventer	Maintenance		Chapter 12
Check valves	Maintenance		Chapter 12
Control valves	Maintenance	Annually	10.2.1.4, Chapter 12
Deluge valve	Maintenance		10.2.2, Chapter 12
Detection systems	Maintenance		*NFPA 72*
Detector check valve	Maintenance		Chapter 12
Electric motor	Maintenance		10.2.9, Chapter 8

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Table 10.1 *Continued*

Item	Activity	Frequency	Reference
Engine drive	Maintenance		10.2.9, Chapter 8
Fire pump	Maintenance		10.2.9, Chapter 8
Gravity tanks	Maintenance		10.2.10, Chapter 9
Pressure tank	Maintenance		10.2.6, Chapter 9
Steam driver	Maintenance		10.2.9, Chapter 8
Strainers	Maintenance	Annually	10.2.1.4, 10.2.1.7, 10.2.7
Strainers (baskets/screen)	Maintenance	5 years	10.2.1.4, 10.2.1.8, A.10.2.7
Suction tanks	Maintenance		10.2.10, Chapter 9
Water spray system	Maintenance	Annually	10.2.1.4, Chapter 12

10.1.4* Impairments. The procedures outlined in Chapter 14 and this section shall be followed where an impairment to protection occurs.

10.1.4.1* When a water spray fixed system or any portion thereof is out of service for any reason, notice shall be given to facility management, the local fire department, the on-site fire brigade, and other authorities having jurisdiction, as applicable.

10.1.4.2 A sign shall be posted at each fire department connection or system control valve indicating which portion of the system is out of service.

10.2 Inspection and Maintenance Procedures.

10.2.1 The components described in this section shall be inspected and maintained at the frequency specified in Table 10.1 and in accordance with this standard and the manufacturer's instructions.

10.2.1.1 Items in areas that are inaccessible for safety considerations due to factors such as continuous process operations and energized electrical equipment shall be inspected during each scheduled shutdown but not more than every 18 months.

10.2.1.2 Inspections shall not be required for items in areas with no provision for access and that are not subject to the conditions noted in 10.2.4.1, 10.2.4.2, and 10.2.5.1.

10.2.1.3 Items in areas that are inaccessible for safety considerations shall be tested at longer intervals in accordance with 12.4.3.2.2.2.

10.2.1.4 Other maintenance intervals shall be permitted depending on the results of the visual inspection and operating tests.

10.2.1.5 Deluge valve enclosures shall be inspected in accordance with the provisions of Chapter 12.

10.2.1.6 Nozzle discharge patterns and direction shall be checked during the annual test.

10.2.1.7 Nozzle strainers shall be removed, inspected, and cleaned during the flushing procedure for the mainline strainer.

10.2.1.8 Mainline strainers shall be removed and inspected every 5 years for damaged and corroded parts.

10.2.2 Deluge Valves. Deluge valves shall be inspected, tested, and maintained in accordance with Chapter 12.

10.2.3 Automatic Detection Equipment. Automatic detection equipment shall be inspected, tested, and maintained in accordance with *NFPA 72, National Fire Alarm Code*, to ensure that the detectors are in place, securely fastened, and protected from corrosion, weather, and mechanical damage and that the communication wiring, control panels, or pneumatic tubing system is functional.

10.2.4* System Piping. System piping, fittings, hangers, and supports shall be inspected and maintained to ensure continuity of water delivery to the spray nozzles at full water-flow and design pressure.

10.2.4.1* System Piping and Fittings. System piping and fittings shall be inspected for the following:

(1) Mechanical damage (e.g., broken piping or cracked fittings)
(2) External conditions (e.g., missing or damaged paint or coatings, rust, and corrosion)
(3) Misalignment or trapped sections
(4) Low point drains (automatic or manual)
(5) Location of rubber-gasketed fittings

10.2.4.2* Hangers and Supports. Hangers and supports shall be inspected for the following and repaired as necessary:

(1) Condition (e.g., missing or damaged paint or coating, rust, and corrosion)
(2) Secure attachment to structural supports and piping
(3) Damaged or missing hangers

10.2.5* Water Spray Nozzles.

10.2.5.1 Water spray nozzles shall be inspected and maintained to ensure that they are in place, continue to be aimed or pointed in the direction intended in the system design, and are free from external loading and corrosion.

10.2.5.2 Where caps or plugs are required, the inspection shall confirm they are in place and free to operate as intended.

10.2.5.3 Misaligned water spray nozzles shall be adjusted (aimed) by visual means, and the discharge patterns shall be checked at the next scheduled flow test.

10.2.6 Water Supply.

10.2.6.1 The dependability of the water supply shall be ensured by regular inspection and maintenance, whether furnished by a municipal source, on-site storage tanks, a fire pump, or private underground piping systems.

10.2.6.2* Water supply piping shall be maintained free of internal obstructions.

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10.2.7* Strainers.

10.2.7.1 Mainline strainers (basket or screen) shall be flushed until clear after each operation or flow test.

10.2.7.2 Individual water spray nozzle strainers shall be removed, cleaned, and inspected after each operation or flow test.

10.2.7.3 All strainers shall be inspected and cleaned in accordance with the manufacturer's instructions.

10.2.7.4 Damaged or corroded parts shall be replaced or repaired.

10.2.8 Drainage. The area beneath and surrounding a water spray fixed system shall be inspected visually on a quarterly basis to ensure that drainage facilities, such as trap sumps and drainage trenches, are not blocked and retention embankments or dikes are in good repair.

10.2.9 Fire Pumps. Chapter 8 shall be followed for inspection and maintenance requirements.

10.2.10 Water Tanks (Gravity, Pressure, or Suction Tanks, or Reservoirs). Chapter 9 shall be followed for inspection and maintenance requirements.

10.3 Operational Tests.

10.3.1 Performance. Water spray fixed systems shall require competent and effective care and maintenance to ensure they perform as designed.

10.3.1.1 Frequency of system tests shall be in accordance with Table 10.1.

10.3.1.2 Water spray fixed systems shall be serviced in accordance with this standard and with the manufacturer's instructions.

10.3.2 Notification.

10.3.2.1 To avoid false alarms where a supervisory service is provided, the alarm receiving facility always shall be notified by the owner or designated representative as follows:

(1) Before conducting any test or procedure that could result in the actuation of an alarm
(2) After such tests or procedures are concluded

10.3.2.2 Notify all personnel whose operations could be affected by the system operation.

10.3.2.3 The owner's representative, the authority having jurisdiction, and the fire department or fire brigade shall be notified that testing is to be conducted so they have the opportunity to observe the inspection and testing of the water spray fixed systems.

10.3.3* Test Preparation. Precautions shall be taken to prevent damage to property during the test.

10.3.4 Operational Test Performance. Operational tests shall be conducted to ensure that the water spray fixed systems respond as designed, both automatically and manually.

10.3.4.1* Response Time.

10.3.4.1.1 Under test conditions, the heat detection systems, where exposed to a heat test source, shall operate within 40 seconds.

10.3.4.1.2 Under test conditions, the flammable gas detection system, where exposed to a standard test gas concentration, shall operate within 20 seconds.

10.3.4.1.3 These response times shall be recorded.

10.3.4.2 Discharge Time. The time lapse between operation of detection systems and water delivery time to the protected area shall be recorded.

10.3.4.3* Discharge Patterns.

10.3.4.3.1 The water discharge patterns from all of the spray nozzles shall be observed to ensure that patterns are not impeded by plugged nozzles and to ensure that nozzles are correctly positioned and that obstructions do not prevent discharge patterns from wetting surfaces to be protected.

10.3.4.3.2 Where obstructions occur, the piping and nozzles shall be cleaned and the system retested.

10.3.4.4 Pressure Readings.

10.3.4.4.1 Pressure readings shall be recorded at the hydraulically most remote nozzle to ensure the water flow has not been impeded by partially closed valves or by plugged strainers or piping.

10.3.4.4.2 A second pressure reading shall be recorded at the deluge valve to ensure the water supply is adequate.

10.3.4.4.3 Readings shall be compared to the hydraulic design pressures to ensure the original system design requirements are met and the water supply is adequate to meet the design requirements.

10.3.4.4.3.1 Where the hydraulically most remote nozzle is inaccessible, nozzles shall be permitted to be checked visually without taking a pressure reading on the most remote nozzle.

10.3.4.4.3.2 Where the reading taken at the riser indicates that the water supply has deteriorated, a gauge shall be placed on the hydraulically most remote nozzle and the results compared with the required design pressure.

10.3.5 Multiple Systems. The maximum number of systems expected to operate in case of fire shall be tested simultaneously to check the adequacy of the water supply.

10.3.6 Manual Operation. Manual actuation devices shall be operated annually.

10.3.7 Return to Service. After the full flow test, the water spray system shall be maintained and returned to service in accordance with the manufacturer's instructions.

10.3.7.1 Main Drain Tests.

10.3.7.1.1 Main drain tests shall be conducted at the main riser to determine whether there has been any change in the condition of the water supply piping and controlling valves.

10.3.7.1.2 Static and residual water pressures shall be recorded respectively before, during, and after the operation of the fully opened drain valve.

10.3.7.1.3 Readings shall be compared with those made at the time of the original acceptance tests or with those made at the time of the last test to determine whether there has been any deterioration of the water supply.

10.3.7.2 Low Point Drains.

10.3.7.2.1 To prevent freezing and corrosion, all low point drains in aboveground piping shall be opened, the pipe drained, and the valves closed and plugs replaced.

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10.3.7.2.2 Where weep holes are provided in lieu of low point drains, they shall be inspected to ensure they are clear and unobstructed.

10.4 Ultra-High-Speed Water Spray System Operational Tests.

10.4.1 A full operational test, including measurements of response time, shall be conducted at intervals not exceeding 1 year.

10.4.1.1 Systems out of service shall be tested before being placed back in service.

10.4.2 All detectors shall be tested and inspected monthly for physical damage and accumulation of deposits on the lenses of optical detectors.

10.4.3 Controllers shall be inspected for faults at the start of each working shift.

10.4.4 Valves.

10.4.4.1 Valves on the water supply line shall be inspected at the start of each working shift to verify they are open.

10.4.4.2 Valves secured in the open position with a locking device or monitored by a signaling device that will sound a trouble signal at the deluge system control panel or other central location shall not require inspection.

10.4.5 Response Time.

10.4.5.1 The response time shall be verified during the operational test.

10.4.5.2 The response time shall be in accordance with the requirements of the system but not more than 100 milliseconds.

10.5 Records. Section 4.3 shall be followed for recordkeeping and reporting procedures.

Chapter 11 Foam-Water Sprinkler Systems

11.1 General. This chapter shall provide the minimum requirements for the routine inspection, testing, and maintenance of foam-water systems. Table 11.1 shall be used to determine the minimum required frequencies for inspection, testing, and maintenance.

Table 11.1 Summary of Foam-Water Sprinkler System Inspection, Testing, and Maintenance

System/Component	Activity	Frequency	Reference
Discharge device location (sprinkler)	Inspection	Annually	11.2.5
Discharge device location (spray nozzle)	Inspection	Monthly	11.2.5
Discharge device position (sprinkler)	Inspection	Annually	11.2.5
Discharge device position (spray nozzle)	Inspection	Monthly	11.2.5
Foam concentrate strainer(s)	Inspection	Quarterly	11.2.7.2
Drainage in system area	Inspection	Quarterly	11.2.8
Proportioning system(s) — all	Inspection	Monthly	11.2.9
Pipe corrosion	Inspection	Quarterly	11.2.3
Pipe damage	Inspection	Quarterly	11.2.3
Fittings corrosion	Inspection	Quarterly	11.2.3
Fittings damage	Inspection	Quarterly	11.2.3
Hangers/supports	Inspection	Quarterly	11.2.4
Water supply tank(s)	Inspection		Chapter 9
Fire pump(s)	Inspection		Chapter 8
Water supply piping	Inspection		11.2.6.1
Control valve(s)	Inspection	Weekly/monthly	—
Deluge/preaction valve(s)	Inspection		11.2.1, Chapter 12
Detection system	Inspection	See *NFPA 72*	11.2.2
Discharge device location	Test	Annually	11.3.3.6
Discharge device position	Test	Annually	11.3.3.6
Discharge device obstruction	Test	Annually	11.3.3.6
Foam concentrate strainer(s)	Test	Annually	11.2.7.2
Proportioning system(s) — all	Test	Annually	11.2.9
Complete foam-water system(s)	Test	Annually	11.3.3
Foam-water solution	Test	Annually	11.3.6
Manual actuation device(s)	Test	Annually	11.3.5
Backflow preventer(s)	Test	Annually	Chapter 12
Fire pump(s)	Test	See Chapter 8	—
Water supply piping	Test	Annually	Chapter 10
Control valve(s)	Test	See Chapter 12	—
Strainer(s) — mainline	Test	See Chapter 10	11.2.7.1
Deluge/preaction valve(s)	Test	See Chapter 12	11.2.1
Detection system	Test	See *NFPA 72*	11.2.2
Backflow preventer(s)	Test	See Chapter 12	—
Water supply tank(s)	Test	See Chapter 9	—
Water supply flow test	Test	See Chapter 4	11.2.6

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Table 11.1 *Continued*

System/Component	Activity	Frequency	Reference
Foam concentrate pump operation	Maintenance	Monthly	11.4.6(A), 11.4.7(A)
Foam concentrate strainer(s)	Maintenance	Quarterly	Section 11.4
Foam concentrate samples	Maintenance	Annually	11.2.10
Proportioning system(s) standard pressure type			
Ball drip (automatic type) drain valves	Maintenance	5 years	11.4.3(A)
Foam concentrate tank — drain and flush	Maintenance	10 years	11.4.3(B)
Corrosion and hydrostatic test	Maintenance	10 years	11.4.3(C)
Bladder tank type			
Sight glass	Maintenance	10 years	11.4.4(A)
Foam concentrate tank — hydrostatic test	Maintenance	10 years	11.4.4(B)
Line type			
Foam concentrate tank — corrosion and pickup pipes	Maintenance	10 years	11.4.5(A)
Foam concentrate tank — drain and flush	Maintenance	10 years	11.4.5(B)
Standard balanced pressure type			
Foam concentrate pump(s)	Maintenance	5 years *(see Note)*	11.4.6(B)
Balancing valve diaphragm	Maintenance	5 years	11.4.6(C)
Foam concentrate tank	Maintenance	10 years	11.4.6(D)
In-line balanced pressure type			
Foam concentrate pump(s)	Maintenance	5 years *(see Note)*	11.4.7(B)
Balancing valve diaphragm	Maintenance	5 years	11.4.7(C)
Foam concentrate tank	Maintenance	10 years	11.4.7(D)
Pressure vacuum vents	Maintenance	5 years	11.4.8
Water supply tank(s)	Maintenance	See Chapter 9	—
Fire pump(s)	Maintenance	See Chapter 8	—
Water supply	Maintenance	Annually	11.2.6.1
Backflow preventer(s)	Maintenance	See Chapter 12	—
Detector check valve(s)	Maintenance	See Chapter 12	—
Check valve(s)	Maintenance	See Chapter 12	—
Control valve(s)	Maintenance	See Chapter 12	—
Deluge/preaction valves	Maintenance	See Chapter 12	11.2.1
Strainer(s) — mainline	Maintenance	See Chapter 10	—
Detection system	Maintenance	See *NFPA 72*	11.2.2

Note: Also refer to manufacturer's instructions and frequency. Maintenance intervals other than preventive maintenance are not provided, as they depend on the results of the visual inspections and operational tests. For foam-water systems in aircraft hangars, refer to the inspection, test, and maintenance requirements of NFPA 409, *Standard on Aircraft Hangars*, Table 6.1.1.

11.1.1 Fire pumps, water storage tanks, and valves common to other types of water-based fire protection systems shall be inspected, tested, and maintained in accordance with Chapters 8, 9, and 12, respectively, and as specified in Table 11.1.

11.1.2 Foam-Water Systems.

11.1.2.1 This section shall apply to foam-water systems as specified in NFPA 16, *Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems.*

11.1.2.2 This section shall not include systems detailed in NFPA 11, *Standard for Low-Expansion Foam.*

11.1.3 Foam-Water System.

11.1.3.1 If during routine inspection and testing it is determined that the foam-water system has been altered or changed (e.g., equipment replaced, relocated, or foam concentrate replaced), it shall be determined whether the design intent has been altered and whether the system operates properly.

11.1.3.2 The inspection shall verify that all components, including foam concentrate discharge devices and proportioning equipment, are installed in accordance with their listing.

11.1.4 Proportioning System. The proportioning system shall be permitted to be any of the following types:

(1) Standard pressure proportioner
(2) Bladder tank proportioner
(3) Line proportioner (venturi pickup)
(4) Standard balanced pressure proportioner
(5) In-line balanced pressure proportioner
(6) Orifice plate, either direct or indirect
(7) Other approved proportioning method

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11.1.5 Impairments. The procedures outlined in Chapter 14 shall be followed where an impairment to protection occurs.

11.1.6 Notification to Supervisory Service. To avoid false alarms where a supervisory service is provided, the alarm receiving facility shall be notified by the owner or designated representative as follows:

(1) Before conducting any test or procedure that could result in the activation of an alarm
(2) After such tests or procedures are concluded

11.2 Inspection. Systems shall be inspected in accordance with the frequency specified in Table 11.1.

11.2.1 Deluge Valves. Deluge valves shall be inspected in accordance with the provisions of Chapter 12.

11.2.2 Automatic Detection Equipment. Automatic detection equipment shall be inspected, tested, and maintained in accordance with *NFPA 72, National Fire Alarm Code*, to ensure that the detectors are in place, securely fastened, and protected from corrosion, weather, and mechanical damage and that the communication wiring, control panels, or pneumatic tubing system is functional.

11.2.3 System Piping and Fittings. System piping and fittings shall be inspected for the following:

(1) Mechanical damage (e.g., broken piping or cracked fittings)
(2) External conditions (e.g., missing or damaged paint or coatings, rust, and corrosion)
(3) Misalignment or trapped sections
(4) Low point drains (automatic or manual)
(5) Location and condition of rubber-gasketed fittings

11.2.4 Hangers and Supports. Hangers and supports shall be inspected for the following and repaired as necessary:

(1) Condition (e.g., missing or damaged paint or coating, rust, and corrosion)
(2) Secure attachment to structural supports and piping
(3) Damaged or missing hangers

11.2.5* Foam-Water Discharge Devices.

11.2.5.1 Foam-water discharge devices shall be inspected visually and maintained to ensure that they are in place, continue to be aimed or pointed in the direction intended in the system design, and are free from external loading and corrosion.

11.2.5.2 Where caps or plugs are required, the inspection shall confirm they are in place and free to operate as intended.

11.2.5.3 Misaligned discharge devices shall be adjusted (aimed) by visual means, and the discharge patterns shall be checked at the next scheduled flow test.

11.2.5.4 Discharge devices are listed or approved for particular foam concentrates. Inspection shall verify that unlisted combinations of discharge devices and foam concentrate have not been substituted.

11.2.6 Water Supply.

11.2.6.1 The dependability of the water supply shall be ensured by regular inspection and maintenance, whether furnished by a municipal source, on-site storage tanks, a fire pump, or private underground piping systems.

11.2.6.2* Water supply piping shall be maintained free of internal obstructions.

11.2.7 Strainers.

11.2.7.1 Mainline and individual discharge device strainers (basket or screen) shall be inspected in accordance with the provisions of Chapter 10.

11.2.7.2 Foam concentrate strainers shall be inspected visually to ensure the blow-down valve is closed and plugged.

11.2.7.2.1 Baskets or screens shall be removed and inspected after each operation or flow test.

11.2.8 Drainage. The area beneath and surrounding a foam-water spray system shall be inspected to ensure that drainage facilities, such as trap sumps and drainage trenches, are not blocked and retention embankments or dikes are in good repair.

11.2.9* Proportioning Systems.

11.2.9.1 The components of the various proportioning systems described in 11.2.9 shall be inspected in accordance with the frequency specified in Table 11.1.

11.2.9.2 Valves specified to be checked shall be permitted to be open or closed, depending on specific functions within each foam-water system.

11.2.9.3 The position (open or closed) of valves shall be verified in accordance with specified operating conditions.

11.2.9.4* Inspection of the concentrate tank shall include verification that the quantity of foam concentrate satisfies the requirements of the original design.

11.2.9.5 Additional inspection requirements shall be performed as detailed for the proportioning systems specified in 11.2.9.

11.2.9.5.1* Standard Pressure Proportioner. This is a pressure vessel. The pressure shall be removed before the inspection to prevent injury. The inspection shall verify the following:

(1) Ball drip valves (automatic drains) are free and opened.
(2) External corrosion on foam concentrate storage tanks is not present.

11.2.9.5.2* Bladder Tank Proportioner. This is a pressure vessel. The pressure shall be removed before the inspection to prevent injury. The inspection shall include the following:

(1) Water control valves to foam concentrate tank
(2) A check for external corrosion on foam concentrate storage tanks
(3) A check for the presence of foam in the water surrounding the bladder (annual)

11.2.9.5.3 Line Proportioner. The inspection shall include the following:

(1)*Strainers
(2)*Verification that pressure vacuum vent is operating freely
(3) A check for external corrosion on foam concentrate storage tanks

11.2.9.5.4 Standard Balanced Pressure Proportioner. The inspection shall include the following:

(1)*Strainers
(2)*Verification that pressure vacuum vent is operating freely
(3) Verification that gauges are in good operating condition

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(4) Verification that sensing line valves are open
(5) Verification that power is available to foam liquid pump

11.2.9.5.5 In-Line Balanced Pressure Proportioner. The inspection shall include the following:

(1)*Strainers
(2)*Verification that pressure vacuum vent is operating freely
(3) Verification that gauges are in good working condition
(4) Verification that sensing line valves at pump unit and individual proportioner stations are open
(5) Verification that power is available to foam liquid pump

11.2.9.5.6 Orifice Plate Proportioner. The inspection shall include the following:

(1)*Strainers
(2)*Verification that pressure vacuum vent is operating freely
(3) Verification that gauges are in good working condition
(4) Verification that power is available to foam liquid pump

11.2.10 Foam Concentrate Samples. Samples shall be submitted in accordance with the manufacturer's recommended sampling procedures.

11.3* Operational Tests. Frequency of system tests shall be in accordance with Table 11.1.

11.3.1 Owner's Representative. The owner's representative, the authority having jurisdiction, and the fire department or fire brigade shall be notified that testing is to be conducted so they have the opportunity to observe the testing of the foam-water systems.

11.3.2* Test Preparation. Precautions shall be taken to prevent damage to property during the test.

11.3.3* Operational Test Performance.

11.3.3.1 Operational tests shall be conducted to ensure that the foam-water system(s) responds as designed, both automatically and manually.

11.3.3.2 The test procedures shall simulate anticipated emergency events so the response of the foam-water system(s) can be evaluated.

11.3.3.3 Where discharge from the system discharge devices would create a hazardous condition or conflict with local requirements, an approved alternate method to achieve full flow conditions shall be permitted.

11.3.3.4 Response Time. Under test conditions, the automatic fire detection systems, when exposed to a test source, shall operate within the requirements of *NFPA 72, National Fire Alarm Code*, for the type of detector provided and the response time shall be recorded.

11.3.3.5 Discharge Time. The time lapse between operation of detection systems and water delivery time to the protected area shall be recorded for open discharge devices.

11.3.3.6 Discharge Patterns.

11.3.3.6.1 The discharge patterns from all of the open spray devices shall be observed to ensure that patterns are not impeded by plugged discharge devices and to ensure that discharge devices are correctly positioned and that obstructions do not prevent discharge patterns from covering surfaces to be protected.

11.3.3.6.2 Where obstructions occur, the piping and discharge devices shall be cleaned and the system retested.

11.3.3.6.3 Discharge devices shall be permitted to be of different orifice sizes and types.

11.3.3.7* Pressure Readings.

11.3.3.7.1 Pressure readings shall be recorded at the highest, most remote discharge device.

11.3.3.7.2 A second pressure reading shall be recorded at the main control valve.

11.3.3.7.3 Readings shall be compared to the hydraulic design pressures to ensure the original system design requirements are met.

11.3.4 Multiple Systems. The maximum number of systems expected to operate in case of fire shall be tested simultaneously to check the adequacy of the water supply and concentrate pump.

11.3.5 Manual Actuation Devices. Manual actuation devices shall be tested annually.

11.3.6 Concentration Testing.

11.3.6.1 During the full flow foam test, a foam sample shall be taken.

11.3.6.2 This sample shall be checked by refractometric or other methods to verify concentration of the solution.

11.3.6.3 Concentration shall be within 10 percent of the acceptance test results but in no case more than 10 percent below minimum design standards.

11.3.7 Return to Service. After the full flow test, the foam-water system shall be returned to service and the foam concentrate tank shall be replenished to design level.

11.4* Maintenance.

11.4.1 Maintenance of foam-water systems shall be in accordance with the requirements of those chapters covering the specific component parts.

11.4.2 Maintenance of specific foam components shall be in accordance with 11.4.3 through 11.4.7.

11.4.3 Standard Pressure Proportioner.

(A) The ball drip (automatic type) drain valves shall be disassembled, cleaned, and reassembled.

(B)* The foam liquid storage tank shall be drained of foam liquid and flushed. (Foam liquid shall be permitted to be salvaged and reused.)

(C) The foam liquid tank shall be inspected for internal and external corrosion and hydrostatically tested to the specified working pressure.

11.4.4 Bladder Tank Proportioner.

(A) Sight glass, where provided, shall be removed and cleaned.

(B)* The foam concentrate tank shall be hydrostatically tested to the specified working pressure.

11.4.5 Line Proportioner.

(A) The foam concentrate tank shall be inspected for internal corrosion. Pickup pipes inside the tank shall be inspected for corrosion, separation, or plugging.

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(B) The foam concentrate tank shall be drained and flushed. (Foam concentrate shall be permitted to be salvaged and reused.)

11.4.6 Standard Balanced Pressure Proportioner.

(A) The foam concentrate pump shall be operated. Foam concentrate shall be circulated back to the tank.

(B) Foam pumps, drive train, and drivers shall be serviced in accordance with the manufacturer's instructions and frequency, but not at intervals of more than 5 years.

(C) The diaphragm balancing valve shall be flushed through the diaphragm section with water or foam concentrate until fluid appears clear or new.

(D) The foam concentrate tank shall be inspected internally for corrosion and sediment. Excessive sediment shall require draining and flushing of the tank.

11.4.7 In-Line Balanced Pressure Proportioner.

(A) The foam concentrate pump shall be operated. Foam concentrate shall be circulated back to the tank.

(B) Foam pumps, drive train, and drivers shall be serviced in accordance with the manufacturer's instructions and frequency, but not at intervals of more than 5 years.

(C) The diaphragm balancing valve shall be flushed through the diaphragm section with water or foam concentrate until fluid appears clear or new.

(D) The foam concentrate tank shall be inspected internally for corrosion and sediment. Excessive sediment shall require draining and flushing of the tank.

11.4.8 Pressure Vacuum Vents. The procedures specified in 11.4.8(A) through 11.4.8(H) shall be performed on pressure vacuum vents every 5 years.

(A) The vent shall be removed from the expansion dome. While the vent is removed, it shall be ensured that the opening is not blocked and that dirt or other foreign objects do not enter the tank.

(B) The vest bonnet shall be removed. The vacuum valve and pressure valve shall be lifted out.

(C) The vent body shall be flushed internally and the vacuum valve and the pressure valve shall be washed thoroughly. It shall be ensured that the screen is not clogged, and the use of any hard, pointed objects to clear the screen shall be avoided.

(D) If the liquid has become excessively gummy or solidified, the vent body and parts shall be soaked in hot soapy water.

(E) The vent body shall be turned upside down and drained thoroughly. Parts shall be dried by placing them in a warm and dry area or by using an air hose.

(F) Parts shall be sprayed with a light Teflon® coating, and the vent shall be reassembled. The use of any type of oil for lubrication purposes shall be avoided, as oil is harmful to the foam liquid.

(G) The vent bonnet shall be replaced, and the vent shall be turned upside down slowly a few times to ensure proper freedom of the movable parts.

(H) The vent shall be attached to the liquid storage tank expansion dome.

Chapter 12 Valves, Valve Components, and Trim

12.1* General. This chapter shall provide the minimum requirements for the routine inspection, testing, and maintenance of valves, valve components, and trim. Table 12.1 shall be used to determine the minimum required frequencies for inspection, testing, and maintenance.

Table 12.1 Summary of Valves, Valve Components, and Trim Inspection, Testing, and Maintenance

Item	Activity	Frequency	Reference
Control Valves			
Sealed	Inspection	Weekly	12.3.2.1
Locked	Inspection	Monthly	12.3.2.1.1
Tamper switches	Inspection	Monthly	12.3.2.1.1
Alarm Valves			
Exterior	Inspection	Monthly	12.4.1.1
Interior	Inspection	5 years	12.4.1.2
Strainers, filters, orifices	Inspection	5 years	12.4.1.2
Check Valves			
Interior	Inspection	5 years	12.4.2.1
Preaction/Deluge Valves			
Enclosure (during cold weather)	Inspection	Daily/weekly	12.4.3.1
Exterior	Inspection	Monthly	12.4.3.1.6
Interior	Inspection	Annually/5 years	12.4.3.1.7
Strainers, filters, orifices	Inspection	5 years	12.4.3.1.8
Dry Pipe Valves/ Quick-Opening Devices			
Enclosure (during cold weather)	Inspection	Daily/weekly	12.4.4.1.1
Exterior	Inspection	Monthly	12.4.4.1.4
Interior	Inspection	Annually	12.4.4.1.5
Strainers, filters, orifices	Inspection	5 years	12.4.4.1.6
Pressure Reducing and Relief Valves			
Sprinkler systems	Inspection	Quarterly	12.5.1.1

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Table 12.1 *Continued*

Item	Activity	Frequency	Reference
Hose connections	Inspection	Quarterly	12.5.2.1
Hose racks	Inspection	Quarterly	12.5.3.1
Fire pumps			
Casing relief valves	Inspection	Weekly	12.5.6.1, 12.5.6.1.1
Pressure relief valves	Inspection	Weekly	12.5.6.2, 12.5.6.2.1
Backflow Prevention Assemblies			
Reduced pressure	Inspection	Weekly/monthly	12.6.1
Reduced pressure detectors	Inspection	Weekly/monthly	12.6.1
Fire Department Connections	Inspection	Quarterly	12.7.1
Main Drains	Test	Annually/quarterly	12.2.6, 12.2.6.1, 12.3.3.4
Water-Flow Alarms	Test	Quarterly	12.2.7
Control Valves			
Position	Test	Annually	12.3.3.1
Operation	Test	Annually	12.3.3.1
Supervisory	Test	Semiannually	12.3.3.5
Preaction/Deluge Valves			
Priming water	Test	Quarterly	12.4.3.2.1
Low air pressure alarms	Test	Quarterly	12.4.3.2.10
Full flow	Test	Annually	12.4.3.2.2
Dry Pipe Valves/ Quick-Opening Devices			
Priming water	Test	Quarterly	12.4.4.2.1
Low air pressure alarm	Test	Quarterly	12.4.4.2.6
Quick-opening devices	Test	Quarterly	12.4.4.2.4
Trip test	Test	Annually	12.4.4.2.2
Full flow trip test	Test	3 years	12.4.4.2.2.2
Pressure Reducing and Relief Valves			
Sprinkler systems	Test	5 years	12.5.1.2
Circulation relief	Test	Annually	12.5.6.1.2
Pressure relief valves	Test	Annually	12.5.6.2.2
Hose connections	Test	5 years	12.5.2.2
Hose racks	Test	5 years	12.5.3.2
Backflow Prevention Assemblies	Test	Annually	12.6.2
Control Valves	Maintenance	Annually	12.3.4
Preaction/Deluge Valves	Maintenance	Annually	12.4.3.3.2
Dry Pipe Valves/ Quick-Opening Devices	Maintenance	Annually	12.4.4.3.2

12.2 General Provisions.

12.2.1 The owner shall have manufacturer's literature available to provide specific instructions for inspecting, testing, and maintaining the valves and associated equipment.

12.2.2 All pertinent personnel, departments, authorities having jurisdiction, or agencies shall be notified that testing or maintenance of the valve and associated alarms is to be conducted.

12.2.3* All system valves shall be protected from physical damage and shall be accessible.

12.2.4 Before opening a test or drain valve, it shall be verified that adequate provisions have been made for drainage.

12.2.5 The general appearance and condition of all valves shall be observed and noted, and it shall be verified that all valves are in the appropriate open or closed position.

12.2.6* Main Drain Test. A main drain test shall be conducted annually at each water-based fire protection system riser to determine whether there has been a change in the condition of the water supply piping and control valves. *(See also 12.3.4.2.)*

12.2.6.1 Systems where the sole water supply is through a backflow preventer and/or pressure reducing valves, the main drain test of at least one system downstream of the device shall be conducted on a quarterly basis.

12.2.7 Water-Flow Alarm. All water-flow alarms shall be tested quarterly in accordance with the manufacturer's instructions.

12.2.8 Gauges.

12.2.8.1 Gauges shall be inspected monthly to verify that they are in good condition and that normal pressure is being maintained.

12.2.8.1.1 Where other sections of this standard have different frequency requirements for specific gauges, those requirements shall be used.

12.2.8.2 Gauges shall be replaced every 5 years or tested every 5 years by comparison with a calibrated gauge.

12.2.8.3 Gauges not accurate to within 3 percent of the full scale shall be recalibrated or replaced.

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12.2.9 Records. Records shall be maintained in accordance with Section 4.3.

12.3 Control Valves in Water-Based Fire Protection Systems.

12.3.1* Each control valve shall be identified and have a sign indicating the system or portion of the system it controls.

12.3.1.1* When a normally open valve is closed, the procedures established in Chapter 14 shall be followed.

12.3.1.1.1 When the valve is returned to service, a drain test (either main or sectional drain, as appropriate) shall be conducted to determine that the valve is open.

12.3.1.2 Each normally open valve shall be secured by means of a seal or a lock or shall be electrically supervised in accordance with the applicable NFPA standards.

12.3.1.3 Normally closed valves shall be secured by means of a seal or shall be electrically supervised in accordance with the applicable NFPA standard.

12.3.1.3.1 Sealing or electrical supervision shall not be required for hose valves.

12.3.2 Inspection.

12.3.2.1 All valves shall be inspected weekly.

12.3.2.1.1 Valves secured with locks or supervised in accordance with applicable NFPA standards shall be permitted to be inspected monthly.

12.3.2.1.2 After any alterations or repairs, an inspection shall be made by the owner to ensure that the system is in service and all valves are in the normal position and properly sealed, locked, or electrically supervised.

12.3.2.2* The valve inspection shall verify that the valves are in the following condition:

(1) In the normal open or closed position
(2)*Properly sealed, locked, or supervised
(3) Accessible
(4) Provided with appropriate wrenches
(5) Free from external leaks
(6) Provided with appropriate identification

12.3.3 Testing.

12.3.3.1 Each control valve shall be operated annually through its full range and returned to its normal position.

12.3.3.2* Post indicator valves shall be opened until spring or torsion is felt in the rod, indicating that the rod has not become detached from the valve.

12.3.3.2.1 This test shall be conducted every time the valve is closed.

12.3.3.3 Post indicator and outside screw and yoke valves shall be backed a one-quarter turn from the fully open position to prevent jamming.

12.3.3.4 A main drain test shall be conducted annually at each system riser and any time the valve is closed at each system riser or feed main after the control valve has been closed to determine whether there has been a change in the condition of the water supply piping and control valves.

12.3.3.5* Supervisory Switches.

12.3.3.5.1 Valve supervisory switches shall be tested semiannually.

12.3.3.5.2 A distinctive signal shall indicate movement from the valve's normal position during either the first two revolutions of a hand wheel or when the stem of the valve has moved one-fifth of the distance from its normal position.

12.3.3.5.3 The signal shall not be restored at any valve position except the normal position.

12.3.4 Maintenance.

12.3.4.1 The operating stems of outside screw and yoke valves shall be lubricated annually.

12.3.4.2 The valve then shall be completely closed and reopened to test its operation and distribute the lubricant.

12.4 System Valves.

12.4.1 Inspection of Alarm Valves. Alarm valves shall be inspected as described in 12.4.1.1 and 12.4.1.2.

12.4.1.1* Alarm valves shall be externally inspected monthly and shall verify the following:

(1) The gauges indicate normal supply water pressure is being maintained.
(2) The valve is free of physical damage.
(3) All valves are in the appropriate open or closed position.
(4) The retarding chamber or alarm drains are not leaking.

12.4.1.2* Alarm valves and their associated strainers, filters, and restriction orifices shall be inspected internally every 5 years unless tests indicate a greater frequency is necessary.

12.4.1.3 Maintenance.

12.4.1.3.1 Internal components shall be cleaned/repaired as necessary in accordance with the manufacturer's instructions.

12.4.1.3.2 The system shall be returned to service in accordance with the manufacturer's instructions.

12.4.2 Check Valves.

12.4.2.1 Inspection. Valves shall be inspected internally every 5 years to verify that all components operate correctly, move freely, and are in good condition.

12.4.2.2 Maintenance. Internal components shall be cleaned, repaired, or replaced as necessary in accordance with the manufacturer's instructions.

12.4.3 Preaction Valves and Deluge Valves.

12.4.3.1 Inspection. Valve enclosure heating equipment for preaction and deluge valves subject to freezing shall be inspected daily during cold weather for its ability to maintain a minimum temperature of at least 4°C (40°F).

12.4.3.1.1 Valve enclosures equipped with low temperature alarms shall be inspected weekly.

12.4.3.1.2 Low temperature alarms, if installed in valve enclosures, shall be inspected annually at the beginning of the heating season.

12.4.3.1.3 Gauges shall be inspected weekly.

12.4.3.1.3.1 The gauge on the supply side of the preaction or deluge valve shall indicate that the normal supply water pressure is being maintained.

12.4.3.1.4 The gauge monitoring the preaction system supervisory air pressure, if provided, shall be inspected monthly to verify that it indicates that normal pressure is being maintained.

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12.4.3.1.5 The gauge monitoring the detection system pressure, if provided, shall be tested monthly to verify that it indicates that normal pressure is being maintained.

12.4.3.1.6 The preaction or deluge valve shall be externally inspected monthly to verify the following:

(1) The valve is free from physical damage.
(2) All trim valves are in the appropriate open or closed position.
(3) The valve seat is not leaking.
(4) Electrical components are in service.

12.4.3.1.7 The interior of the preaction or deluge valve and the condition of detection devices shall be inspected annually when the trip test is conducted.

12.4.3.1.7.1 Internal inspection of valves that can be reset without removal of a faceplate shall be permitted to be conducted every 5 years.

12.4.3.1.8 Strainers, filters, restricted orifices, and diaphragm chambers shall be inspected internally every 5 years unless tests indicate a greater frequency is necessary.

12.4.3.2 Testing.

12.4.3.2.1* The priming water level in supervised preaction systems shall be tested quarterly for compliance with the manufacturer's instructions.

12.4.3.2.2* Each deluge or preaction valve shall be trip tested annually at full flow in warm weather and in accordance with the manufacturer's instructions. Protection shall be provided for any devices or equipment subject to damage by system discharge during tests.

12.4.3.2.2.1 Where the nature of the protected property is such that water cannot be discharged for test purposes, the trip test shall be conducted in a manner that does not necessitate discharge in the protected area.

12.4.3.2.2.2 Where the nature of the protected property is such that water cannot be discharged unless protected equipment is shut down (e.g., energized electrical equipment), a full flow system test shall be conducted at the next scheduled shutdown. In all cases, the test frequency shall not exceed 3 years.

12.4.3.2.2.3 Preaction or deluge valves protecting freezers shall be trip tested in a manner that does not introduce moisture into the piping in the freezer.

12.4.3.2.3 The water discharge patterns from all open sprinklers or spray nozzles shall be observed to ensure that patterns are not impeded by plugging and to ensure that they are correctly positioned and that obstructions do not prevent discharge patterns from wetting surfaces to be protected.

12.4.3.2.3.1 Where obstructions occur, the piping and sprinklers or nozzles shall be cleaned and the system retested.

12.4.3.2.4 Pressure Readings.

12.4.3.2.4.1 Pressure readings shall be recorded at the hydraulically most remote nozzle or sprinkler.

12.4.3.2.4.2 A second pressure reading shall be recorded at the deluge valve.

12.4.3.2.4.3 These readings shall be compared to the hydraulic design pressures to ensure the original system design requirements are met by the water supply.

12.4.3.2.4.4 Where the hydraulically most remote nozzle or sprinkler is inaccessible, nozzles or sprinklers in other than foam-water systems shall be permitted to be checked visually without taking a pressure reading on the most remote nozzle or sprinkler.

12.4.3.2.4.5 Where the reading taken at the riser indicates that the water supply has deteriorated, a gauge shall be placed on the hydraulically most remote nozzle or sprinkler and the results compared with the required design pressure.

12.4.3.2.5 **Multiple Systems.** The maximum number of systems expected to operate in case of fire shall be tested simultaneously to check the adequacy of the water supply.

12.4.3.2.6 **Manual Operation.** Manual actuation devices shall be operated annually.

12.4.3.2.7 **Return to Service.** After the full flow test, the system shall be returned to service in accordance with the manufacturer's instructions.

12.4.3.2.8 Grease or other sealing materials shall not be applied to the seating surfaces of preaction or deluge valves.

12.4.3.2.9* Records indicating the date the preaction or deluge valve was last tripped and the tripping time as well as the individual and organization conducting the test shall be maintained at a location or in a manner readily available for review by the authority having jurisdiction.

12.4.3.2.10 Low air pressure alarms, if provided, shall be tested quarterly in accordance with the manufacturer's instructions.

12.4.3.2.11 Low temperature alarms, if installed in valve enclosures, shall be tested annually at the beginning of the heating season.

12.4.3.2.12 Automatic air pressure maintenance devices, if provided, shall be tested yearly at the time of the annual preaction or deluge valve trip test, in accordance with the manufacturer's instructions.

12.4.3.3 Maintenance.

12.4.3.3.1 Leaks causing drops in supervisory pressure sufficient to sound warning alarms and electrical malfunctions causing alarms to sound shall be located and repaired.

12.4.3.3.2 During the annual trip test, the interior of the preaction or deluge valve shall be cleaned thoroughly and the parts replaced or repaired as necessary.

12.4.3.3.2.1 Interior cleaning and parts replacement or repair shall be permitted every 5 years for valves that can be reset without removal of a faceplate.

12.4.3.3.3* Low points in preaction or deluge systems shall be drained after each operation and before the onset of freezing weather conditions.

12.4.3.3.4 Additional maintenance as required by the manufacturer's instructions shall be provided.

12.4.4 Dry Pipe Valves/Quick-Opening Devices.

12.4.4.1 Inspection.

12.4.4.1.1 Valve enclosure heating equipment shall be inspected daily during cold weather for its ability to maintain a minimum temperature of at least 4°C (40°F).

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12.4.4.1.1.1 Valve enclosures equipped with low temperature alarms shall be inspected weekly.

12.4.4.1.1.2 Low temperature alarms, if installed in valve enclosures, shall be inspected annually at the beginning of the heating season.

12.4.4.1.2 Gauges shall be inspected weekly.

(A) The gauge on the supply side of the dry pipe valve shall indicate that the normal supply water pressure is being maintained.

(B) The gauge on the system side of the dry pipe valve shall indicate that the proper ratio of air or nitrogen pressure to water supply pressure is being maintained in accordance with the manufacturer's instructions.

(C)* The gauge on the quick-opening device, if provided, shall indicate the same pressure as the gauge on the system side of the dry pipe valve.

12.4.4.1.3 Systems equipped with low air or nitrogen pressure alarms shall be inspected monthly.

12.4.4.1.4 The dry pipe valve shall be externally inspected monthly to verify the following:

(1) The valve is free of physical damage.
(2) All trim valves are in the appropriate open or closed position.
(3) The intermediate chamber is not leaking.

12.4.4.1.5 The interior of the dry pipe valve shall be inspected annually when the trip test is conducted.

12.4.4.1.6 Strainers, filters, and restricted orifices shall be inspected internally every 5 years unless tests indicate a greater frequency is necessary.

12.4.4.2 **Testing.**

12.4.4.2.1* The priming water level shall be tested quarterly.

12.4.4.2.2* Each dry pipe valve shall be trip tested annually during warm weather.

12.4.4.2.2.1 Dry pipe valves protecting freezers shall be trip tested in a manner that does not introduce moisture into the piping in the freezers.

12.4.4.2.2.2* Every 3 years and whenever the system is altered, the dry pipe valve shall be trip tested with the control valve fully open and the quick-opening device, if provided, in service.

12.4.4.2.2.3* During those years when full flow testing in accordance with 12.4.4.2.2.2 is not required, each dry pipe valve shall be trip tested with the control valve partially open.

12.4.4.2.3 Grease or other sealing materials shall not be applied to the seating surfaces of dry pipe valves.

12.4.4.2.4* Quick-opening devices, if provided, shall be tested quarterly.

12.4.4.2.5 A tag or card that shows the date on which the dry pipe valve was last tripped and the name of the person and organization conducting the test shall be attached to the valve.

12.4.4.2.5.1 Separate records of initial air and water pressure, tripping air pressure, and dry pipe valve operating conditions shall be maintained on the premises for comparison with previous test results.

12.4.4.2.5.2 Records of tripping time shall be maintained for full flow trip tests.

12.4.4.2.6 Low air pressure alarms, if provided, shall be tested quarterly in accordance with the manufacturer's instructions.

12.4.4.2.7 Low temperature alarms, if installed in valve enclosures, shall be tested annually at the beginning of the heating season.

12.4.4.2.8 Automatic air pressure maintenance devices, if provided, shall be tested annually during the dry pipe valve trip test in accordance with the manufacturer's instructions.

12.4.4.3 **Maintenance.**

12.4.4.3.1* Leaks resulting in air pressure losses greater than 0.7 bar (10 psi) per week shall be located and repaired.

12.4.4.3.2 During the annual trip test, the interior of the dry pipe valve shall be cleaned thoroughly and parts replaced or repaired as necessary.

12.4.4.3.3* Low points in dry pipe sprinkler systems shall be drained after each operation and before the onset of freezing weather conditions.

12.5 **Pressure Reducing Valves and Relief Valves.**

12.5.1 **Inspection and Testing of Sprinkler Pressure Reducing Control Valves.** Sprinkler pressure reducing control valves shall be inspected and tested as described in 12.5.1.1 and 12.5.1.2.

12.5.1.1 All valves shall be inspected quarterly to verify that the valves are in the following condition:

(1) In the open position
(2) Not leaking
(3) Maintaining downstream pressures in accordance with the design criteria
(4) In good condition, with handwheels installed and unbroken

12.5.1.2* A full flow test shall be conducted on each valve at 5-year intervals and shall be compared to previous test results.

12.5.1.2.1 Adjustments shall be made in accordance with the manufacturer's instructions.

12.5.1.3 A partial flow test adequate to move the valve from its seat shall be conducted annually.

12.5.2 **Hose Connection Pressure Reducing Valves.**

12.5.2.1 All valves shall be inspected quarterly to verify the following:

(1) The handwheel is not broken or missing.
(2) The outlet hose threads are not damaged.
(3) No leaks are present.
(4) The reducer and the cap are not missing.

12.5.2.2* A full flow test shall be conducted on each valve at 5-year intervals and shall be compared to previous test results.

12.5.2.2.1 Adjustments shall be made in accordance with the manufacturer's instructions.

12.5.2.3 A partial flow test adequate to move the valve from its seat shall be conducted annually.

12.5.3 **Hose Rack Assembly Pressure Reducing Valves.**

12.5.3.1 All valves shall be inspected quarterly to verify the following:

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(1) The handwheel is not missing or broken.
(2) No leaks are present.

12.5.3.2 A full flow test shall be conducted on each valve at 5-year intervals and compared to previous test results.

12.5.3.2.1 Adjustments shall be made in accordance with the manufacturer's instructions.

12.5.3.3 A partial flow test adequate to move the valve from its seat shall be conducted annually.

12.5.4 Pressure Reducing Valves.

12.5.4.1 All pressure reducing valves installed on fire protection systems not covered by 12.5.1, 12.5.2, or 12.5.3 shall be inspected in accordance with 12.5.1.1.

12.5.4.2 All pressure reducing valves installed on fire protection systems not covered by 12.5.1, 12.5.2, or 12.5.3 shall be tested in accordance with 12.5.1.2.

12.5.5 Hose Valves.

12.5.5.1 Inspection.

12.5.5.1.1 Hose valves shall be inspected quarterly.

12.5.5.1.2 All deficiencies shall be corrected.

12.5.5.1.3 Hose valves shall be inspected to ensure that hose caps are in place and not damaged.

12.5.5.1.4 Hose threads shall be inspected for damage.

12.5.5.1.5 Valve handles shall be present and not damaged.

12.5.5.1.6 Gaskets shall be inspected for damage or deterioration.

12.5.5.1.7 Hose valves shall be inspected for leaks.

12.5.5.1.8 Hose valves shall be inspected to ensure no obstructions are present.

12.5.5.1.9 Hose valves shall be inspected to ensure that restricting devices are present.

12.5.5.2 Testing.

12.5.5.2.1* Class I and Class III standpipe system hose valves shall be tested annually by opening and closing the valves.

12.5.5.2.1.1 Hose valves that are difficult to operate or leak shall be repaired or replaced.

12.5.5.2.2* Hose valves on hose stations attached to sprinkler systems and Class II standpipe systems shall be tested every 3 years by opening and closing the valves.

12.5.5.2.2.1 Hose valves that are difficult to operate or leak shall be repaired or replaced.

12.5.5.3 Maintenance. Hose valves that do not operate smoothly or open fully shall be lubricated, repaired, or replaced.

12.5.6 Fire Pump Pressure Relief Valves.

12.5.6.1 All circulation relief valves shall be inspected weekly.

12.5.6.1.1 The inspection shall verify that water flows through the valve when the fire pump is operating at shut-off pressure (i.e., churn) to prevent the pump from overheating.

12.5.6.1.2 During the annual fire pump test, the closure of the circulation relief valve shall be verified to be in accordance with the manufacturer's specifications.

12.5.6.2 All pressure relief valves shall be inspected weekly.

12.5.6.2.1 The inspection shall verify that the pressure downstream of the relief valve fittings in the fire pump discharge piping does not exceed the pressure for which the system components are rated.

12.5.6.2.2 During the annual fire pump flow test, the pressure relief valve shall be verified to be correctly adjusted and set to relieve at the correct pressure and to close below that pressure setting.

12.5.7 Maintenance. All damaged or missing components noted during the inspections specified in 12.5.5.1 through 12.5.5.2.2 shall be repaired or replaced in accordance with the manufacturer's instructions.

12.6 Backflow Prevention Assemblies.

12.6.1 Inspection. Inspection of backflow prevention assemblies shall be as described in 12.6.1.1 through 12.6.1.2.2.

12.6.1.1 The double check assembly (DCA) valves and double check detector assembly (DCDA) valve shall be inspected weekly to ensure that the OS&Y isolation valves are in the normal open position.

12.6.1.1.1 Valves secured with locks or electrically supervised in accordance with applicable NFPA standards shall be inspected monthly.

12.6.1.2* Reduced pressure assemblies (RPA) and reduced pressure detector assemblies (RPDA) shall be inspected weekly to ensure that the differential-sensing valve relief port is not continuously discharging and the OS&Y isolation valves are in the normal open position.

12.6.1.2.1 Valves secured with locks or electrically supervised in accordance with applicable NFPA standards shall be inspected monthly.

12.6.1.2.2 After any testing or repair, an inspection by the owner shall be made to ensure that the system is in service and all isolation valves are in the normal open position and properly locked or electrically supervised.

12.6.2 Testing.

12.6.2.1* All backflow preventers installed in fire protection system piping shall be tested annually in accordance with the following:

(1) A forward flow test shall be conducted at the system demand, including hose stream demand, where hydrants or inside hose stations are located downstream of the backflow preventer.
(2) A backflow performance test, as required by the authority having jurisdiction, shall be conducted at the completion of the forward flow test.

12.6.2.1.1 For backflow preventers sized 50.8 mm (2 in.) and under, the forward flow test shall be acceptable to conduct without measuring flow, where the test outlet is of a size to flow the system demand.

12.6.2.1.2 Where water rationing shall be enforced during shortages lasting more than 1 year, an internal inspection of the backflow preventer to ensure the check valves will fully open shall be acceptable in lieu of conducting the annual forward flow test.

12.6.2.1.3 Where connections do not permit a full flow test, tests shall be completed at the maximum flow rate possible.

12.6.2.1.4 The forward flow test shall not be required where annual fire pump testing causes the system demand to flow through the backflow preventer device.

12.6.2.2* All backflow devices installed in fire protection water supply shall be tested annually at the designed flow rate of the fire protection system, including required hose stream demands.

12.6.2.2.1 Where connections do not permit a full flow test, tests shall be conducted at the maximum flow rate possible.

12.6.3 Maintenance.

12.6.3.1 Maintenance of all backflow prevention assemblies shall be conducted by a trained individual following the manufacturer's instructions in accordance with the procedure and policies of the authority having jurisdiction.

12.6.3.2 Rubber parts shall be replaced in accordance with the frequency required by the authority having jurisdiction and the manufacturer's instructions.

12.7 Fire Department Connections.

12.7.1 Fire department connections shall be inspected quarterly. The inspection shall verify the following:

(1) The fire department connections are visible and accessible.
(2) Couplings or swivels are not damaged and rotate smoothly.
(3) Plugs or caps are in place and undamaged.
(4) Gaskets are in place and in good condition.
(5) Identification signs are in place.
(6) The check valve is not leaking.
(7) The automatic drain valve is in place and operating properly.
(8) The fire department connection clapper(s) is in place and operating properly.

12.7.2 If fire department connection plugs or caps are not in place, the interior of the connection shall be inspected for obstructions, and it shall be verified that the fire department connection clapper is operational over its full range.

12.7.3 Components shall be repaired or replaced as necessary in accordance with the manufacturer's instructions. Any obstructions that are present shall be removed.

Chapter 13 Obstruction Investigation

13.1 General. This chapter shall provide the minimum requirements for conducting investigations of fire protection system piping for possible sources of materials that can cause pipe blockage.

13.2* Obstruction Investigation and Prevention.

13.2.1 An investigation of piping and branch line conditions shall be conducted every 5 years by opening a flushing connection at the end of one main and by removing a sprinkler toward the end of one branch line for the purpose of investigating for the presence of foreign organic and inorganic material.

13.2.1.1 Alternative nondestructive examination methods shall be permitted.

13.2.1.2 Tubercules or slime, if found, shall be tested for indications of microbiologically influenced corrosion (MIC).

13.2.2* An obstruction investigation shall be conducted for system or yard main piping wherever any of the following conditions exist:

(1) Defective intake for fire pumps taking suction from open bodies of water
(2) The discharge of obstructive material during routine water tests
(3) Foreign materials in fire pumps, in dry pipe valves, or in check valves
(4) Foreign material in water during drain tests or plugging of inspector's test connection(s)
(5) Plugged sprinklers
(6) Plugged piping in sprinkler systems dismantled during building alterations
(7) Failure to flush yard piping or surrounding public mains following new installations or repairs
(8) A record of broken public mains in the vicinity
(9) Abnormally frequent false tripping of a dry pipe valve(s)
(10) A system that is returned to service after an extended shutdown (greater than 1 year)
(11) There is reason to believe that the sprinkler system contains sodium silicate or highly corrosive fluxes in copper systems
(12) A system has been supplied with raw water via the fire department connection
(13) Pinhole leaks
(14) A 50-percent increase in the time it takes water to travel to the inspector's test connection from the time the valve trips during a full flow trip test of a dry pipe sprinkler system when compared to the original system acceptance test

13.2.3* Systems shall be examined for internal obstructions where conditions exist that could cause obstructed piping.

13.2.3.1 If the condition has not been corrected or the condition is one that could result in obstruction of the piping despite any previous flushing procedures that have been performed, the system shall be examined for internal obstructions every 5 years.

13.2.3.2 Internal inspections shall be accomplished by examining the interior of the following four points:

(1) System valve
(2) Riser
(3) Cross main
(4) Branch line

13.2.3.3 Alternative nondestructive examination methods shall be permitted.

13.2.4* If an obstruction investigation carried out in accordance with 13.2.1 indicates the presence of sufficient material to obstruct sprinklers, a complete flushing program shall be conducted by qualified personnel.

13.3 Prevention of Ice Obstruction. Dry pipe or preaction sprinkler system piping that protects or passes through freezers or cold storage rooms shall be inspected internally on an annual basis for ice obstructions at the point where the piping enters the refrigerated area.

13.3.1 Alternative nondestructive examinations shall be permitted.

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13.3.2 All penetrations into the cold storage areas shall be inspected and, if an ice obstruction is found, additional pipe shall be examined to ensure no ice blockage exists.

Chapter 14 Impairments

14.1 General. This chapter shall provide the minimum requirements for a water-based fire protection system impairment program. Measures shall be taken during the impairment to ensure that increased risks are minimized and the duration of the impairment is limited.

14.2 Impairment Coordinator.

14.2.1 The building owner shall assign an impairment coordinator to comply with the requirements of this chapter.

14.2.2 In the absence of a specific designee, the owner shall be considered the impairment coordinator.

14.2.3 Where the lease, written use agreement, or management contract specifically grants the authority for inspection, testing, and maintenance of the fire protection system(s) to the tenant, management firm, or managing individual, the tenant, management firm, or managing individual shall assign a person as impairment coordinator.

14.3 Tag Impairment System.

14.3.1* A tag shall be used to indicate that a system, or part thereof, has been removed from service.

14.3.2* The tag shall be posted at each fire department connection and system control valve indicating which system, or part thereof, has been removed from service.

14.3.3 The authority having jurisdiction shall specify where the tag is to be placed.

14.4 Impaired Equipment.

14.4.1 The impaired equipment shall be considered to be the water-based fire protection system, or part thereof, that is removed from service.

14.4.2 The impaired equipment shall include, but shall not be limited to, the following:

(1) Sprinkler systems
(2) Standpipe systems
(3) Fire hose systems
(4) Underground fire service mains
(5) Fire pumps
(6) Water storage tanks
(7) Water spray fixed systems
(8) Foam-water systems
(9) Fire service control valves

14.5* Preplanned Impairment Programs.

14.5.1 All preplanned impairments shall be authorized by the impairment coordinator.

14.5.2 Before authorization is given, the impairment coordinator shall be responsible for verifying that the following procedures have been implemented:

(1) The extent and expected duration of the impairment have been determined.
(2) The areas or buildings involved have been inspected and the increased risks determined.
(3) Recommendations have been submitted to management or building owner/manager. Where a required fire protection system is out of service for more than 4 hours in a 24-hour period, the impairment coordinator shall arrange for one of the following:
   (a) Evacuation of the building or portion of the building affected by the system out of service
   (b)*An approved fire watch
   (c)*Establishment of a temporary water supply
   (d)*Establishment and implementation of an approved program to eliminate potential ignition sources and limit the amount of fuel available to the fire
(4) The fire department has been notified.
(5) The insurance carrier, the alarm company, building owner/manager, and other authorities having jurisdiction have been notified.
(6) The supervisors in the areas to be affected have been notified.
(7) A tag impairment system has been implemented. *(See Section 14.3.)*
(8) All necessary tools and materials have been assembled on the impairment site.

14.6 Emergency Impairments.

14.6.1 Emergency impairments include but are not limited to system leakage, interruption of water supply, frozen or ruptured piping, and equipment failure.

14.6.2 When emergency impairments occur, emergency action shall be taken to minimize potential injury and damage.

14.6.3 The coordinator shall implement the steps outlined in Section 14.5.

14.7 Restoring Systems to Service. When all impaired equipment is restored to normal working order, the impairment coordinator shall verify that the following procedures have been implemented:

(1) Any necessary inspections and tests have been conducted to verify that affected systems are operational. The appropriate chapter of this standard shall be consulted for guidance on the type of inspection and test required.
(2) Supervisors have been advised that protection is restored.
(3) The fire department has been advised that protection is restored.
(4) The building owner/manager, insurance carrier, alarm company, and other authorities having jurisdiction have been advised that protection is restored.
(5) The impairment tag has been removed.

Annex A Explanatory Material

Annex A is not a part of the requirements of this NFPA document but is included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs.

A.1.2 History has shown that the performance reliability of a water-based fire protection system under fire-related conditions increases where comprehensive inspection, testing, and maintenance procedures are enforced. Diligence during an inspection is important. The inspection, testing, and maintenance of some items in the standard might not be practical or possible, depending on existing conditions. The inspector should use good judgment when making inspections.

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A.1.3 An entire program of quality control includes, but is not limited to, maintenance of equipment, inspection frequency, testing of equipment, on-site fire brigades, loss control provisions, and personnel training. Personnel training can be used as an alternative even if a specific frequency differs from that specified in this standard.

A.1.4 The liter and bar units, which are not part of but are recognized by SI, commonly are used in international fire protection. These units are provided in Table A.1.4 with their conversion factors.

Table A.1.4 Metric Conversions

Name of Unit	Unit Symbol	Conversion Factor
liter	L	1 gal = 3.785 L
liter per minute per square meter	$L/min \cdot m^2$	1 gpm/ft^2 = 40.746 $L/min \cdot m^2$
cubic decimeter	dm^3	1 gal = 3.785 dm^3
pascal	Pa	1 psi = 6894.757 Pa
bar	bar	1 psi = 0.0689 bar
bar	bar	1 bar = 10^5 Pa

Note: For additional conversions and information, see ASTM E 380, *Standard for Metric Practice*.

A.3.2.1 **Approved.** The National Fire Protection Association does not approve, inspect, or certify any installations, procedures, equipment, or materials; nor does it approve or evaluate testing laboratories. In determining the acceptability of installations, procedures, equipment, or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure, or use. The authority having jurisdiction may also refer to the listings or labeling practices of an organization that is concerned with product evaluations and is thus in a position to determine compliance with appropriate standards for the current production of listed items.

A.3.2.2 **Authority Having Jurisdiction (AHJ).** The phrase "authority having jurisdiction," or its acronym AHJ, is used in NFPA documents in a broad manner, since jurisdictions and approval agencies vary, as do their responsibilities. Where public safety is primary, the authority having jurisdiction may be a federal, state, local, or other regional department or individual such as a fire chief; fire marshal; chief of a fire prevention bureau, labor department, or health department; building official; electrical inspector; or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the authority having jurisdiction. In many circumstances, the property owner or his or her designated agent assumes the role of the authority having jurisdiction; at government installations, the commanding officer or departmental official may be the authority having jurisdiction.

A.3.2.3 **Listed.** The means for identifying listed equipment may vary for each organization concerned with product evaluation; some organizations do not recognize equipment as listed unless it is also labeled. The authority having jurisdiction should utilize the system employed by the listing organization to identify a listed product.

A.3.3.2 **Automatic Detection Equipment.** Water spray systems can use fixed temperature, rate-of-rise, rate-compensation fixed temperature, optical devices, flammable gas detectors or products of combustion detectors, and manual means to initiate water flow.

A.3.3.10 **Fire Hydrant.** See Figure A.3.3.10(a) and Figure A.3.3.10(b).

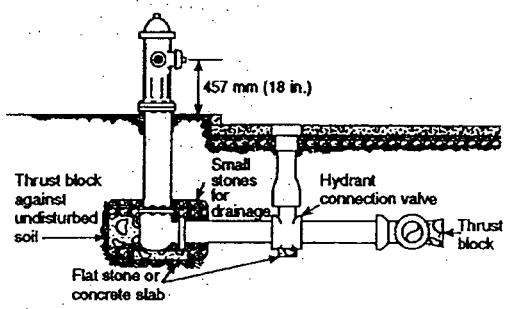

FIGURE A.3.3.10(a) Typical Fire Hydrant Connection.

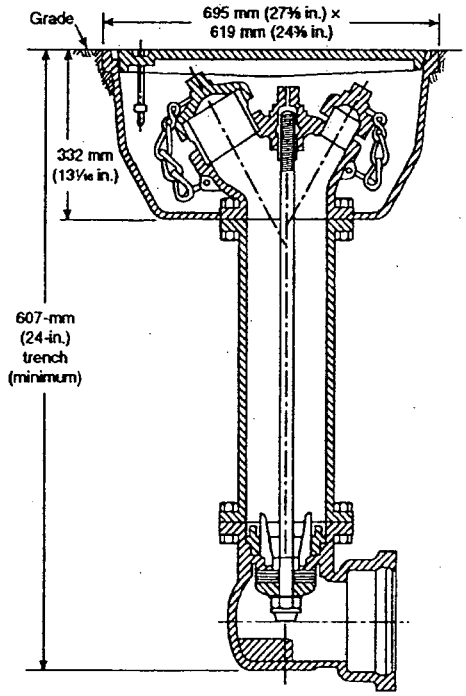

FIGURE A.3.3.10(b) Flush-Type Hydrant.

A.3.3.10.1 **Dry Barrel Hydrant (Frostproof Hydrant).** See Figure A.3.3.10.1.

A.3.3.10.2 **Monitor Nozzle Hydrant.** See Figure A.3.3.10.2.

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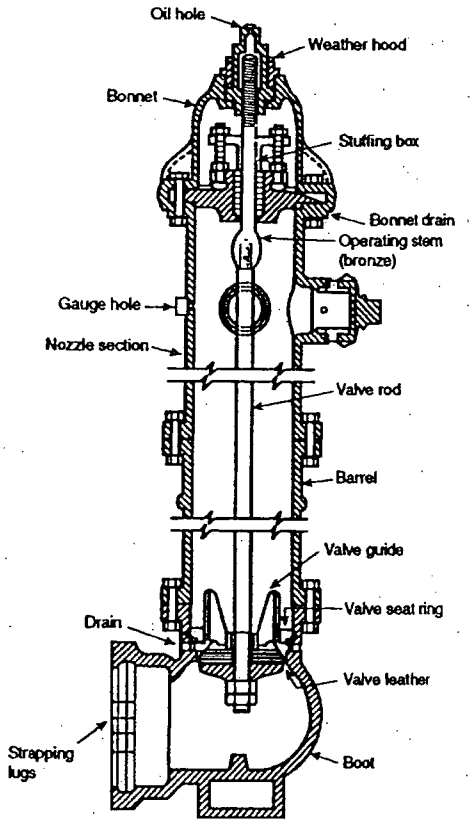

FIGURE A.3.3.10.1 Dry Barrel Hydrant.

A.3.3.10.3 Wall Hydrant. See Figure A.3.3.10.3.

A.3.3.10.4 Wet Barrel Hydrant. See Figure A.3.3.10.4.

A.3.3.14 Hose House. See Figure A.3.3.14(a) through Figure A.3.3.14(c).

A.3.3.17.1 Conventional Pin Rack. See Figure A.3.3.17.1.

A.3.3.17.2 Horizontal Rack. See Figure A.3.3.17.2.

A.3.3.17.3 Hose Reel. See Figure A.3.3.17.3.

A.3.3.17.4 Semiautomatic Hose Rack Assembly. See Figure A.3.3.17.4.

A.3.3.24.1 Monitor Nozzle. See Figure A.3.3.24.1(a) and Figure A.3.3.24.1(b).

A.3.3.24.2 Water Spray Nozzle. The selection of the type and size of spray nozzles should be made with proper consideration given to such factors as physical character of the hazard involved, draft or wind conditions, material likely to be burning, and the general purpose of the system.

High-velocity spray nozzles, generally used in piped installations, discharge in the form of a spray-filled cone. Low-velocity spray nozzles usually deliver a much finer spray in the form of either a spray-filled spheroid or cone. Due to differences in the size of orifices or waterways in the various nozzles and the range of water particle sizes produced by each type, nozzles of one type cannot ordinarily be substituted for those of another type in an individual installation without seriously affecting fire extinguishment. In general, the higher the velocity and the coarser the size of the water droplets, the greater the effective "reach" or range of the spray.

FIGURE A.3.3.10.2 Hydrant with Monitor Nozzle.

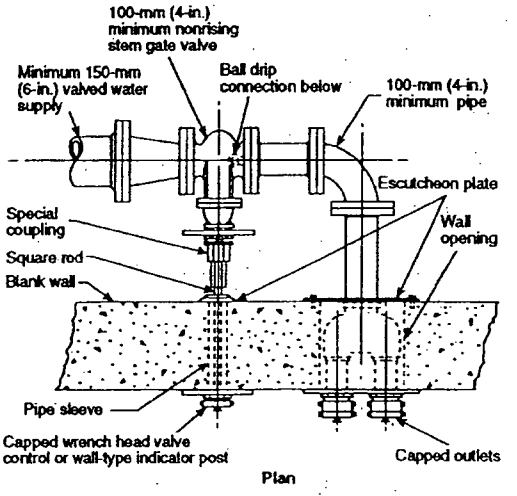

FIGURE A.3.3.10.3 Wall Hydrant.

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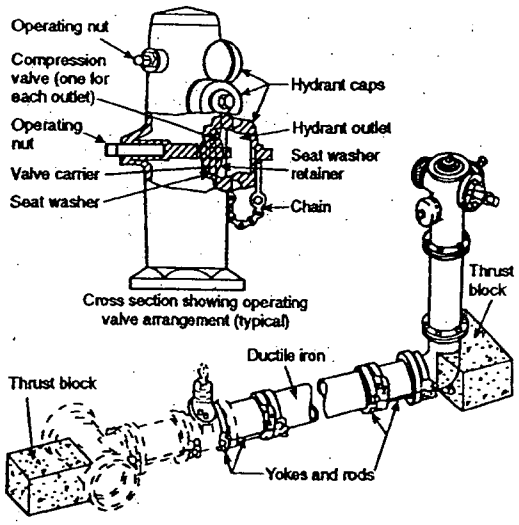

FIGURE A.5.3.10.4 Wet Barrel Hydrant. *(Courtesy of the Los Angeles Department of Water and Power.)*

FIGURE A.5.3.14(a) Hose House of Five-Sided Design for Installation over a Private Hydrant.

Another type of water spray nozzle uses the deflector principle of the standard sprinkler. The angle of the spray discharge cones is governed by the design of the deflector. Some manufacturers make spray nozzles of this type individually automatic by constructing them with heat-responsive elements as used in standard automatic sprinklers.

A.5.3.28 Pressure Vacuum Vent. See Figure A.5.3.28.

A.5.3.29 Proportioners. See Figure A.5.3.29.

A.5.3.29.1 Bladder Tank Proportioner. See Figure A.5.3.29.1.

A.5.3.29.2 In-Line Balanced Pressure Proportioner. See Figure A.5.3.29.2.

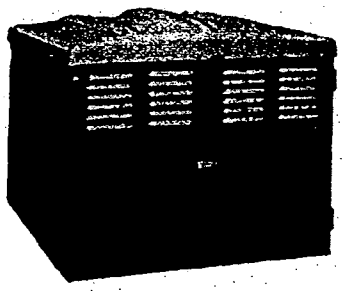

FIGURE A.5.3.14(b) Steel Hose House of Compact Dimensions for Installation over a Private Hydrant. House Is Shown Closed; Top Lifts Up and Doors on Front Side Open for Complete Accessibility.

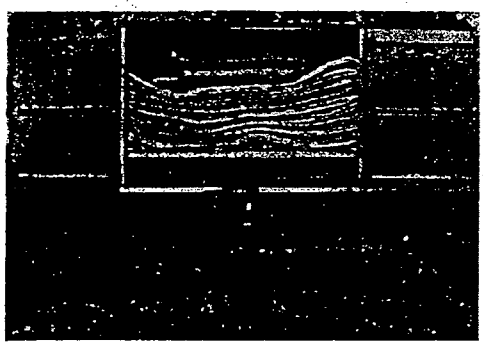

FIGURE A.5.3.14(c) Hose House That Can Be Installed on Legs, As Pictured, or on a Wall Near, but Not Directly over, a Private Hydrant.

A.5.3.29.3 Line Proportioner. See Figure A.5.3.29.3.

A.5.3.29.4 Standard Balanced Pressure Proportioner. See Figure A.5.3.29.4.

A.5.3.29.5 Standard Pressure Proportioner. See Figure A.5.3.29.5.

A.5.3.34 Strainer. There are two types of strainers. Pipeline strainers are used in water supply connections. These are capable of removing from the water all solids of sufficient size to obstruct the spray nozzles [3.2-mm (⅛-in.) perforations usually are suitable]. Pipeline strainer designs should incorporate a flushout connection or should be capable of flushing through the main drain.

Individual strainers for spray nozzles, where needed, are capable of removing from the water all solids of sufficient size to obstruct the spray nozzle that they serve.

A.5.5.1 Control Valve. Experience has shown that closed valves are the primary cause of failure of water-based fire protection systems in protected occupancies.

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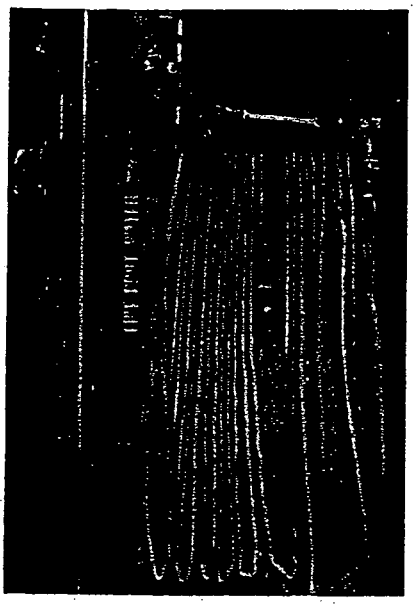


FIGURE A.3.3.17.1 Conventional Pin Rack.

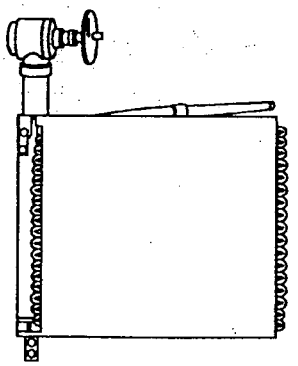


FIGURE A.3.3.17.2 Horizontal Rack.

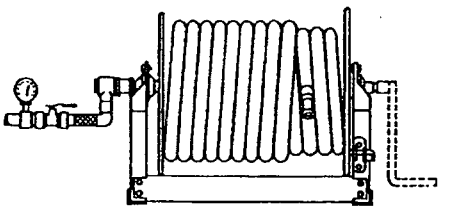


FIGURE A.3.3.17.3 Constant Flow Hose Reel.

FIGURE A.3.3.17.4 Semiautomatic Hose Rack Assembly.

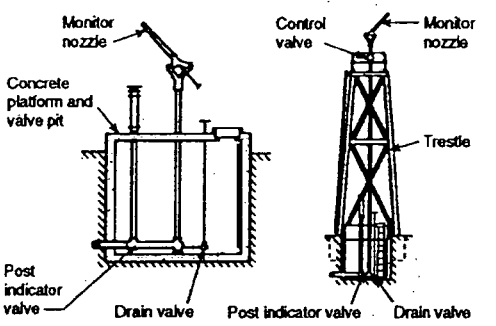


FIGURE A.3.3.24.1(a) Standard Monitor Nozzles; Gear Control Nozzles Also Are Permitted.

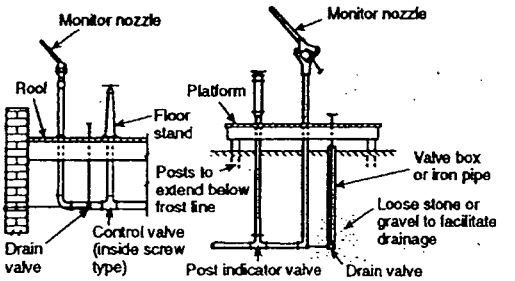


FIGURE A.3.3.24.1(b) Alternative Arrangement of Standard Monitor Nozzles.

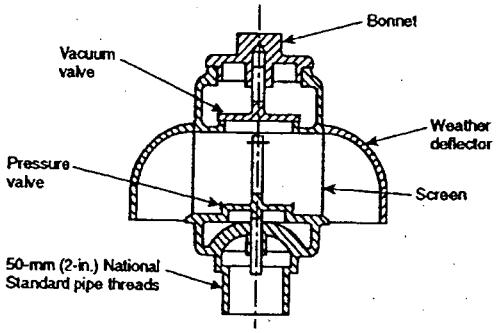


FIGURE A.3.3.28 Pressure Vacuum Vent.

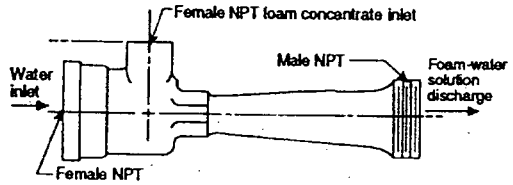


FIGURE A.3.3.29 Proportioner.

A.3.6.4 Sprinkler System. A sprinkler system is considered to have a single system riser control valve. The design and installation of water supply facilities such as gravity tanks, fire pumps, reservoirs, or pressure tanks are covered by NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection*, and NFPA 22, *Standard for Water Tanks for Private Fire Protection*.

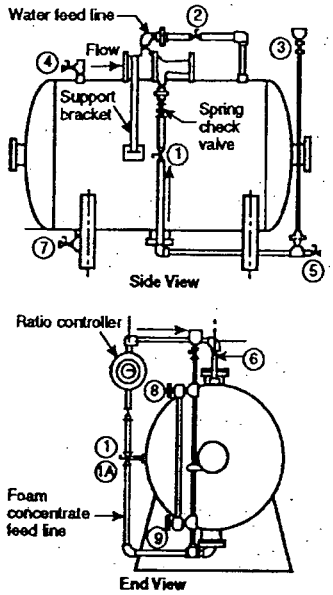
A.3.6.4.6 Wet Pipe Sprinkler System. Hose connections [40-mm (1½-in.) hose, valves, and nozzles] supplied by sprinkler system piping are considered components of the sprinkler system.

A.4.1.1 The components are not required to be open or exposed. Doors, removable panels, or valve pits can be permitted to satisfy the need for accessibility. Such equipment should not be obstructed by features such as walls, ducts, columns, direct burial, or stock storage.

A.4.1.2 Inspection, testing, and maintenance can be permitted to be contracted with an inspection, testing, and maintenance service.

A.4.1.4 Recalled products should be replaced or remedied. Such replacement or remedial product should be installed in accordance with the manufacturer's instructions and the appropriate NFPA installation standards. A recalled product is a product subject to a statute or administrative regulation specifically requiring the manufacturer, importer, distributor, wholesaler, or retailer of a product, or any combination of such entities, to recall the product, or a product voluntarily recalled by a combination of such entities.

A.4.1.5 Fire protection systems should not be removed from service when the building is not in use; however, where a system that has been out of service for a prolonged period (such as in the case of idle or vacant properties) is returned to service, it is recommended that a responsible and experienced contractor be retained to perform all inspections and tests.



Valve description		Normal position	
Valve no.	Description	Manual system	Auto system
1	Concentrate shutoff	Closed	Closed
1A	Auto. conc. shutoff	N/A	Closed
2	Water pres. shutoff	Open	Open
3	Fill cup shutoff	Closed	Closed
4	Tank water vent	Closed	Closed
5	Diaph. conc. vent	Closed	Closed
6	Water fill	Closed	Closed
7	Concentrate drain/fill	Closed	Closed
8	Upr. sight gauge (opt.)	Closed	Closed
9	Lwr. sight gauge (opt.)	Closed	Closed

FIGURE A.3.3.29.1 Bladder Tank Proportioner.

A.4.3.1 Typical records include, but are not limited to, valve inspections; flow, drain, and pump tests; and trip tests of dry pipe, deluge, and preaction valves.

Computer programs that file inspection and test results should provide a means of comparing current and past results and should indicate the need for corrective maintenance or further testing.

Acceptance test records should be retained for the life of the system or its special components. Subsequent test records should be retained for a period of 1 year after the next test. The comparison determines deterioration of system performance or condition and the need for further testing or maintenance.

A.4.4 Inspection and periodic testing determine what, if any, maintenance actions are required to maintain the operability of a water-based fire protection system. The standard establishes minimum inspection/testing frequencies, responsibilities, test routines, and reporting procedures but does not define precise limits of anomalies where maintenance actions are required.

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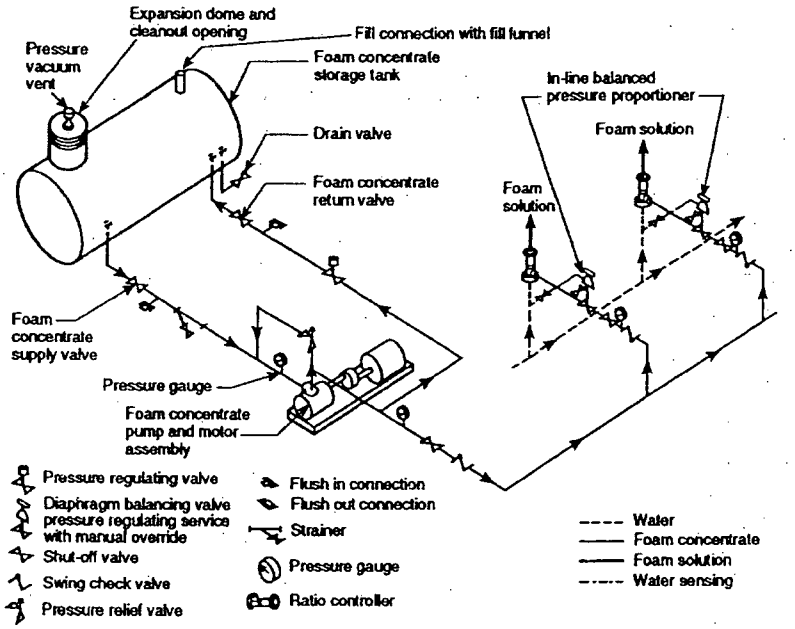

FIGURE A.3.3.29.2 In-Line Balanced Pressure Proportioner.

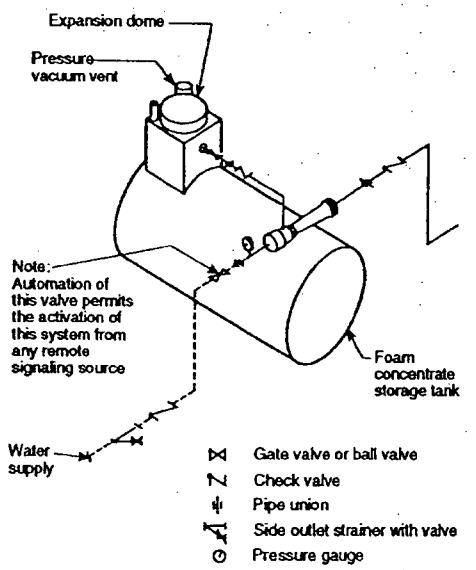

FIGURE A.3.3.29.3 Line Proportioner.

Substandard conditions, such as a closed valve, subnormal water pressure, loss of building heat or power, or obstruction of sprinklers, nozzles, detectors, or hose stations, can delay or prevent system actuation and impede manual fire-fighting operations.

A.4.5.6 Examples of components or subsystems are fire pumps, drivers or controllers, pressure regulating devices, detection systems and controls, alarm check, and dry pipe, deluge, and preaction valves.

A.4.6 Preventive maintenance includes, but is not limited to, lubricating control valve stems; adjusting packing glands on valves and pumps; bleeding moisture and condensation from air compressors, air lines, and dry pipe system auxiliary drains; and cleaning strainers. Frequency of maintenance is indicated in the appropriate chapter.

Corrective maintenance includes, but is not limited to, replacing loaded, corroded, or painted sprinklers; replacing missing or loose pipe hangers; cleaning clogged fire pump impellers; replacing valve seats and gaskets; restoring heat in areas subject to freezing temperatures where water-filled piping is installed; and replacing worn or missing fire hose or nozzles.

Emergency maintenance includes, but is not limited to, repairs due to piping failures caused by freezing or impact damage; repairs to broken underground fire mains; and replacement of frozen or fused sprinklers, defective electric power, or alarm and detection system wiring.

A.4.7.4 Most places using or storing hazardous materials have stations set up for employees where material safety data sheets (MSDSs) are stored. The inspector should be familiar with the types of materials present and the appropriate actions to take in an emergency.

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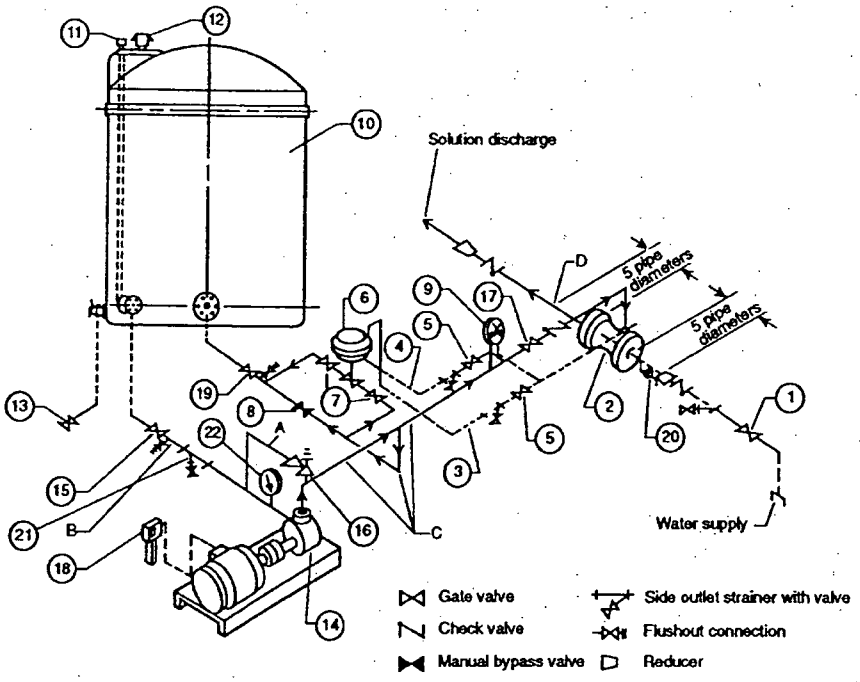

Legend:
1 Water supply valve (normally closed)
2 Ratio controller
3 Water balance line — minimum 5-mm (3/16-in.) I.D. pipe or tubing recommended
4 Concentrate balance line — minimum 5-mm (3/16-in.) I.D. pipe or tubing recommended
5 Sensing line valves (normally open)
6 Diaphragm control valve — automatic pressure balance — must be in vertical position
7 Block valves (normally open)
8 Manual bypass valve (normally open)
9 Water and concentrate pressure gauge (duplex)
10 Foam concentrate storage tank
11 Concentrate storage tank fill connection
12 Pressure vacuum vent
13 Concentrate storage tank drain valve (normally closed)
14 Foam concentrate pump and motor
15 Concentrate pump supply valve (normally open)
16 Pressure relief valve (setting as required by system)
17 Concentrate pump discharge valve (normally open)
18 Electric motor starter and switch
19 Concentrate return line valve (normally open)
20 Ball drip valve — 20 mm (¾ in.) (install in horizontal position)
21 Strainer with valved side outlet
22 Compound gauge

Operation:
Start concentrate pump (18). Open water supply valve (1). Open concentrate pump discharge valve (17). Equal gauge readings then maintained at (9) by the automatic valve (6). For manual operation, valves (7) can be closed and equal gauge readings maintained by regulating valve (8) manually.

System Automation:
By automating certain valves, the balanced pressure proportioning system can be activated from any remote signaling source.

- Water supply valve (1), normally closed, to be automatically operated;
- Concentrate pump discharge valve (17), normally closed, to be automatically operated;
- Electric motor starter switch (18) to be automatically operated.

FIGURE A.3.3.29.4 Standard Balanced Pressure Proportioner.

A.4.8 WARNING: NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection,* includes electrical requirements that discourage the installation of a disconnect means in the power supply to electric motor-driven fire pumps. This is intended to ensure the availability of power to the fire pumps. Where equipment connected to those circuits is serviced or maintained, the service person could be subject to unusual exposure to electrical and other hazards. It could be necessary to establish special safe work practices and to use safeguards or personal protective clothing, or both.

A.5.2 The provisions of the standard are intended to apply to routine inspections. In the event of a fire, a post-fire inspection should be made of all sprinklers within the fire area. In

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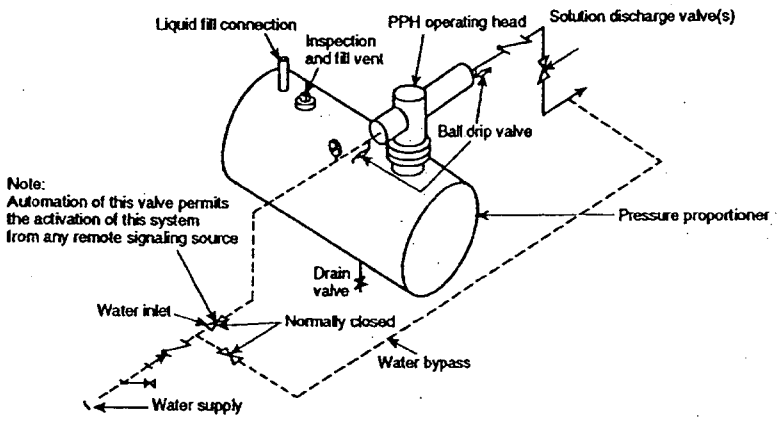

FIGURE A.3.3.29.5 Standard Pressure Proportioner.

situations where the fire was quickly controlled or extinguished by one or two sprinklers, it may only be necessary to replace the activated sprinklers. Care should be taken that the replacement sprinklers are of the same make and model or that they have compatible performance characteristics (*see 5.4.1.1*). Soot-covered sprinklers should be replaced because deposits can result in corrosion of operating parts. In the event of a substantial fire, special consideration should be given to replacing the first ring of sprinklers surrounding the operated sprinklers due to the potential for excessive thermal exposure, which could weaken the response mechanisms.

A.5.2.1.1 The conditions described in this section can have a detrimental effect on the performance of sprinklers by affecting water distribution patterns, insulating thermal elements, delaying operation, or otherwise rendering the sprinkler inoperable or ineffectual.

Severely loaded or corroded sprinklers should be rejected as part of the visual inspection. Such sprinklers could be affected in their distribution or other performance characteristics not addressed by routine sample testing. Lightly loaded or corroded sprinklers could be permitted for continued use if samples are selected for testing based on worst-case conditions and the samples successfully pass the tests.

A.5.2.1.1.4 Examples include some floor/ceiling or roof/ceiling assemblies, areas under theater stages, pipe chases, and other inaccessible areas.

A.5.2.1.2 Obstructions to spray patterns include continuous or noncontinuous obstructions less than or equal to 457 mm (18 in.) below the sprinkler deflector that prevent the pattern from fully developing. Obstructions that prevent sprinkler discharge from reaching the hazard include continuous or noncontinuous obstructions that interrupt the water discharge in a horizontal plane more than 457 mm (18 in.) below the sprinkler deflector in a manner to limit the distribution from reaching the protected hazard. Specific guidance for clearance and obstructions is found in NFPA 13, *Standard for the Installation of Sprinkler Systems*, and specific sprinkler listings.

A.5.2.2 The conditions described in this section can have a detrimental effect on the performance and life of pipe by affecting corrosion rates or pipe integrity or otherwise rendering the pipe ineffectual.

A.5.2.2.3 Examples include some floor/ceiling or roof/ceiling assemblies, areas under theater stages, pipe chases, and other inaccessible areas.

A.5.2.3 The conditions described in this section can have a detrimental effect on the performance of hangers and braces by allowing failures if the components become loose.

A.5.2.3.3 Examples of hangers and seismic braces installed in concealed areas include some floor/ceiling or roof/ceiling assemblies, areas under theater stages, pipe chases, and other inaccessible areas.

A.5.2.4.1 Due to the high probability of a buildup of excess pressure, gridded wet pipe systems should be provided with a relief valve not less than 6.3 mm (¼ in.) in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*.

A.5.2.4.4 See Figure A.5.2.4.4.

A.5.2.7 The hydraulic nameplate should be secured to the riser with durable wire, chain, or equivalent. *(See Figure A.5.2.7.)*

A.5.3.1 The sprinkler field service testing described in this section is considered routine testing. Non-routine testing should be conducted to address unusual conditions not associated with the routine test cycles mandated within this standard. Due to the nature of non-routine testing, specific tests cannot be identified in this standard. The type of tests to be conducted and number and location of samples to be submitted should be appropriate to the problem discovered or being investigated and based on consultation with the manufacturer, listing agency, and the authority having jurisdiction.

A.5.3.1.1 Sprinklers should be first given a visual inspection for signs of mechanical damage, cleaning, painting, leakage in service, or severe loading or corrosion, all of which are considered causes for immediate replacement. Devices that have passed the visual inspection should then be laboratory tested for sensitivity and functionality. The waterway should clear when sensitivity/functionality tested at .4 bar (5 psi) or the minimum listed operating pressure for dry sprinklers.

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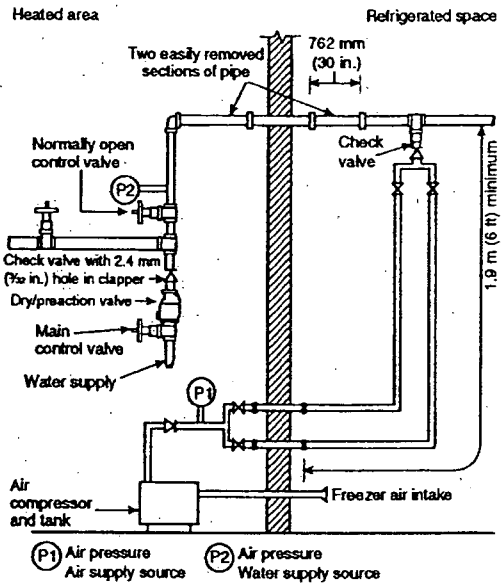

Notes:
1. Check valve with 2.4-mm (3/32-in.) hole in clapper not required if prime water not used.
2. Supply air to be connection to top or side of system pipe.
3. Each removable air line shall be a minimum of 25 mm (1 in.) diameter and minimum of 1.9 m (6 ft) long.

FIGURE A.5.2.4.4 Refrigerator Area Sprinkler System Used to Minimize the Chances of Developing Ice Plugs.

This system as shown on _____ company

print no _____ dated _____

for _____

at _____ contract no _____

is designed to discharge at a rate of _____

L/min per m^2 (gpm per ft^2) of floor area over a maximum

area of _____ m^2 (ft^2) when supplied

with water at a rate of _____ L/min (gpm)

at _____ bar (psi) at the base of the riser.

Hose stream allowance of _____

L/min (gpm) is included in the above.

FIGURE A.5.2.7 Sample Hydraulic Nameplate.

Thermal sensitivity should be not less than that permitted in post-corrosion testing of new sprinklers of the same type.

Sprinklers that have been in service for a number of years should not be expected to have all of the performance qualities of a new sprinkler. However, if there is any question about their continued satisfactory performance, the sprinklers should be replaced.

See Figure A.5.3.1.1.

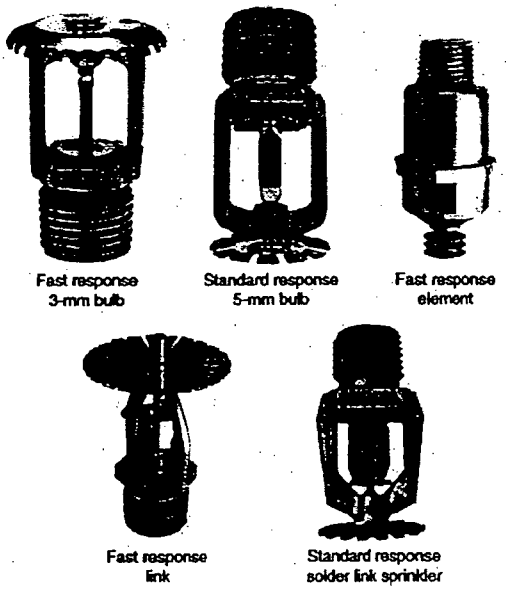

FIGURE A.5.3.1.1 Sprinkler Operating Element Identification.

A.5.3.1.1.1.3 Due to solder migration caused by the high temperatures to which these devices are exposed, it is important to test them every 5 years. Because of this phenomenon, the operating temperature can vary over a wide range.

A.5.3.1.1.2 Examples of these environments are paper mills, packing houses, tanneries, alkali plants, organic fertilizer plants, foundries, forge shops, fumigation, pickle and vinegar works, stables, storage battery rooms, electroplating rooms, galvanizing rooms, steam rooms of all descriptions including moist vapor dry kilns, salt storage rooms, locomotive sheds or houses, driveways, areas exposed to outside weather, around bleaching equipment in flour mills, all portions of cold storage areas, and portions of any area where corrosive vapors prevail. Harsh water environments include water supplies that are chemically reactive.

A.5.3.1.2 A sample should represent a given environment, and the sample size should consist of 1 percent or minimum of 4 of each type used in that environment. For example, a loading dock would be considered a different environment from the adjoining warehouse.

Within an environment, similar sidewall, upright, and pendent sprinklers produced by the same manufacturer could be considered part of the same sample but would be considered different samples if produced by different manufacturers.

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A.5.3.2 The normal life expectancy of a gauge is between 10 and 15 years. A gauge can be permitted to have a reading with an error of ±3 percent of the maximum (full scale) gauge reading. For example, a gauge having 13.8 bar (200 psi) maximum radius installed on a system with 4.1 bar (60 psi) normal pressure can be permitted if the gauge reads from 3.7 bar to 4.5 bar (54 psi to 66 psi).

A.5.3.3 Testing of the water-flow alarm on wet pipe systems should be completed by opening the inspector's test connection. This simulates activation of a sprinkler. Where freezing weather conditions or other circumstances prohibit using the inspector's test connection, the bypass test connection can be permitted to be used.

A.5.3.3.2 Data concerning reliability of vane-type waterflow devices indicate no appreciable change in failure rates for those tested quarterly and those tested semiannually. Mechanical motor gongs and pressure switches, however, have additional mechanical and environmental failure modes and need to be tested more often.

A.5.3.3.3 Opening the inspector's test connection simulates activation of a sprinkler.

A.5.3.3.5 Opening the inspector's test connection can cause the system to trip accidentally.

A.5.3.4 Listed CPVC sprinkler pipe and fittings should be protected from freezing with glycerin only. The use of diethylene, ethylene, or propylene glycols is specifically prohibited. Where inspecting antifreeze systems employing listed CPVC piping, the solution should be verified to be glycerin based.

A.5.4.1.1.1 Old-style sprinklers are permitted to replace existing old-style sprinklers. Old-style sprinklers should not be used to replace standard sprinklers without a complete engineering review of the system. The old-style sprinkler is the type manufactured before 1953. It discharges approximately 40 percent of the water upward to the ceiling, and it can be installed in either the upright or pendent position.

A.5.4.1.3 It is imperative that any replacement sprinkler have the same characteristics as the sprinkler being replaced. If the same temperature range, response characteristics, spacing requirements, flow rates, and *K*-factors cannot be obtained, a sprinkler with similar characteristics should be used, and the system should be evaluated to verify the sprinkler is appropriate for the intended use. With regard to response characteristics, matching identical Response Time Index (RTI) and conductivity factors is not necessary unless special design considerations are given for those specific values.

A.5.4.1.4 A minimum of two sprinklers of each type and temperature rating installed should be provided.

A.5.4.1.6 Other types of wrenches could damage the sprinklers.

A.5.4.1.8 Corrosion-resistant or specially coated sprinklers should be installed in locations where chemicals, moisture, or other corrosive vapors exist.

A.5.4.2 Conversion of dry pipe systems to wet pipe systems causes corrosion and accumulation of foreign matter in the pipe system and loss of alarm service.

A.5.4.3 Where pressure testing listed CPVC piping, the sprinkler systems should be filled with water and air should be bled from the highest and farthest sprinkler before test pressure is applied. Air or compressed gas should never be used for pressure testing.

A.5.4.4 Certain sprinkler systems, such as those installed aboard ships, are maintained under pressure by a small fresh-water supply but are supplied by a raw water source following system activation. In these systems, the effects of raw water are minimized by draining and refilling with fresh water. For systems on ships, flushing within 45 days or the vessel's next port of call, whichever is longer, is considered acceptable.

A.6.3.1.1 The hydraulically most remote hose connections in a building are generally at a roof manifold, if provided, or at the top of a stair leading to the roof. In a multizone system, the testing means is generally at a test header at grade or at a suction tank on higher floors.

Where a flow test at the hydraulically most remote hose connection is not practicable, the authority having jurisdiction should be consulted for the appropriate location of the test.

A.6.3.2.2 The intent of this paragraph is to ascertain whether the system retains its integrity under fire conditions. Minimum leakage existing only under test pressure is not cause for repair.

A.7.2.2 The requirements in 7.2.2 outline inspection intervals, conditions to be inspected, and corrective actions necessary for private fire service mains and associated equipment.

A.7.2.2.3 Any flow in excess of the flow through the main drain connection should be considered significant.

A.7.3.1 Full flow tests of underground piping can be accomplished by methods including, but not limited to, flow through yard hydrants, fire department connections once the check valve has been removed, main drain connections, and hose connections.

A.7.4.3.2 The intent of this section is to maintain adequate space for use of hydrants during a fire emergency. The amount of space needed depends on the configuration as well as the type and size of accessory equipment, such as hose, wrenches, and other devices that could be used.

A.8.1 A fire pump assembly provides water flow and pressure for private fire protection. The assembly includes the water supply suction and discharge piping and valving; pump; electric, diesel, or steam turbine driver and control; and the auxiliary equipment appurtenant thereto.

A.8.1.2 Types of centrifugal fire pumps include single and multistage units of horizontal or vertical shaft design. Listed fire pumps have rated capacities of 95 L/min to 18,925 L/min (25 gpm to 5000 gpm) with a net pressure range from approximately 2.75 bar to 27.6 bar (40 psi to 400 psi).

(1) *Horizontal Split Case.* This pump has a double suction impeller with an inboard and outboard bearing and is used with a positive suction supply. A variation of this design can be mounted with the shaft in a vertical plane. *[See Figure A.8.1.2(1).]*
(2) *End Suction and Vertical In-Line.* This pump can have either a horizontal or vertical shaft with a single suction impeller and a single bearing at the drive end. *[See Figure A.8.1.2(2).]*
(3) *Vertical Shaft, Turbine Type.* This pump has multiple impellers and is suspended from the pump head by a column pipe that also serves as a support for the shaft and bearings. This pump is necessary where a suction lift is needed, such as from an underground reservoir, well, river, or lake. *[See Figure A.8.1.2(3).]*

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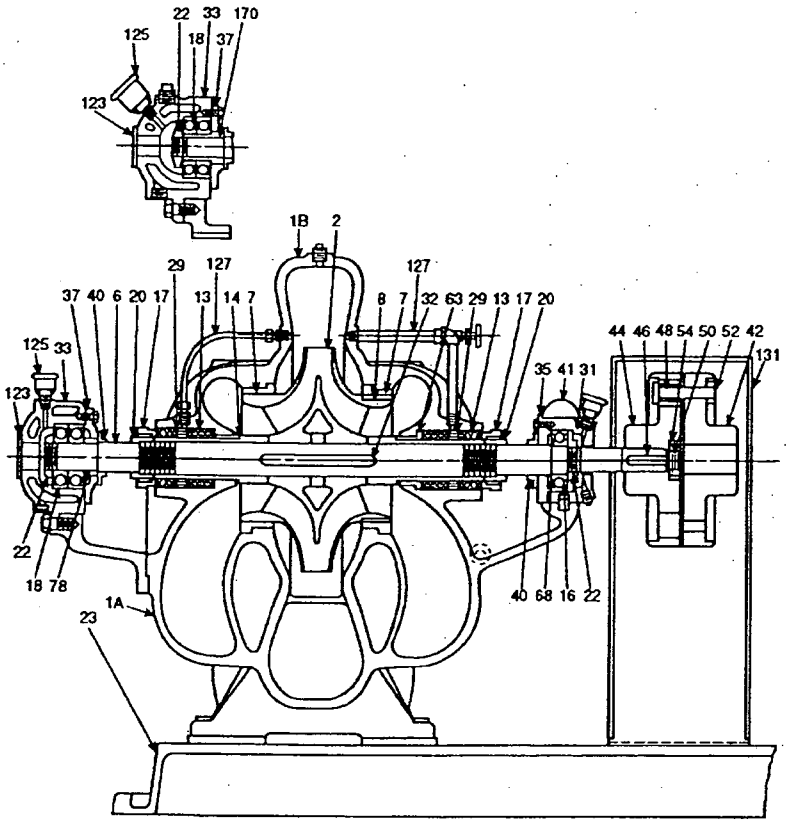

1A Casing, lower half
1B Casing, upper half
2 Impeller
6 Shaft, pump
7 Ring, casing
8 Ring, impeller
13 Packing
14 Sleeve, shaft
16 Bearing, inboard
17 Gland
18 Bearing, outboard
20 Nut, shaft sleeve
22 Locknut
23 Base plate
29 Ring, lantern
31 Housing, bearing, inboard
32 Key, impeller
33 Housing, bearing, outboard
35 Cover, bearing, inboard
37 Cover, bearing, outboard
40 Deflector
41 Cap, bearing, inboard
42 Coupling half driver
44 Coupling half, pump
46 Key, coupling
48 Bushing, coupling
50 Locknut, coupling
52 Pin, coupling
54 Washer, coupling
63 Bushing, stuffing box
68 Collar, shaft
78 Spacer, bearing
123 Cover, bearing end
125 Cup, grease
127 Piping, seal
131 Guard, coupling
170 Adapter, bearing

The numbers used in this figure do not necessarily represent standard part numbers used by any manufacturer.

FIGURE A.8.1.2(1) Impeller between Bearings, Separately Coupled, Single-Stage Axial (Horizontal) Split Case. *(Courtesy of Hydraulic Institute Standard for Centrifugal, Rotary and Reciprocating Pumps.)*

A.8.1.6 Controllers include air-, hydraulic-, or electric-operated units. These units can take power from the energy source for their operation, or the power can be obtained elsewhere. Controllers used with electric power sources can apply the source to the driver in one (across-the-line) or two (reduced voltage or current) steps. Controllers can be used with automatic and manual transfer switches to select the available electric power source where more than one is provided.

A.8.2.2 See Table A.8.2.2 and Figure A.8.2.2.

A.8.2.2(5) Visual indicators other than pilot lights can be used for the same purpose.

A.8.3 The purpose of testing the pump assembly is to ensure automatic or manual operation upon demand and continuous delivery of the required system output. An additional purpose is to detect deficiencies of the pump assembly not evident by inspection.

A.8.3.2.1 See Table A.8.3.2.1.

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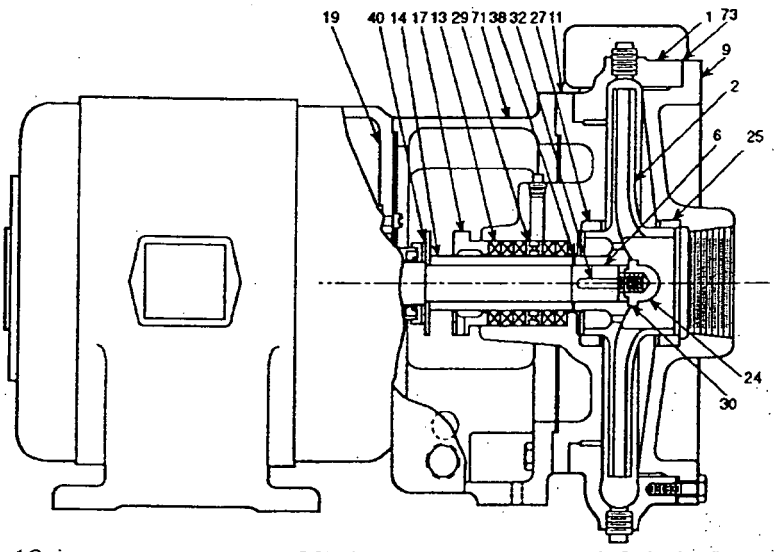

1 Casing
2 Impeller
6 Shaft
9 Cover, suction
11 Cover, stuffing box
13 Packing
14 Sleeve, shaft
17 Gland
19 Frame
24 Nut, impeller
25 Ring, suction cover
27 Ring, stuffing box cover
29 Ring, lantern
30 Gasket, impeller nut
32 Key, impeller
38 Gasket, shaft sleeve
40 Deflector
71 Adapter
73 Gasket

The numbers used in this figure do not necessarily represent standard part numbers used by any manufacturer.

FIGURE A.8.1.2(2) Overhung Impeller, Close-Coupled, Single-Stage, End Suction. *(Courtesy of Hydraulic Institute Standard for Centrifugal, Rotary and Reciprocating Pumps.)*

A.8.3.3.1.1 Peak flow for a fire pump is 150 percent of the rated flow. Minimum flow for a pump is the churn pressure.

A.8.3.3.1.2 The method described in 8.3.3.1.2.1 is not considered as complete as those in 8.3.3.1.2.2 and 8.3.3.1.2.3, because it does not test the adequacy of the water supply for compliance with the requirements of 8.1.3 at the suction flange.

A.8.3.3.3 A pressure relief valve that opens during a flow condition is discharging water that is not measured by the recording device(s). It can be necessary to temporarily close the pressure relief valve to achieve favorable pump test results. At the conclusion of the pump test, the pressure relief valve must be readjusted to relieve pressures in excess of the normal operating pressure of the system components.

If the pressure relief valve is open during the flowing conditions due to the fact that the pressure is too high for the components in the fire protection system, the discharge control valve should be closed prior to closing the pressure relief valve to make sure that the fire protection system is not overpressurized. After the test, make sure that the valve is opened again.

A.8.3.3.7 During periods of unusual water supply conditions such as floods, inspection should be on a daily basis.

A.8.3.4.4 If pumps and drivers were shipped from the factory with both machines mounted on a common base plate, they were accurately aligned before shipment. All base plates are flexible to some extent and, therefore, must not be relied upon to maintain the factory alignment. Realignment is necessary after the complete unit has been leveled on the foundation and again after the grout has set and foundation bolts have been tightened. The alignment should be checked after the unit is piped and rechecked periodically. To facilitate accurate field alignment, most manufacturers either do not dowel the pumps or drivers on the base plates before shipment, or at most dowel the pump only.

After the pump and driver unit has been placed on the foundation, the coupling halves should be disconnected. The coupling should not be reconnected until the alignment operations have been completed.

The purpose of the flexible coupling is to compensate for temperature changes and to permit end movement of the shafts without interference with each other while transmitting power from the driver to the pump.

There are two forms of misalignment between the pump shaft and the driver shaft, as follows:

(1) Angular Misalignment. Shafts with axes concentric but not parallel.
(2) Parallel Misalignment. Shafts with axes parallel but not concentric.

The faces of the coupling halves should be spaced within the manufacturer's recommendations and far enough apart so that they cannot strike each other when the driver rotor is moved hard over toward the pump. Due allowance should be

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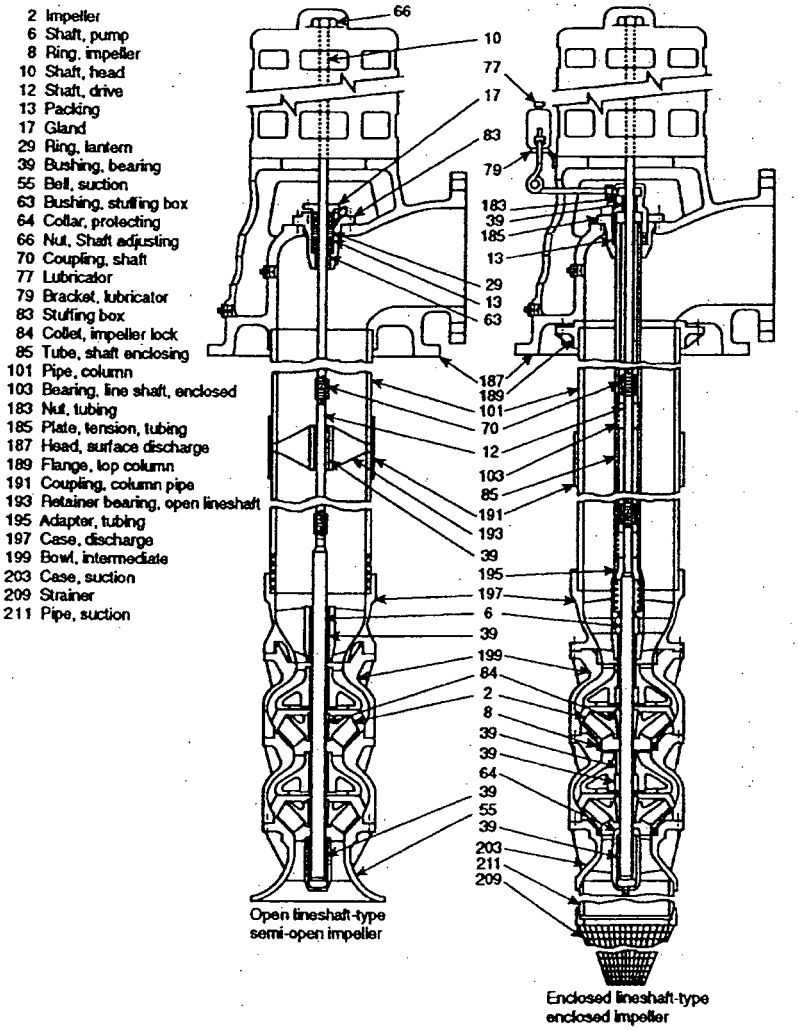

The cross-sectional views illustrate the largest possible number of parts in their proper relationship and some construction modifications but do not necessarily represent recommended design.

FIGURE A.8.1.2(3) Turbine-Type, Vertical, Multistage, Deep Well. *(Courtesy of Hydraulic Institute Standard for Centrifugal, Rotary and Reciprocating Pumps.)*

made for wear of the thrust bearings. The necessary tools for an approximate check of the alignment of a flexible coupling are a straight edge and a taper gauge or a set of feeler gauges.

A check for angular alignment is made by inserting the taper gauge or feelers at four points between the coupling faces and comparing the distance between the faces at four points spaced at 90-degree intervals around the coupling [*see Figure A.8.3.4.4(a)*]. The unit will be in angular alignment when the measurements show that the coupling faces are the same distance apart at all points.

A check for parallel alignment is made by placing a straight edge across both coupling rims at the top, bottom, and at both sides [*see Figure A.8.3.4.4(b)*]. The unit will be in parallel alignment when the straight edge rests evenly on the coupling rim at all positions. Allowance may be necessary for temperature changes and for coupling halves that are not of the same outside diameter. Care must be taken to have the straight edge parallel to the axes of the shafts.

Angular and parallel misalignment are corrected by means of shims under the motor mounting feet. After each change, it

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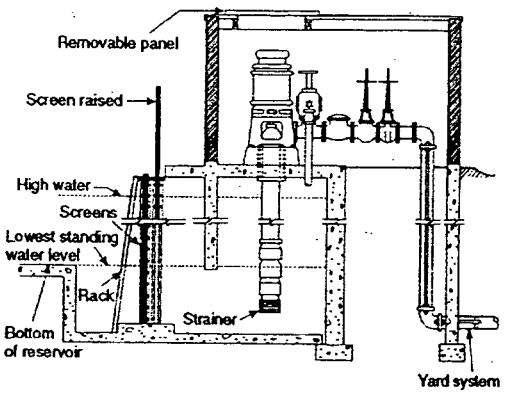

FIGURE A.8.2.2 Wet Pit Suction Screen Installation.

is necessary to recheck the alignment of the coupling halves. Adjustment in one direction may disturb adjustments already made in another direction. It should not be necessary to adjust the shims under the pump.

The permissible amount of misalignment will vary with the type of pump and driver; and coupling manufacturer, model, and size. [20: A.3.5]

A.8.3.5.1 Where the information is available, the test plot should be compared with the original acceptance test plot. It should be recognized that the acceptance test plot could exceed the minimum acceptable pump requirements as indicated by the rated characteristics for the pump. While a reduction in output is a matter of concern, this condition should be evaluated in light of meeting the rated characteristics for the pump. [*See Figure A.8.3.5.3(1).*]

The test equipment should be of high quality and accuracy. All equipment should have been calibrated within the last 12 months by an approved calibration facility. Where possible, the calibration facility should provide documentation indicating the instrument reading against the calibrated reading. Instruments that pass the calibration test should be labeled by the calibration facility with the name of the facility and the date of the test.

Pressure gauges should have an accuracy of not greater than 1 percent of full scale. In order to prevent damage to a pressure gauge utilizing a Bourdon tube mechanism, it should not be used where the expected test pressure is greater than 75 percent of the test gauge scale. Some digital gauges can be subjected to twice the full scale pressure without damage. The

Table A.8.2.2 Weekly Observations

Item	Before Pump Is Operated
Horizontal pumps	1. Check drip pockets under packing glands for proper drainage. Standing water in drip pockets is the most common cause of bearing failure. 2. Check packing adjustment — approximately one drop per second is necessary to keep packing lubricated. 3. Observe suction and discharge gauges. Readings higher than suction pressure indicate leakage back from system pressure through either the fire pump or jockey pump.

Table A.8.3.2.1 Weekly Observations

Item	While Pump Is Operating
Horizontal pumps	1. Read suction and discharge gauges — difference between these readings indicates churn pressure, which should match churn pressure as shown on fire pump nameplate. 2. Observe packing glands for proper leakage for cooling of packing. 3. Observe discharge from casing relief valve — adequate flow keeps pump case from overheating.
Vertical pumps	1. Read discharge gauge — add distance to water level in feet and divide by 2.31 to compute psi. This total must match churn pressure as shown on fire pump nameplate. 2. Observe packing glands for proper leakage for cooling of packing. 3. Observe discharge from casing relief valve — adequate flow keeps pump case from overheating.
Diesel engines	1. Observe discharge of cooling water from heat exchanger — if not adequate, check strainer in cooling system for obstructions. If still not adequate, adjust pressure reducing valve for correct flow. 2. Check engine instrument panel for correct speed, oil pressure, water temperature, and ammeter charging rate. 3. Check battery terminal connections for corrosion and clean if necessary. 4. After pump has stopped running, check intake screens, if provided; change diesel system pressure recorder chart and rewind if necessary.

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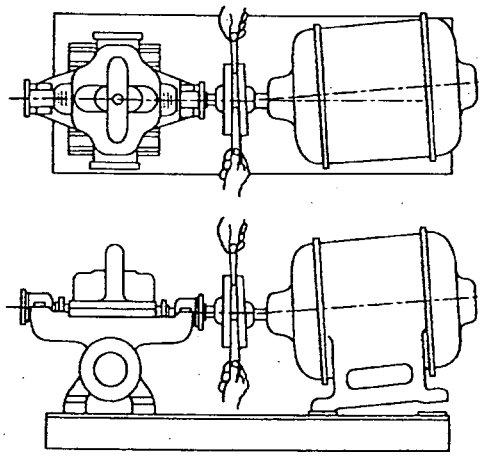

FIGURE A.8.3.4.4(a) Checking Angular Alignment. *(Courtesy of Hydraulic Institute Standard for Centrifugal, Rotary and Reciprocating Pumps.)*

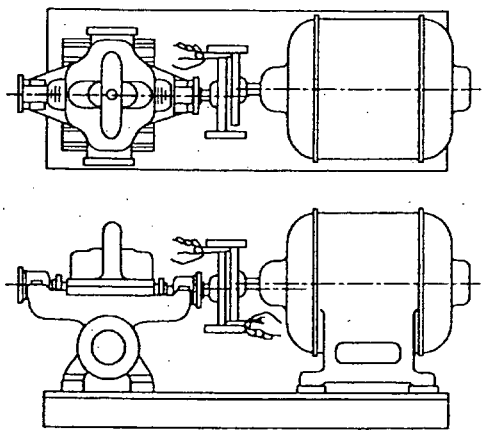

FIGURE A.8.3.4.4(b) Checking Parallel Alignment. *(Courtesy of Hydraulic Institute Standard for Centrifugal, Rotary and Reciprocating Pumps.)*

manufacturer's recommendations should be consulted for the proper use of the gauge. In order to be able to easily read an analog gauge, the diameter of the face of an analog gauge should be greater than 76 mm (3 in.). Pressure snubbers should be used for all gauges to minimize needle fluctuation. All gauges used in the test should be such that a gauge with the lowest full scale pressure is used. For example, a 20.7-bar (300-psi) gauge should not be used to measure a 1.4-bar (20-psi) pitot pressure.

Equipment other than pressure gauges, such as volt/ammeters, tachometers, and flow meters, should be calibrated to the manufacturer's specifications. The readings from equipment with this level of accuracy and calibration can be used without adjustment for accuracy.

A.8.3.5.3(1) See Figure A.8.3.5.3(1).

A.8.3.5.4 See Annex C.

A.8.4.2 See 8.3.3.4.

A.8.5.1 It is important to provide proper bearing lubrication and to keep bearings clean. Some bearings are the sealed type and need no relubrication. Couplings with rubber drive parts do not need lubrication; other types generally do. The following practices are recommended:

(1) Lubricant fittings should be cleaned before relubricating with grease.
(2) The proper amount of lubricant should be used. Too much lubricant results in churning, causing excessive power loss and overheating.
(3) The correct lubricant should be used.

Engine Maintenance. Engines should be kept clean, dry, and well lubricated. The proper oil level in the crankcase should be maintained.

Battery Maintenance. Only distilled water should be used in battery cells. Plates should be kept submerged at all times. An automatic battery charger is not a substitute for proper maintenance of the battery and charger. Periodic inspection ensures that the charger is operating correctly, the water level in the battery is adequate, and the battery is holding its proper charge.

Fuel Supply Maintenance. The fuel storage tank should be kept at least two-thirds full. Fuel should be maintained free of water and foreign material by draining water and foreign material from the tank sump annually. This necessitates draining approximately 19 L (5 gal).

Temperature Maintenance. The temperature of the pump room, pump house, or area where engines are installed should never be less than the minimum recommended by the engine manufacturer. The manufacturer's temperature recommendations for water and oil heaters should be followed.

A.9.1 One source of information on the inspection and maintenance of steel gravity and suction tanks is the AWWA *Manual of Water Supply Practices — M42 Steel Water-Storage Tanks*, Part III and Annex C.

A.9.1.3 The inspection, testing, and maintenance of water storage tanks can involve or result in a system that is out of service. In cases where a tank is the sole source of supply to a fire protection system, it is recommended that an alternate water supply be arranged while maintenance is performed on the tank.

A.9.2.1.1 More frequent inspections should be made where extreme conditions, such as freezing temperatures or arid climate, can increase the probability of adversely affecting the stored water.

Supervisory water level alarms installed on tanks provide notification that the tank water level is above or below an acceptable level. The water level of the tank is the main concern as opposed to the condition of the water. For convenience, inspection of the condition of the water can take place concurrently with the water level inspection.

A.9.2.5.1 Lightning protection systems, where provided, should be inspected, tested, and maintained in accordance with NFPA 780, *Standard for the Installation of Lightning Protection Systems*.

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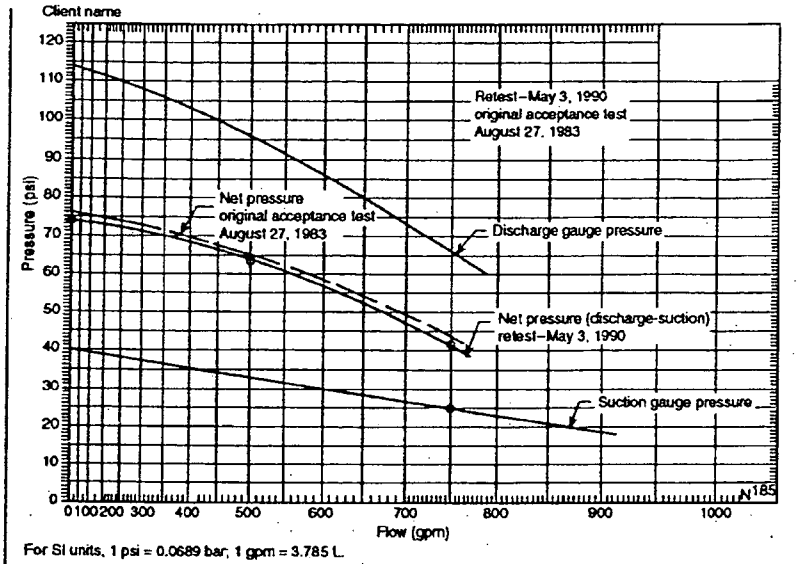

FIGURE A.8.3.5.3(1) Fire Pump Retest.

A.9.2.6.1.1 To aid in the inspection and evaluation of test results, it is a good idea for owners to stencil the last known date of an interior paint job on the exterior of the tank in a conspicuous place. A typical place is near one of the manways at eye level.

A.9.2.6.5 This inspection can be performed by looking for dents on the tank floor. Additionally, walking on the tank floor and looking for buckling of the floor will identify problem areas.

A.9.3.1 The testing procedure for listed mercury gauges is as follows.

To determine that the mercury gauge is accurate, the gauge should be tested every 5 years as follows [steps (1) through (7) coincide with Figure A.9.3.1]:

(1) Overflow the tank.
(2) Close valve F. Open test cock D. The mercury will drop quickly into the mercury pot. If it does not drop, there is an obstruction that needs to be removed from the pipe or pot between the test cock and the gauge glass.
(3) If the mercury does lower at once, close cock D and open valve F. If the mercury responds immediately and comes to rest promptly opposite the "FULL" mark on the gauge board, the instrument is functioning properly.
(4) If the mercury column does not respond promptly and indicate the correct reading during the test, there probably are air pockets or obstructions in the water connecting pipe. Open cock D. Water should flow out forcibly. Allow water to flow through cock D until all air is expelled and rusty water from the tank riser appears. Close cock D. The gauge now likely will read correctly. If air separates from the water in the 25-mm (1-in.) pipe due to being enclosed in a buried tile conduit with steam pipes, the air can be removed automatically by installing a 20-mm (¾-in.) air trap at the high point of the piping. The air trap usually can be installed most easily in a tee connected by a short piece of pipe at E, with a plug in the top of the tee so that mercury can be added in the future, if necessary, without removing the trap. If there are inaccessible pockets in the piping, as where located below grade or under concrete floors, the air can be removed only through petcock D.
(5) If, in step (4), the water does not flow forcibly through cock D, there is an obstruction that needs to be removed from the outlet of the test cock or from the water pipe between the test cock and the tank riser.
(6) If there is water on top of the mercury column in the gauge glass, it will provide inaccurate readings and should be removed. First, lower the mercury into the pot as in step (2). Close cock D and remove plug G. Open valve F very slowly, causing the mercury to rise slowly and the water above it to drain through plug G. Close valve F quickly when mercury appears at plug G, but have a receptacle ready to catch any mercury that drains out. Replace plug G. Replace any escaped mercury in the pot.
(7) After testing, leave valve F open, except under the following conditions: If it is necessary to prevent forcing mercury and water into the mercury catcher, the controlling valve F can be permitted to be closed when filling the tank but should be left open after the tank is filled. In cases where the gauge is subjected to continual fluctuation of pressure, it could be necessary to keep the gauge shut off except when it needs to be read. Otherwise, it could be necessary to remove water frequently from the top of the mercury column as in step (5).

A.9.3.4 The manufacturer's instructions should be consulted for guidance on testing. In some situations, it might not be possible to test the actual initiating device. In such cases, only the circuitry should be tested.

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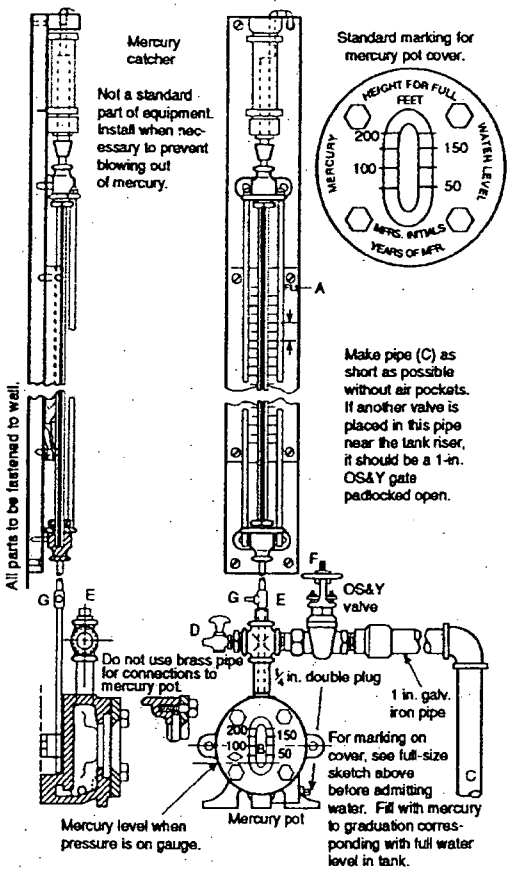

Note: For SI units, 1 in. = 25.4 mm.

FIGURE A.9.3.1 Mercury Gauge.

A.9.3.5 See A.9.3.4.

A.9.3.6 See A.9.3.4.

A.10.1 The effectiveness and reliability of water spray fixed systems depends on maintenance of the integrity of hydraulic characteristics, water control valves, deluge valves and their fire detection/actuation systems, pipe hangers, and prevention of obstructions to nozzle discharge patterns.

Water spray fixed systems are most commonly used to protect processing equipment and structures, flammable liquid and gas vessels, piping, and equipment such as transformers, oil switches, and motors. They also have been shown to be effective on many combustible solids.

A.10.1.2 Insulation acting in lieu of water spray protection is expected to protect a vessel or structure for the duration of the exposure. The insulation is to prevent the temperature from exceeding 454°C (850°F) for structural members and 393°C (650°F) for vessels. If the insulation is missing, the structure or vessel is not considered to be protected, regardless of water spray protection or insulation on other surfaces. To reestablish the proper protection, the insulation should be replaced or the water spray protection should be extended, using the appropriate density.

A.10.1.4 The inspection, testing, and maintenance of water spray fixed systems can involve or result in a system that is out of service. Also see Chapter 14.

A.10.1.4.1 Many of the components and subsystems found in a water spray system require the same inspection, test, and maintenance procedures mandated where they are used in automatic sprinkler systems and other fixed water-based fire protection systems. Other chapters of this standard should be consulted for particulars on required inspection and maintenance.

A.10.2.4 The operation of the water spray system is dependent on the integrity of the piping, which should be kept in good condition and free of mechanical damage. The pipe should not be used for support of ladders, stock, or other material. Where piping is subject to a corrosive atmosphere, a protective corrosion-resistant coating should be provided and maintained. Where the age or service conditions warrant, an internal examination of the piping should be made. Where it is necessary to flush all or part of the piping system, this work should be done by sprinkler contractors or other qualified workers.

A.10.2.4.1 Rubber-gasketed fittings in the fire areas are inspected to determine that they are protected by the water spray or other approved means. Unless properly protected, fire could cause loss of the rubber gasket following excessive leakage in a fire situation.

A.10.2.4.2 Hangers and supports are designed to support and restrain the piping from severe movement when the water supply operates and to provide adequate pipe slope for drainage of water from the piping after the water spray system is shut down. Hangers should be kept in good repair. Broken or loose hangers can put undue strain on piping and fittings, cause pipe breaks, and interfere with proper drainage of the pipe. Broken or loose hangers should be replaced or refastened.

A.10.2.5 Systems need inspection to ensure water spray nozzles effectively discharge water unobstructed onto surfaces to be protected from radiant heat (exposure protection) or onto flaming surfaces to extinguish or control combustion. Factors affecting the proper placement of water spray nozzles include the following:

(1) Changes or additions to the protected area that obstruct existing nozzles or require additional coverage for compliance
(2) Removal of equipment from the protected area that results in nozzle placement at excessive distances from the hazard
(3) Mechanical damage or previous flow tests that have caused nozzles to be misdirected
(4) A change in the hazard being protected that requires more or different nozzles to provide adequate coverage for compliance

Spray nozzles can be permitted to be placed in any position necessary to obtain proper coverage of the protected area. Positioning of nozzles with respect to surfaces to be protected, or to fires to be controlled or extinguished, should be guided by the particular nozzle design and the character of water spray produced. In positioning nozzles, care should be taken

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that the water spray does not miss the targeted surface and reduce the efficiency or calculated discharge rate.

A.10.2.6.2 Water supply piping should be free of internal obstructions that can be caused by debris (e.g., rocks, mud, tuberdes) or by closed or partially closed control valves. See Chapter 5 for inspection and maintenance requirements.

A.10.2.7 Mainline strainers should be removed and inspected for damaged and corroded parts every 5 years.

A.10.3.3 The owner's representative should take care to prevent damage to equipment or the structure during the test. Damage could be caused by the system discharge or by runoff from the test site. It should be verified that there is adequate and unobstructed drainage. Equipment should be removed or covered as necessary to prevent damage. Means such as curbing or sandbagging should be used to prevent entry of the water.

A.10.3.4.1 Test methods are as follows:

(1) Some detection circuits can be permitted to be deliberately desensitized in order to override unusual ambient conditions. In such cases, the response in 10.3.4.1 can be permitted to be exceeded.
(2) Testing of integrating tubing systems can be permitted to be related to this test by means of a standard pressure impulse test specified by the listing laboratory.
(3) One method of testing heat detection uses a radiant heat surface at a temperature of 149°C (300°F) and a capacity of 350 watts at a distance of 25 mm (1 in.) but not more than 50 mm (2 in.) from the nearest part of the detector. This method of testing with an electric test set should not be used in hazardous locations. Other test methods can be permitted to be employed, but the results should be obtained under these conditions.

A.10.3.4.3 Spray nozzles can be of different sizes and types. Some are more subject to internal obstructions than others.

A.11.2.5 Directional-type foam-water discharge devices are quite often located in heavy traffic areas and are more apt to be dislocated compared to ordinary sprinkler locations. Of particular concern are low-level discharge devices in loading racks in and around low-level tankage and monitor-mounted devices that have been pushed out of the way for convenience. Inspection frequency might have to be increased accordingly.

A.11.2.6.2 Water supply piping should be free of internal obstructions that can be caused by debris (e.g., rocks, mud, tuberdes) or by closed or partially closed control valves. See Chapter 5 for inspection and maintenance requirements.

A.11.2.9 Proportioning systems might or might not include foam concentrate pumps. If pumps are part of the proportioning system, the driver, pump, and gear reducer should be checked in accordance with the manufacturer's recommendations, and the check can include items such as lubrication, fuel, filters, oil levels, and clutches.

A.11.2.9.4 In some cases, an adequate supply of foam liquid is available without a full tank. This is particularly true of foam liquid stored in nonmetallic tanks. If liquid is stored in metallic tanks, the proper liquid level should be one-half the distance into the expansion dome.

A.11.2.9.5.1 Although under normal standby conditions this type of proportioning system should not be pressurized, some installations allow for inadvertent pressurization. Pressure should be removed before inspection.

A.11.2.9.5.2 Where inspecting for a full liquid tank, the manufacturer's instructions should be followed. If checked incorrectly, the tank sight gauges could indicate a full tank when the tank actually is empty of foam liquid. Some foam liquids, due to their viscosity, might not indicate true levels of foam liquid in the tank where checked via the sight glass.

> **CAUTION:** Depending on system configuration, this type of proportioner system might be pressurized or nonpressurized under normal conditions. Pressure should be removed before inspection.

A.11.2.9.5.3(1) See 11.2.7.1.

A.11.2.9.5.3(2) See Figure A.3.3.28.

A.11.2.9.5.4(1) See 11.2.7.1.

A.11.2.9.5.4(2) See Figure A.3.3.28.

A.11.2.9.5.5(1) See 11.2.7.1.

A.11.2.9.5.5(2) See Figure A.3.3.28.

A.11.2.9.5.6(1) See 11.2.7.1.

A.11.2.9.5.6(2) See Figure A.3.3.28.

A.11.3 Operational tests generally should be comprised of the following:

(1) A detection/actuation test with no flow to verify that all components such as automated valves, foam and water pumps, and alarms operate properly
(2) A water-only flow test to check piping continuity, discharge patterns, pressures, and line flushing
(3) A foam flow test to verify solution concentration
(4) Resetting of system to its normal standby condition, including draining of lines and filling of foam liquid tank

A.11.3.2 The owner's representative should take care to prevent damage to equipment or the structure during the test. Damage could be caused by the system discharge or by runoff from the test site. It should be verified that there is adequate and unobstructed drainage. Equipment should be removed or covered as necessary to prevent damage. Means such as curbing or sandbagging should be used to prevent entry of the foam-water solution.

A.11.3.3 An alternate method for achieving flow can be permitted to be an installation as shown in Figure A.11.3.3. This type of testing does not verify system pipe conditions or discharge device performance but only the water supply, foam concentrate supply, and proportioning accuracy.

A.11.3.3.7 Specific foam concentrates typically are listed or approved with specific sprinklers. Part of the approval and listing is a minimum sprinkler operating pressure. Sprinkler operating pressure affects foam quality, discharge patterns, and fire extinguishment (control) capabilities. Discharge pressures less than this specified minimum pressure should be corrected immediately; therefore, it is necessary to test under full flow conditions.

A.11.4 The maintenance items specified in the body of this standard are in addition to the typical inspection and test procedures indicated. Foam-water systems are, as are all fire protection systems, designed to be basically maintenance free. There are, however, some areas that need special attention. Foam concentrate shelf life varies between liquids and is af-

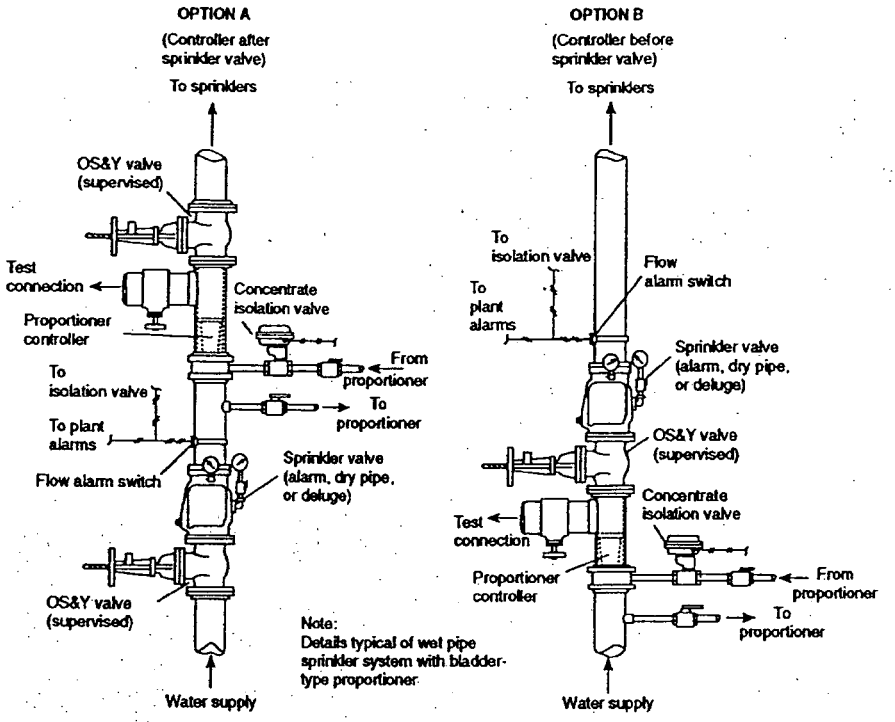

FIGURE A.11.3.3 Foam System/Test Header Combination.

fected by factors such as heat, cold, dilution, contamination, and many others. As with all systems, common sense dictates those maintenance-sensitive areas that should be given attention. Routine testing and inspection generally dictate the need for additional maintenance items. Those maintenance items specified are key procedures that should be performed routinely.

A.11.4.3(B) Foam concentrates tend to settle out over time. Depending on the specific characteristics of the foam concentrate, sedimentation accumulates in the bottom of the storage vessel. This sediment can affect proportioning and foam concentrate integrity. Some concentrates tend to settle out more rapidly than others. If the annual samples indicate excessive sediment, flushing the tank could be required more frequently.

A.11.4.4(B) Where hydrostatically testing bladder tanks, the generation of a pressure differential across the diaphragm should not be allowed. The manufacturer should be consulted for specific procedures.

A.12.1 *Alarm Valves.* Alarm valves are installed in water-based fire protection systems to sound a fire alarm when a flow of water from the system equals or exceeds the flow of a single discharge device. A retarding chamber, which minimizes false alarms due to surges and fluctuating water supply pressure, can be supplied with the alarm valve.

Backflow Prevention Devices. Backflow prevention devices are used to prevent water in a fire protection system from entering the public water supply due to a reverse flow of water, thermal expansion, hydraulic shock, back pressure, or back siphonage. *[See Figure A.12.1(a).]*

Ball Valves. Ball valves are manually operated through their full range of open to closed positions with a one-quarter turn.

Butterfly Valves. Butterfly valves are water supply control valves with gear operators to assist in opening and closing. Butterfly valves can be of the wafer or grooved-end type. *[See Figure A.12.1(b).]*

Check Valves. Check valves allow water flow in one direction only. *[See Figure A.12.1(c).]*

DCA. A double check assembly (DCA) consists of two independently operating spring-loaded check valves. The assembly includes two resilient-seated isolation valves and four test cocks required for testing.

DCDA. A double check detector assembly (DCDA) is hydraulically balanced to include a metered bypass assembly to detect system leakage. The main valve assembly and bypass assembly afford equal levels of backflow prevention and are each equipped with two resilient-seated isolation valves and four test cocks required for testing.

Deluge Valves. Deluge valves hold water at the valve until actuated by the operation of a detection system or manual release. *[See Figure A.12.1(d).]*

Drip Valves. Drip valves automatically drain condensation or small amounts of water that have leaked into system piping or valves. Drip valves close when exposed to system pressure.

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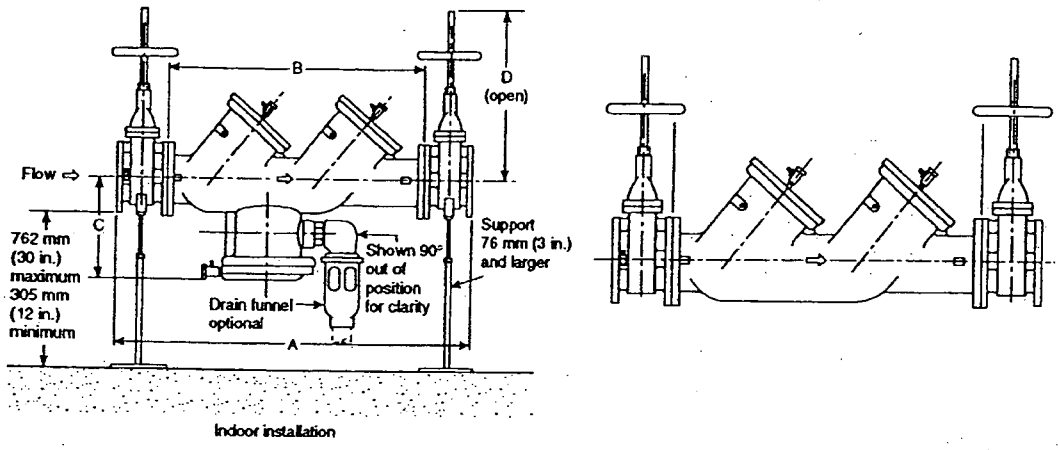

FIGURE A.12.1(a) Reduced Pressure Backflow Preventers (left) and Double Check Valve Assemblies (right).

FIGURE A.12.1(b) Butterfly Post Indicator Valve. *(Courtesy of Henry Pratt Co.)*

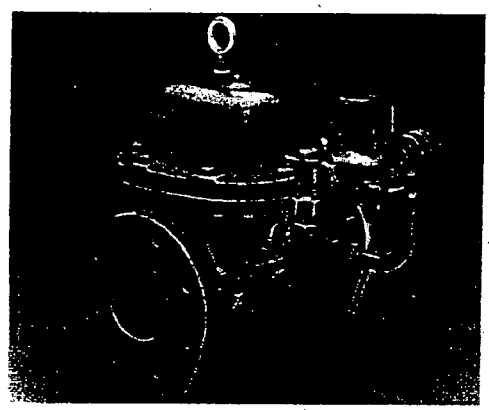

FIGURE A.12.1(c) Detector Check Valve.

Dry Pipe Valves. Dry pipe valves control the flow of water to areas that could be exposed to freezing conditions. Water is held at the valve by air pressure in the system piping. When the air pressure is reduced, the valve operates and floods the system. *[See Figure A.12.1(e) and Figure A.12.1(f).]*

Indicating Valves. Indicating valves provide a dependable, visible indication of the open position, even at a distance.

Indicator Posts. Indicator posts include wall and underground types and are intended for use in operating inside screwed pattern gate valves and for indicating the position of the gates in the valves. *[See Figure A.12.1(g).]*

NRS Gate Valves, OS&Y Gate Valves. Nonrising stem (NRS) gate valves are used underground with indicator posts attached or as roadway box valves (curb-box installation). Outside screw and yoke (OS&Y) gate valves are used indoors and in pits outdoors. The valve stem moves out when the valve is open and moves in when it is closed. The stem indicates the position of the valve. *[See Figure A.12.1(h) and Figure A.12.1(i).]*

RPA. A reduced-pressure zone principle assembly (RPA) consists of two independently spring-loaded check valves separated by a differential-sensing valve. The differential-sensing valve includes a relief port to atmosphere that discharges excess water resulting from supply system fluctuations. The assembly includes two resilient-seated isolation valves and four test cocks required for testing.

RPDA. A reduced-pressure detector assembly (RPDA) is hydraulically balanced to include a metered bypass assembly to detect system leakage. The main valve assembly and bypass assembly afford equal levels of backflow prevention, and each assembly is equipped with two resilient-seated isolation valves and four test cocks required for testing.

Strainers. Strainers are used for protection against clogging of water discharge openings.

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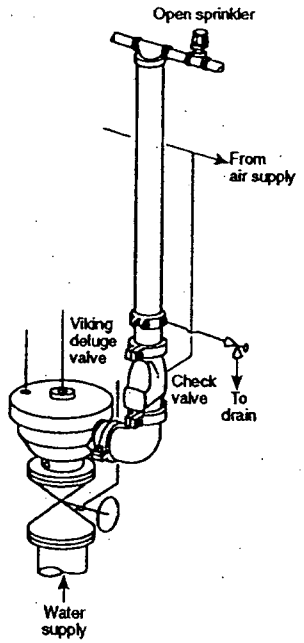


FIGURE A.12.1(d) Deluge Valve.

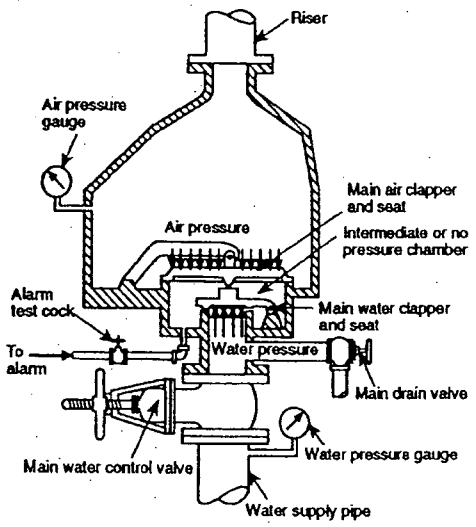


FIGURE A.12.1(e) Dry Pipe Valve.

Water-Flow Detector Check Valves. Detector-type check valves allow flow in one direction only and have provisions for the connection of a bypass meter around the check valve. *[See Figure A.12.1(c).]*

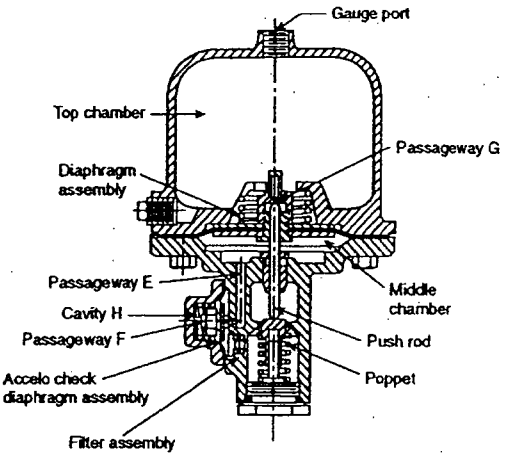
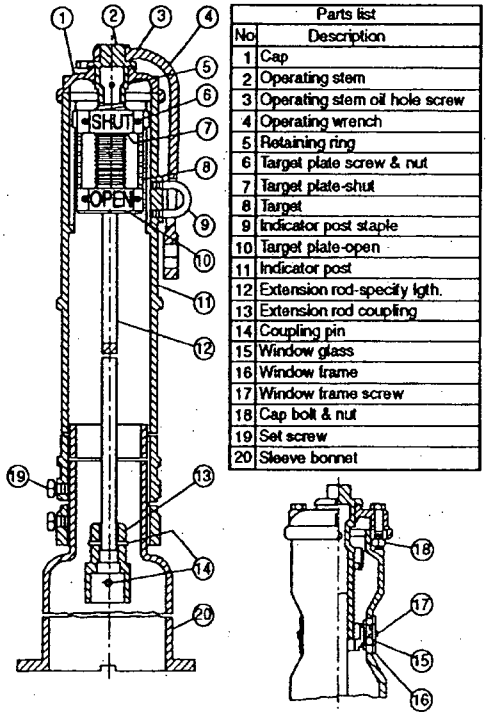


FIGURE A.12.1(f) Dry Pipe System Accelerator. *(Courtesy of Reliable Automatic Sprinkler Co.)*



Parts list	
No	Description
1	Cap
2	Operating stem
3	Operating stem oil hole screw
4	Operating wrench
5	Retaining ring
6	Target plate screw & nut
7	Target plate-shut
8	Target
9	Indicator post staple
10	Target plate-open
11	Indicator post
12	Extension rod-specify lgth.
13	Extension rod coupling
14	Coupling pin
15	Window glass
16	Window frame
17	Window frame screw
18	Cap bolt & nut
19	Set screw
20	Sleeve bonnet

FIGURE A.12.1(g) Vertical Indicator Post.

A.12.2.3 The valves are not required to be exposed. Doors, removable panels, or valve pits can be permitted to satisfy this requirement. Such equipment should not be obstructed by

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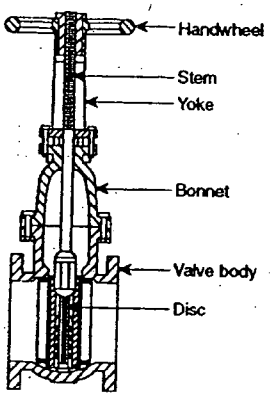

FIGURE A.12.1(h) OS&Y Gate Valve.

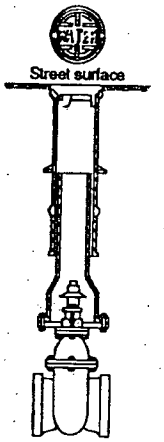

FIGURE A.12.1(i) Nonindicating-Type Gate Valve.

features such as walls, ducts, columns, direct burial, or stock storage.

A.12.2.6 Main drains are installed on system risers for one principal reason: to drain water from the overhead piping after the system is shut off. This allows the contractor or plant maintenance department to perform work on the system or to replace nozzles after a fire or other incident involving system operation.

The test for standpipe systems should be done at the low point drain for each standpipe or the main drain test connection where the supply main enters the building.

These drains also are used to determine whether there is a major reduction in water flow to the system, such as could be caused by a major obstruction, a dropped gate, a valve that is almost fully closed, or a check valve clapper stuck to the valve seat.

A large drop in the full flow pressure of the main drain (as compared to previous tests) normally is indicative of a dangerously reduced water supply caused by a valve in an almost fully closed position or other type of severe obstruction. After closing the drain, a slow return to normal static pressure is confirmation of the suspicion of a major obstruction in the waterway and should be considered sufficient reason to determine the cause of the variation.

A satisfactory drain test (i.e., one that reflects the results of previous tests) does not necessarily indicate an unobstructed passage, nor does it prove that all valves in the upstream flow of water are fully opened. The performance of drain tests is not a substitute for a valve check on 100 percent of the fire protection valving.

The main drain test is conducted in the following manner:

(1) Record the pressure indicated by the supply water gauge
(2) Close the alarm control valve on alarm valves
(3) Fully open the main drain valve
(4) After the flow has stabilized, record the residual (flowing) pressure indicated by the water supply gauge
(5) Close the main drain valve slowly
(6) Record the time taken for the supply water pressure to return to the original static (nonflowing) pressure
(7) Open the alarm control valve

A.12.3.1 Signs identifying underground fire service main control valves in roadway boxes should indicate the direction of valve opening, the distance and direction of the valve from the sign location (if the valve is subject to being covered by snow or ice), and the location of the wrench if not located with the sign.

A.12.3.1.1 Valves that normally are closed during cold weather should be removed and replaced with devices that provide continuous fire protection service.

A.12.3.2.2 Valves should be kept free of snow, ice, storage, or other obstructions so that access is ensured.

A.12.3.2.2(2) The purpose of the valve sealing program is as follows:

(1) The presence of a seal on a control valve is a deterrent to closing a valve indiscriminately without obtaining the proper authority.
(2) A broken or missing seal on a valve is cause for the plant inspector to verify that protection is not impaired and to notify superiors of the fact that a valve could have been closed without following procedures.

A.12.3.3.2 These "spring tests" are made to verify that a post indicator valve is fully open. If an operator feels the valve is fully open, he or she should push in the "open" direction. The handle usually moves a short distance (approximately a one-quarter turn) and "springs" back toward the operator in a subtle move when released. This spring occurs when the valve gate pulls up tight against the top of its casting and the valve shaft (being fairly long) twists slightly. The spring indicates that the valve is fully opened and that the gate is attached to the handle. If the gate is jammed due to a foreign particle, the handle is not likely to spring back. If the gate is loose from the handle, the handle continues to turn in the "open" direction with little resistance.

A.12.3.3.5 For further information, see *NFPA 72®, National Fire Alarm Code®*.

A.12.4.1.1 A higher pressure reading on the system gauge is normal in variable pressure water supplies. Pressure over 12.1 bar (175 psi) can be caused by fire pump tests or thermal expansion and should be investigated and corrected.

A.12.4.1.2 The system should be drained for internal inspection of valve components as follows:

(1) Close the control valve
(2) Open the main drain valve
(3) Open the inspector's test valve
(4) Wait for the sound of draining water to cease and for all gauges to indicate 0 bar (0 psi) before removing the hand-hole cover or dismantling any component

A.12.4.3.2.1 High priming water levels can adversely affect the operation of supervisory air. Test the water level as follows:

(1) Open the priming level test valve
(2) If water flows, drain it
(3) Close the valve when water stops flowing and air discharges
(4) If air discharges when the valve is opened, the priming water level could be too low. To add priming water, refer to the manufacturer's instructions

A.12.4.3.2.2 Preaction and deluge valves in areas subject to freezing should be trip tested in the spring to allow time before the onset of cold weather for all water that has entered the system or condensation to drain to low points or back to the valve.

A.12.4.3.2.9 Methods of recording maintenance include tags attached at each riser, records retained at each building, and records retained at one building in a complex.

A.12.4.3.3.3 Suitable facilities should be provided to dispose of drained water. Low points equipped with a single valve should be drained as follows:

(1) Open the low point drain valve slowly
(2) Close the drain valve as soon as water ceases to discharge and allow time for additional accumulation above the valve
(3) Repeat this procedure until water ceases to discharge
(4) Replace plug or nipple and cap as necessary

Low points equipped with dual valves should be drained as follows:

(1) Close the upper valve
(2) Open the lower valve and drain the accumulated water
(3) Close the lower valve, open the upper valve, and allow time for additional water accumulation
(4) Repeat this procedure until water ceases to discharge
(5) Replace plug or nipple and cap in lower valve

A.12.4.4.1.2(C) A conflict in pressure readings could indicate an obstructed orifice or a leak in the isolated chamber of the quick-opening device, either of which could make the quick-opening device inoperative.

A.12.4.4.2.1 High priming water levels can affect the operation of supervisory air or nitrogen pressure maintenance devices. Test the water level as follows:

(1) Open the priming level test valve
(2) If water flows, drain it
(3) Close the valve when water stops flowing and air discharges
(4) If air discharges when the valve is opened, the priming water level could be too low. To add priming water, refer to the manufacturer's instructions

A.12.4.4.2.2 Dry pipe valves should be trip tested in the spring to allow time before the onset of cold weather for all water that has entered the system or condensation to drain to low points or back to the valve.

A.12.4.4.2.2.2 A full flow trip test generally requires at least two individuals, one of whom is situated at the dry pipe valve while the other is at the inspector's test. If possible, they should be in communication with each other. A full flow trip test is conducted as follows:

(1) The main drain valve is fully opened to clean any accumulated scale or foreign material from the supply water piping. The main drain valve then is closed.
(2) The system air or nitrogen pressure and the supply water pressure is recorded.
(3) The system air or nitrogen pressure is relieved by opening the inspector's test valve completely. Concurrent with opening the valve, both testers start their stopwatches. If two-way communication is not available, the tester at the dry valve is to react to the start of downward movement on the air pressure gauge.
(4) Testers at the dry pipe valve note the air pressure at which the valve trips and note the tripping time.
(5) Testers at the inspector's test note the time at which water flows steadily from the test connection. This time is noted for comparison purposes to previous tests and is not meant to be a specific pass/fail criterion. Note that NFPA 13, *Standard for the Installation of Sprinkler Systems*, does not require water delivery in 60 seconds for all systems.
(6) When clean water flows, the test is terminated by closing the system control valve.
(7) The air or nitrogen pressure and the time elapsed are to be recorded as follows:
    (a) From the complete opening of the test valve to the tripping of the valve
    (b) From the complete opening of inspector's valve to the start of steady flow from the test connection
(8) All low point drains are opened and then closed when water ceases to flow.
(9) The dry pipe valve and quick-opening device are reset, if installed, in accordance with the manufacturer's instructions, and the system is returned to service.

A.12.4.4.2.2.3 A partial flow trip test is conducted in the following manner:

(1) Fully open the main drain valve to clean any accumulated scale or foreign material from the supply water piping
(2) Close the control valve to the point where additional closure cannot provide flow through the entire area of the drain outlet
(3) Close the valve controlling flow to the device if a quick-opening device is installed
(4) Record the system air or nitrogen pressure and the supply water pressure
(5) Relieve system air or nitrogen pressure by opening the priming level test valve
(6) Note and record the air or nitrogen pressure and supply water pressure when the dry pipe valve trips
(7) Immediately close the system control valve and open the main drain valve to minimize the amount of water entering the system piping
(8) Trip test the quick-opening device, if installed, in accordance with the manufacturer's instructions
(9) Open all low point drains; close when water ceases to flow

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(10) Reset the dry pipe valve and quick-opening device, if installed, in accordance with the manufacturer's instructions and return the system to service

CAUTION: A partial flow trip test does not provide a high enough rate of flow to latch the clappers of some model dry pipe valves in the open position. When resetting such valves, check that the latching equipment is operative.

A.12.4.4.2.4 Except when a full flow trip test is conducted in accordance with A.12.4.4.2.2.2, a quick-opening device should be tested in the following manner:

(1) Close the system control valve.
(2) Open the main drain valve and keep it in the open position.
(3) Verify that the quick-opening device control valve is open.
(4) Open the inspector's test valve. A burst of air from the device indicates that it has tripped.
(5) Close the device's control valve.
(6) Return the device to service in accordance with the manufacturer's instructions and return the system to service.

A.12.4.4.3.1 Leaks can be located by inspecting the system for damage or by applying leak detecting fluids to pipe joints and valve packing nuts or bonnets.

A.12.4.4.3.3 A quick-opening device, if installed, should be removed temporarily from service prior to draining low points.

A.12.5.1.2 The sectional drain valve should be opened to compare the results with the original installation or acceptance tests.

A.12.5.2.2 PRV devices can be bench tested in accordance with the manufacturer's instructions or tested in place. To test in place, a gauge is connected on both the inlet side and the outlet side of the device and flow readings are taken using a Pitot tube or a flowmeter. Water is discharged through a roof manifold, if available, or through hose to the exterior of the building. Another acceptable method for systems having at least two risers is to take one standpipe out of service and use it as a drain by removing PRV devices and attaching hoses at the outlets near the ground floor level. When testing in this manner, a flowmeter should be used and a hose line utilized to connect the riser being tested and the drain riser.

Readings are to be compared to the system's hydraulic demands at the test location. Field-adjustable valves are to be reset in accordance with manufacturer's instructions. Nonadjustable valves should be replaced. Extreme caution should be exercised because of the high pressure involved when testing.

A.12.5.5.2.1 Hose valves can be tested without a full flow if the cap is left on the hose threads. The purpose of this requirement is to exercise the valve so it can be operated easily.

A.12.5.5.2.2 See A.12.5.5.2.1.

A.12.6.1.2 Intermittent discharge from a differential-sensing valve relief port is normal. Continuous discharge is a sign of malfunction of either or both of the check valves, and maintenance is necessary.

A.12.6.2.1 The full flow test of the backflow prevention valve can be performed with a test header or other connections downstream of the valve. A bypass around the check valve in the fire department connection line with a control valve in the normally closed position can be an acceptable arrangement. When flow to a visible drain cannot be accomplished, closed loop flow can be acceptable if a flowmeter or sight glass is incorporated into the system to ensure flow.

A.12.6.2.2 The tests required by 12.6.2 typically test only for operation of the device under backflow conditions. Forward-flow test conditions are required by other portions of this standard.

A.13.2 For obstruction investigation and prevention, see Annex D.

A.13.2.2 For obstruction investigation procedures, see Section D.3.

A.13.2.3 For obstruction prevention program recommendations, see Section D.4.

A.13.2.4 For obstruction investigation flushing procedures, see Section D.5.

A.14.3.1 A clearly visible tag alerts building occupants and the fire department that all or part of the water-based fire protection system is out of service. The tag should be weather resistant, plainly visible, and of sufficient size [typically 100 mm × 150 mm (4 in. × 6 in.)]. The tag should identify which system is impaired, the date and time impairment began, and the person responsible. Figure A.14.3.1 illustrates a typical impairment tag.

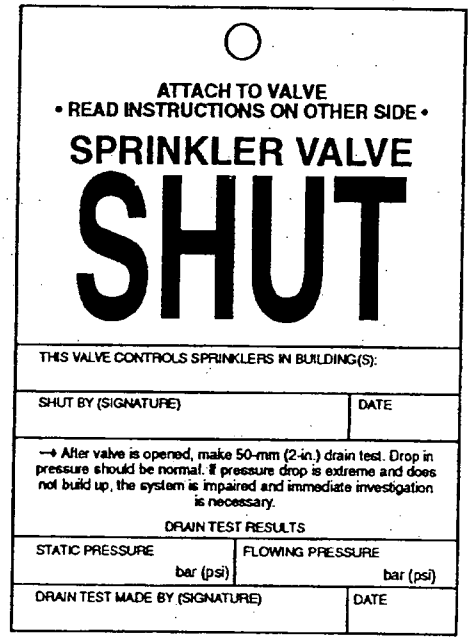

FIGURE A.14.3.1 Sample Impairment Tag.

A.14.3.2 An impairment tag should be placed on the fire department connection to alert responding fire fighters of an abnormal condition. An impairment tag that is located on the system riser only could go unnoticed for an extended period if fire fighters encounter difficulty in gaining access to the building or sprinkler control room.

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A.14.5 The need for temporary fire protection, termination of all hazardous operations, and frequency of inspections in the areas involved should be determined. All work possible should be done in advance to minimize the length of the impairment. Where possible, temporary feedlines should be used to maintain portions of systems while work is completed.

Water-based fire protection systems should not be removed from service when the building is not in use. Where a system that has been out of service for a prolonged period, such as in the case of idle or vacant properties, is returned to service, qualified personnel should be retained to inspect and test the systems.

A.14.5.2(3)(b) A fire watch should consist of trained personnel who continuously patrol the affected area. Ready access to fire extinguishers and the ability to promptly notify the fire department are important items to consider. During the patrol of the area, the person should not only be looking for fire, but making sure that the other fire protection features of the building such as egress routes and alarm systems are available and functioning properly.

A.14.5.2(3)(c) Temporary water supplies are possible from a number of sources including use of a large-diameter hose from a fire hydrant to a fire department connection, use of a portable tank and a portable pump, or use of a standby fire department pumper and/or tanker.

A.14.5.2(3)(d) Depending on the use and occupancy of the building, it could be enough in some circumstances to stop certain processes in the building or to cut off the flow of fuel to some machines. It is also helpful to implement "No Smoking" and "No Hot Work" (cutting, grinding, or welding) policies while the system is out of service because these activities are responsible for many fire ignitions.

Annex B Forms for Inspection, Testing, and Maintenance

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

B.1 Forms [*see Figure B.1(a) through Figure B.1(p)*] need to be complete with respect to the requirements of NFPA 25 for the system being inspected, tested, or maintained, or any combination thereof. Because water-based fire protection systems are comprised of many components, it could be necessary to complete more than one form for each system.

Authorities having jurisdiction are legitimately concerned that the forms used are comprehensive. Therefore, they could develop their own forms or utilize those already developed and reviewed by their jurisdiction.

At least five formats can be used and are described as follows:

(1) All requirements for NFPA 25 are specified in one form having large sections of information that do not apply to most systems.
(2) Individual forms provide requirements corresponding to each chapter of NFPA 25. These forms address the following:
   (a) Sprinkler systems
   (b) Standpipe systems
   (c) Private fire service mains
   (d) Fire pumps
   (e) Storage tanks
   (f) Water spray systems
   (g) Foam-water sprinkler systems
(3) These forms include information from the specific system chapter: Chapter 1, Chapter 12, and Chapter 13.
(4) A series of forms similar to option (2) but with a more detailed breakdown of system types. For example, fire sprinkler systems are divided into five separate forms such as:
   (a) Wet pipe fire sprinkler systems
   (b) Dry pipe fire sprinkler systems
   (c) Preaction fire sprinkler systems
   (d) Deluge fire sprinkler systems
   (e) Foam-water sprinkler systems
(5) Separate forms for each individual component of each fire protection system.

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Report of Inspection
of Water Based Fire Protection Systems

Information Section

Inspecting agency:	Inspector:	Inspection contract #			
Date of this inspection:	Completed by:				
Occupant business name:					
Street address:					
City:	State:	Zip:			
Phone:	Fax:				
Contact person name:					
Position:	Authority to approve work?		Y	N/A	N
Name of property owner:					
Property owner's address:					
City:	State:	Zip:			
Phone:	Fax:				
Responsible party name:		Position:			
Name of supervisory alarm company:		Phone:			
Date of last inspection:	Prior inspector's name:				

		Y	N/A	N
1.	All prior inspection reports, logs and test data are available for review?			
2.	Plans of systems on site for review?			
3.	Modifications made to systems fully reviewed and documented?			
4.	Reports of sprinkler action fully reviewed and corrections made?			
5.	Copy of NFPA 25 on site?			
6.	Weekly logs of inspections required by NFPA 25 on file?			
7.	Is the occupancy and hazard the same reported on last inspection?			
8.	All deficiencies reported at last inspection corrected?			
9.	MS data sheets reviewed and hazards to inspector removed?			

SAMPLE

(Use separate sheet for additional information as may be needed. All "NO" answers to be fully explained.)
Form 94-104A should be completed by the Inspecting Firm/Contractor and provided to the Owner.

Comments:

The owner and/or designated representative acknowledges the responsibility of the operating condition of the component parts at the time of this inspection. It is agreed that the inspection service provided by the contractor as prescribed herein is limited to performing a visual inspection and/or routine testing, and any investigation or unscheduled testing, modification, maintenance, repair etc., of the component parts is not included as part of the inspection work performed. It is further understood that all information contained herein is provided to the best of the knowledge of the party providing such information.

Owner/designated representative: Date:

Inspector's signature: Date:

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FIGURE B.1(a) AFSA Report of Inspection (Information Section) Form.

Report of Inspection
of Water Based Fire Protection Systems

Inspector's Information Section

Inspecting firm: (contractor)		Inspection contract #
Street address:		
City:	State:	Zip:
Phone:	Fax:	
Inspector name:	Date:	
Property name: (refer to Form 103A)		

This report contains information resulting from a visual inspection of the following types of **Water Based Fire Protection Systems:** (please check all that apply)

	Form Description	Form #	
	Report of inspection (Information section)	103A	Cover sheet
	Report of inspection (Inspector's section)	104A	Cover sheet
	Weekly report of inspection	105A	No. of systems
	Wet pipe fire sprinkler system – inspection/testing/maintenance	106A	No. of systems
	Dry pipe fire sprinkler system – inspection/testing/maintenance	107A	No. of systems
	Wet standpipe system – inspection/testing/maintenance	108A	No. of risers
	Dry pipe standpipe system – inspection/testing/maintenance	[illegible]	No. of risers
	Fire pump – inspection/testing/maintenance	[illegible]	No. of pumps
	Underground fire main – inspection/testing/maintenance	[illegible]	----------
	Water reservoir, tank, pond, etc. – inspection/testing/maintenance	[illegible]	Reservoir cap
	Preaction fire protection system – inspection/testing/maintenance	113A	No. of systems
	Deluge fire protection system – inspection/testing/maintenance	114A	No. of systems
	Water - foam fire protection system – inspection/testing/maintenance	115A	No. of systems
	Foam fire protection system – inspection/testing/maintenance	116A	No. of systems
	Other components (describe)		

SAMPLE

The scheduled visual inspection is to be performed as indicated below. The inspector is to complete all questions and review the results of this inspection and any recommendations, corrections, testing, maintenance, etc., with the owner. **All "NO" answers are to be fully explained in detail.**

Scheduled inspection: *(circle one)* Weekly: Monthly: Quarterly: Annually:

Recommendations:

Note: There are scheduled periodic testing and maintenance tasks that must be conducted for the continuous reliability of the fire protection system. These should be performed at the intervals indicated in NFPA 25 standard. This information is being provided as a matter of courtesy. These tasks should only be performed by properly trained personnel using proper equipment.

The owner's or designated representative's signature shall be obtained acknowledging receipt of this report.
(Each page shall be initialed and dated by the owner or designated representative and inspector.)

Owner/designated representative: Date:

Inspector's signature: Date:

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FIGURE B.1(b) AFSA Report of Inspection (Inspector's Information Section) Form.

Weekly Report of Inspection

of Water Based Fire Protection Systems

ALL QUESTIONS ARE TO BE FULLY ANSWERED AND ALL BLANKS TO BE FILLED

This form is being offered to assist in the performance and recording of the results of Weekly Scheduled Inspection Tasks of the various types of Fire Sprinkler Systems and component parts as listed below.

Inspecting firm:

Name of property:

Inspector name: Date:

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Wet Sprinkler and Standpipe Systems:

A-1.1 Splr. supply gauge: psi

A-1.2 Splr. system gauge: psi

A-1.3 Stpipe supply gauge: psi

A-1.4 Stpipe system gauge: psi

A-1.5 Stpipe (top flr) gauge: psi

		Y	N/A	N
A-2.0	System in service on inspection:			
A-2.1	Splr. control valves sealed open:			
A-2.2	Stpipe control valves sealed open:			
A-3.1	Trim piping leak tight:			
A-4.1	Backflow asmb. valves sealed open:			
A-5.1	Control valves accessible:			
A-8.1	Signage/identification tags in place:			
A-9.1	Alarm panel clear:			
A-9.2	Systems left in service			
A-10.1	Comme			

SAMPLE

Dry Pipe Sprinkler System:

B-1.1 Air pressure gauge: psi

B-1.2 Accelerator gauge: psi

B-1.3 Water pressure gauge: psi

		Y	N/A	N
B-2.0	System in service on inspection:			
B-2.1	Compressor operational:			
*B-2.2	Oil level full:			
B-3.1	Control valve sealed open:			
B-3.2	Control valves accessible:			
B-3.3	Alarm test [illegible]:			
B-3.4	Alarm line valves [illegible]:			
B-3.5	Intermediate [illegible] leak tight:			
B-3.2	Low point drum drips drained: (as frequently as needed)			
B-5.1	Valve enclosure secured:			
*B-5.2	Low temperature alarm operational:			
B-5.3	Heater operational:			
B-8.1	Signage/identification tags in place:			
B-9.1	Alarm panel clear:			
B-9.2	System left in service:			
B-10.1	Comments:			

** The inspection tasks noted with an asterisk (*) are required to be performed on a monthly frequency schedule; however, due to varying conditions that may exist on any individual project, it is suggested that these tasks be performed on a weekly frequency schedule.*

Fire Dept. Connection:

		Y	N/A	N
*C-1.1	Caps or plugs on FDC:			
*C-1.2	Swivel rotation nonbinding:			
*C-2.1	FDC location plainly visible:			
*C-2.2	FDC easily accessible:			
*C-2.3	FDC identification plate in place:			
*C-3.1	Ball drip drain leak tight:			
*C-4.1	Wall hydrant plainly visible:			
*C-4.2	Wall hydrant easily accessible:			
*C-4.3	Wall hydrant identification plate in place:			
*C-10.1	Comments:			

Sprinkler Heads:

		Y	N/A	N
*D-1.1	Extra heads in spare head cabinet:			
*D-1.2	Heads appear of proper temperature:			
*D-1.3	Head wrench for each type of head:			
*D-2.1	Head in cooler appears free of ice, corrosion:			
*D-2.2	Head appears free of leakage or damage:			
*D-2.3	Head appears free of paint:			
*D-2.4	Heads appear free of non-approved coverings:			
*D-3.1	Standard head less than 50 year:			
*D-3.2	Residential head less than 20 year:			
*D-3.3	Fast response heads 20 year:			
*D-3.4	High temperature heads 5 year:			
*D-10.1	Comments:			

(All "NO" answers to be fully explained.)

Inspector's initial _____ Owner/designated rep. initial _____ Date: _____

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FIGURE B.1(c) AFSA Weekly Report of Inspection of Water Based Fire Protection Systems.

Weekly Report of Inspection of Water Based Fire Protection Systems . . . *continued*

Preaction and Deluge System:

E-1.1 Air pressure gauge: psi

E-1.2 Water pressure gauge: psi

		Y	N/A	N
E-2.0	Systems in service on inspection:			
E-2.1	Control valves sealed open:			
E-2.2	Control valves accessible:			
E-3.1	Enclosure secured:			
E-3.2	Heater operational:			
E-3.3	Low temperature alarm operational:			
E-4.1	Trim valves normally open:			
E-4.2	Alarm test valve closed:			
E-4.3	Trim piping leak tight:			
E-5.1	Low point drum drips drained: (as frequently as needed)			
E-8.1	Signage/identification tags in place:			
E-9.1	**Alarm panel clear:**			
E-9.2	**Systems left in service:**			

E-10.1 **Comments:**

Other:

Fire Pump:

F-1.1 Suction pressure gauge: psi

F-1.2 Discharge pressure gauge: psi

		Y	N/A	N
F-2.0	Pump in service on inspection:			
F-2.1	Control valves sealed open:			
F-2.2	Control valves accessible:			
F-3.1	Pump enclosure secured:			
F-3.2	Pump enclosure heated (40° F):			
F-3.3	Adequately lighted:			
F-4.1	Weekly run test: (no water flow)			
F-4.2	Shaft seals dripping water properly:			
F-4.3	Casing relief valve free of damage:			
F-4.4	Pressure relief valve free of damage:			
F-5.1	Jockey pumps operational:			
F-6.1	Bearings and valves lubricated:			
F-6.2	Valves, fittings, pipe leak free:			
F-7.1	Controllers power "ON":			
F-7.2	Controllers set on "AUTO":			
F-8.1	Hose header [illegible] valve closed:			
F-9.1	Diesel tank [illegible] full:			
F-9.4	Oil level full:			
F-9.5	Water level full:			
F-9.6	Water jacket condition good:			
F-9.7	Water jacket heater working:			
F-9.8	Antifreeze protect adequate:			
F-9.9	Cooling line strainer appears clear of debris:			
F-9.10	Water jacket piping leak tight:			
F-9.11	Batteries fully charged:			
F-9.12	Battery charger appears operating properly:			
F-9.13	Battery terminals clear:			
F-10.1	Battery state of charge checked:			
F-10.2	Solenoid valve appears operating correctly:			
F-14.1	Condensate drain cleaner:			
F-15.1	Louvers, intake duct clean:			
F-15.2	Signage/identification tags in place:			
F-16.1	**Alarm panel clear:**			
	Systems left in service:			

Comments:

SAMPLE

(All "NO" answers to be fully explained.)

Inspector's Initial _____ Owner/designated rep. Initial _____ Date: _____

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FIGURE B.1(c) *Continued*

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Report of Inspection & Testing

of Water Based Fire Protection Systems

Monthly Items to be Reviewed

ALL QUESTIONS ARE TO BE FULLY ANSWERED AND ALL BLANKS TO BE FILLED

(Weekly inspection tasks are included in this report.)

(There is not a scheduled monthly testing task requirement. See the quarterly schedule.)

Inspecting firm: (contractor) Inspection contract #

Name of property:

Inspector name: Date:

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Inspection frequency: ❑ Monthly ❑ Quarterly ❑ Annually ❑ Other:

Wet Sprinkler System Inspection

A-1.1 Splr. supply gauge: psi

A-1.2 Splr. system gauge: psi

		Y	N/A	N
A-2.0	System in service on inspection:			
A-2.1	Splr. control va. locked/tamper open:			
A-2.2	Stpipe control va. locked/tamper open:			
A-2.3	Backflow va. locked open/tamper:			
A-2.4	Anti-freeze system va. locked/tamper open:			
A-2.8	Tamper switches appear operational:			
A-3.1	Valve area accessible:			
A-3.2	Control valves [illegible]			
A-4.1	Pressure regulating [illegible]			
A-4.2	Pressure regulating [illegible] condition:			
A-4.3	Pressure reg. valve leak tight:			
A-4.4	Pressure reg. va. maintaining down-stream pressure per design criteria:			
A-5.1	Pressure relief va. in closed position except when operational:			
A-5.2	Pressure relief va. in good condition:			
A-5.3	Pressure relief va. leak tight:			
A-5.4	Pressure relief va. maintaining up-stream pressure per design criteria:			
A-6.1	Main check valve holding pressure:			
A-6.2	Alarm check va. exterior free of damage:			
A-6.3	Water flow switch operational:			
A-7.1	Trim piping leak tight:			
A-7.2	Retard chamber drip tight:			
A-7.3	Alarm drain drip light when not operational:			
A-8.1	Trim valves in appropriate position:			
A-8.2	Alarm test line valve closed:			

		Y	N/A	N
A-9.1	FDC plainly visible:			
A-9.2	FDC easily accessible:			
A-9.5	FDC swivels non-binding rotation:			
A-9.6	FDC caps/plugs in place:			
A-9.7	FDC gaskets/signs in place:			
A-9.10	FDC check valve [illegible] free:			
A-9.11	FDC [illegible] drip drain [illegible] free:			
[illegible]	[illegible] alarms properly identified:			
[illegible]	[illegible] appear operational:			
[illegible]	Interior alarms appear operational:			
[illegible]	Extra heads in spare head cabinet:			
A-11.2	Heads appear of proper temperature:			
A-11.3	Head wrench for each type of head:			
A-11.6	Head in cooler appears free of ice, corrosion:			
A-11.7	Head appears free of leakage or damage:			
A-11.8	Head appears free of paint:			
A-11.9	Heads appear free of non-approved coverings:			
A-12.0	Standard head less than 50 year:			
A-13.0	Residential head less than 20 year:			
A-14.0	Watt hydrant plainly visible:			
A-14.1	Watt hydrant easily accessible:			
A-14.2	Watt hydrant identification plate in place:			
A-15.1	Hose/hydrant house free of damage:			
A-15.2	Hose/hydrant house fully equipped:			
A-15.3	Hose/hydrant house is accessible:			
A-16.1	Wet pipe areas appear properly heated:			
A-17.0	Alarm panel clear:			
A-18.0	System left in service:			

A-20.0 Comments:

(All "NO" answers to be fully explained.)

Inspector's initial _____ Owner/designated rep. initial _____ Date: _____

(AFSA Form 94-106A)
Page 1 of 3

FIGURE B.1(d) AFSA Report of Inspection and Testing of Water Based Fire Protection Systems.

Report of Inspection & Testing

of Water Based Fire Protection Systems
Quarterly and Annual Items to be Reviewed

ALL QUESTIONS ARE TO BE FULLY ANSWERED AND ALL BLANKS TO BE FILLED

Inspecting firm: (contractor)			Inspection contract #	
Name of property:				
Inspector name:			Date:	
Page of				
Inspection frequency:	☐ Monthly	☐ Quarterly	☐ Annually	☐ Other:

Quarterly Report of Inspection of Wet Sprinkler System

(For a quarterly inspection, complete all items listed on FORM 94-106A "Report of Inspection – Monthly Items to be Reviewed" AND the items listed below.)

		Y	N/A	N
B-1.1	Hydraulic nameplate attached:			
B-1.2	Strainers and filters cleaned:			
B-1.3	Exterior alarms properly identified:			
B-2.0	**Alarm panel clear:**			
B-3.0	**System left in service:**			
B-20.0	**Comments:**			

SAMPLE

Quarterly Testing Requirements for Wet Sprinkler System

		Y	N/A	N
C-1.1	Main drain flow test with ____ in. valve full open:			
C-2.1	Splr. supply gauge: psi			
C-2.2	Splr. supply gauge: main drain flow: psi			
C-3.1	Spl. system gauge: psi			
C-3.2	Spl. system gauge: main drain flow: psi			
C-4.1	Water flow alarm devices activated:			
C-4.2	Interior bldg. alarms operating:			
C-4.3	Exterior alarms operating:			
C-5.1	Inspectors test flow: psi			
C-6.1	Time to ring alarm from alarm check valve: min sec			
C-7.1	Time to ring alarm from flow switch: min sec			
C-8.1	Time to ring alarm from pressure switch: min sec			
C-9.1	Gauges appear operating properly:			
C-10.1	Did alarm supervisory company receive signal properly:			
C-10.2	Did alarm panel reset properly:			
C-11.0	**Alarm panel clear:**			
C-12.0	**System left in service:**			
C-20.0	**Comments:**			

(All "NO" answers to be fully explained.)

Inspector's initial _____ Owner/designated rep. initial _____ Date: _____

(AFSA Form 94-106A)
Page 2 of 3

FIGURE B.1(d) *Continued*

ROA_01542

Report of Inspection & Testing of Water Based Fire Protection Systems (Quarterly & Annual Items to be Reviewed) . . . *continued*

Annual Report of Inspection of Wet Sprinkler System

(Description of this form: These tasks are in addition to the monthly and quarterly tasks. Complete the monthly and quarterly reports AND this report as required for a total annual report of inspection. Visual inspection is defined as what can be observed from the floor level by an inspector. The use of binoculars is recommended for visual inspections in high buildings.)

		Y	N/A	N
D-1.1	Prior to freezing season, owner is responsible for bldg. to be in secure condition and properly heated:			
D-2.1	Visual inspection: hanger/seismic bracing appear attached and secure:			
D-3.1	Visual inspection: "exposed" piping appear in good condition:			
D-3.2	Piping appears free of mechanical damage:			
D-3.3	Piping appears free of leakage:			
D-3.4	Piping appears free of corrosion:			
D-3.5	Piping appears properly aligned:			
D-3.6	Piping appears free of external loads:			
D-4.1	Sprinklers appear free of co[illegible]			
D-4.2	Sprinklers appear properly p[illegible]			
D-4.3	Sprinklers appear properly s[illegible]			
D-4.4	Sprinklers appear free of foreign material:			
D-4.5	Sprinkler spray patterns appear free of obstructions:			
D-10.0	**Alarm panel clear:**			
D-11.0	**System in service:**			
D-20.0	**Comments:**			

" Provide additional pages if necessary to record the:*
Volume of flow _____ gpm,
Supply side pressure _____ psi,
System side pressure _____ psi.

Annual Testing & Maintenance Tasks that are in Addition to Other Frequency Tasks – For Wet Sprinkler System

		Y	N/A	N
E-1.1	Control valve lubricated:			
E-2.1	Control valve operated to closed position and returned to open position:			
F-1.1	Backflow assembly control valves lubricated:			
F-1.2	Backflow assemble valve operated and returned to open position:			
G-1.1	Post indicator valve operated with number of turns recorded: _____			
G-1.2	Post indicator valve returned to open position: (Valves left 1/4 turn [illegible]n wide open)			
H-1.1	Antifreeze so[illegible] checked to provide [illegible]uate freez[illegible]tion: ([illegible]ction tem[illegible]F)			

[illegible]st Frequency Items of 5 Years or Greater

H-2.0 Internal inspection last date (5 years): _____

H-2.1	Alarm check valve:			
H-2.15	Flow tested pressure regulating control valves: ""			
H-2.2	Make:			
H-2.3	Model:			
H-2.4	Size: Date:			
H-2.5	Check valve:			
H-2.6	Strainers:			
H-2.7	Filters:			
H-2.8	Trim orifices:			
H-2.9	Other:			
H-3.0	Gauge maintenance: date last tested (5 year): _____			
H-3.1	Replaced date:			
H-3.2	Calibrated date:			
J-1.0	Sprinkler maintenance test:			
J-1.1	(5 year) High temp. date: _____			
J-1.2	(20 year, then 10 year thereafter) Fast response date: _____			
J-1.3	Residential head 20 year:			
J-1.4	(50 year, then 10 year thereafter) Standard sprinkler date: _____			
J-20.0	**Comments:**			

(All "NO" answers to be fully explained.)

Inspector's Initial _____ Owner/designated rep. Initial _____ Date: _____

(AFSA Form 94-106A)
Page 3 of 3

FIGURE B.1(d) *Continued*

SAMPLE

Report of Inspection & Testing

of Dry Pipe Fire Protection Systems
Monthly and/or Quarterly Items to be Reviewed

ALL QUESTIONS ARE TO BE FULLY ANSWERED AND ALL BLANKS TO BE FILLED

(Weekly inspection tasks are included in this report.)

(There is not a scheduled monthly testing task requirement. See the quarterly schedule.)

Inspecting firm: (contractor)				Inspection contract #
Name of property:				
Inspector name:				Date:
Page of				
Inspection frequency:	❑ Monthly	❑ Quarterly	❑ Annually	❑ Other:

Dry Pipe Sprinkler System Inspection

A-1.1	Air pressure gauge: psi			
A-1.2	Accelerate or quick opening device gauge: psi			
A-1.3	Water pressure gauge: psi			
A-1.4	Water supply gauge: psi			

		Y	N/A	N
A-2.0	System in service on Inspection:			
A-2.1	Dry pipe valve appears free of damage:			
A-2.2	Trim valves in appropriate position:			
A-2.3	Alarm test valve closed:			
A-2.4	Intermediate chamber leak OK:			
A-3.1	Valve enclosure secure:			
A-3.2	Heater operational:			
A-3.3	Low temperature alarm operational:			
A-4.1	Compressor operational:			
A-4.2	Oil level full:			
A-4.3	High/low pressure switches operational:			
A-4.4	Auto. air maint. devices operational:			
A-5.1	Control va. locked/tamper open:			
A-5.2	Backflow va. locked open/tamper:			
A-5.3	Tamper switches appear operational:			
A-5.4	Valve area accessible:			
A-5.6	Control valves accessible:			
A-5.7	Main check valve holding pressure:			
A-6.1	FDC plainly visible:			
A-6.2	FDC easily accessible:			
A-6.3	FDC swivels non-binding rotation:			
A-6.4	FDC caps/plugs in place:			
A-6.5	FDC gaskets/signs in place			
A-6.6	FDC check valve drip free:			
A-6.7	FDC ball drip drain drip free:			

		Y	N/A	N
A-7.1	Exterior alarms properly identified:			
A-7.2	Exterior alarms appear operational:			
A-7.3	Interior alarms appear operational:			
A-8.1	Extra heads in [illegible] head cabinet:			
A-8.2	Heads appear to be proper temperature:			
A-8.3	Head wrench for each type of head:			
A-8.4	[illegible] cooler [illegible] of ice, corrosion:			
A-8.5	Heads appear free of leakage or damage:			
A-8.8	Heads appear free of paint:			
A-8.9	Head appears free of non-approved coverings:			
A-9.0	Standard head less than 50 year:			
A-10.0	Residential head less than 20 year:			
A-11.1	Hose/hydrant house free of damage:			
A-11.2	Hose/hydrant house fully equipped:			
A-11.3	Hose/hydrant house is accessible:			
A-12.1	Wet pipe areas appear properly heated: (Wet SSP on dry pipe sys.?)			
A-13.1	Low point drum drips drained: (As frequently as needed)			
A-13.2	All low points drained:			
A-14.1	All valves identified with signage:			
A-14.2	Hydraulic nameplate attached:			
A-18.0	Alarm panel clear:			
A-19.0	System in service:			
A-20.0	Comments:			

SAMPLE

(All "NO" answers to be fully explained.)

Inspector's initial _____ Owner/designated rep. initial _____ Date: _____

(AFSA Form 94-107A)
Page 1 of 4

FIGURE B.1(e) AFSA Report of Inspection and Testing of Dry Pipe Fire Protection Systems.

Report of Inspection & Testing

of Dry Pipe Fire Protection Systems
Quarterly and Annual Items to be Reviewed

ALL QUESTIONS ARE TO BE FULLY ANSWERED AND ALL BLANKS TO BE FILLED

Inspecting firm: (contractor) Inspection contract #

Name of property:

Inspector name: Date:

Page of

Inspection frequency: ☐ Monthly ☐ Quarterly ☐ Annually ☐ Other:

Quarterly Testing Requirements for a Dry Pipe Sprinkler System

		Y	N/A	N
C-1.1	Quick opening devices tested during semi-annual inspections:			
C-1.2	Quick opening device test date: _____			
C-1.3	Priming water at proper level:			
C-2.1	Low air pressure alarm tested:			
C-3.1	Main drain flow test with _____ in. valve full open:			
C-3.2	Splr. supply gauge: _____ psi			
C-3.3	Splr. supply gauge with main drain flow: _____ psi			
C-3.4	Gauges operational:			
C-4.1	Water flow alarm devices activated:			
C-4.2	Interior bldg. alarms operate:			
C-4.3	Exterior alarms operate:			
C-4.6	Did alarm supervisory company receive signal:			
C-4.7	Did alarm panel reset:			
C-18.0	**Alarm panel clear:**			
C-19.0	**System left in service:**			
C-20.0	**Comments:**			

Annual Inspection of Dry Pipe Sprinkler System

		Y	N/A	N
D-1.1	Interior of dry pipe valve in good condition:			
D-1.2	Interior of quick opening device in good condition:			
D-1.3	Inspect interior of strainers, filters, restricted orifices every 5th year: Date: _____			
D-1.4	Inspect interior of main check valve every 5th year: Date: _____			
D-2.1	Visual inspection: hanger/seismic bracing appear attached and secure:			
D-3.1	Visual inspection: "exposed" piping appears in good condition:			
D-3.2	Piping appears free of mechanical damage:			
D-3.3	Piping appears free of leakage:			
D-3.4	Exterior of piping appears free of corrosion:			
D-3.6	Piping appears properly aligned:			
D-3.7	Piping appears free of external loads:			
D-4.1	Sprinklers appear free of corrosion:			
D-4.2	Sprinklers appear properly positioned:			
D-4.3	Sprinklers appear properly spaced:			
D-4.6	Sprinklers appear free of foreign material:			
D-4.7	Sprinkler spray patterns appear free of obstructions:			
D-18.0	**Alarm panel clear:**			
D-19.0	**System left in service:**			
D-20.0	**Comments:**			

SAMPLE

(All "NO" answers to be fully explained.)

Inspector's initial _____ Owner/designated rep. initial _____ Date: _____

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Page 2 of 4

FIGURE B.1(e) *Continued*

Annual Testing and Maintenance Tasks That Are in Addition to Other Frequency Tasks — For Dry Pipe System

		Y	N/A	N
E-1.1	Dry pipe valve: (annually)			
E-2.1	Quick opening devices: (semi-annually)			
E-3.1	Dry pipe valve trip tested with control valve partially open: Date: _____			
E-3.2	Trip test with control valve fully open when system is altered or every 3rd year: Date: _____ /			
	(Exception: When protecting a cooler or freezer, DO NOT introduce moisture into system.)			
E-4.1	Strainers and filters and restricted orifices cleaned after trip test or every 5 years:			
E-4.2	Information on last trip test recorded:			
E-5.1	Automatic air maintenance device tested and operating properly:			
E-6.1	Control valve lubricated:			
E-6.2	Control valve operated to closed position and returned to open position:			
E-6.3	Backflow assembly control valves lubricated:			
E-6.6	Backflow assembly control valves operated and returned to open position:			
E-6.7	Post indicator valves operated to _____ number of turns required:			
E-6.8	Post indicator valves returned to open position:			
	(All above listed control valves to be left ¼ turn from wide open)			
E-7.1	All low points drained:			
E-7.2	Internal pipe inspection recommended:			

		Y	N/A	N
	Test Frequency Items of 5 Years Unless noted			
F-1.1	Gauge maintenance test: (5 year) _____			
F-1.2	Replaced date:			
F-1.3	Calibrated date:			
F-2.1	Sprinkler maintenance test frequencies:			
F-2.2	(5 year) high temp. date: _____			
F-2.3	(20 year, then 10 year thereafter) Fast response date: _____			
F-2.4	(50 year, then 10 year thereafter) Standard sprinkler date: _____			
F3.1	Other:			
F-4.1	**Supplemental Information on Dry Pipe Valve and System Condition Report (Annual)**			
F-4.2	Dry system controls sprinklers in: _____			
	_____			
	_____			
	Dry valve trip test satisfactory:			
	Results of failure or partly satisfactory:			
F-4.5	Condition: interior of body in good condition			
F-4.6	Condition: water from test pipe in good condition			
F-4.7	Condition: moving parts in good condition			
F-4.8	Condition: seats in good condition			
F-4.9	Condition: rubber lacing in good condition			
F-4.10	Q.O.D operation indicate satisfactory:			
F-4.11	Q.O.D operation indicate failed:			
F-4.12	Q.O.D operation indicate shut off:			

F-10.0 **Comments:**

SAMPLE

Trip Test Table

Dry Valve Make	Size Model	Year Serial no.	Q.O.D. Make	Model	Year Serial no.

Dry pipe operating test	Time to trip thru test pipe Min	Time to trip thru test pipe Sec	Water pressure psi	Air pressure psi	Trip point air pressure psi	Time water reached test outlet Min	Time water reached test outlet Sec	Alarm operated Yes	Alarm operated No
Without Q.O.D.									
With Q.O.D.									

If No, explain:

(All "NO" answers to be fully explained.)

Inspector's initial _____ Owner/designated rep. initial _____ Date: _____

(AFSA Form 94-107A)
Page 3 of 4

FIGURE B.1(e) *Continued*

ROA_01546

Report of Inspection & Testing

of Fire Protection Systems

Report of Internal Condition of Sprinkler Piping (5 years and/or as required)

ALL QUESTIONS ARE TO BE FULLY ANSWERED AND ALL BLANKS TO BE FILLED

Inspecting firm: (contractor)				Inspection contract #	
Name of property:					
Inspector name:				Date:	
Page of		Date of previous internal pipe inspection:			
Inspection frequency:	☐ Monthly	☐ Quarterly	☐ Annually	☐ Other:	
Identify system(s) involved:	☐ Wet	☐ Dry	☐ Preaction	☐ Deluge	☐ Other:

An examination of representative sections of this sprinkler system has been made to determine internal conditions.

Initial Examination Data:

Number of branch lines examined: % of total branch lines

Number of cross mains examined: % of bulk lines

Other points examined (describe):

Results of Initial Examination:

(Check box which applies)

☐ 1. The interior of the sprinkler piping appears in satisfactory condition.

☐ 2. The sprinkler systems are in need of internal cleaning because ___ of the pipes were found to be partially full of foreign materials. (specify nature of foreign materials, stoppage, pipe deterioration, fungi, tuberculation)

SAMPLE

Examination Subsequent to Cleaning System:

Cleaning method used (describe):

Number of branch lines examined: % of total branch lines

Number of cross mains examined: % of bulk lines

Other points examined (describe):

Results of Examination Subsequent to Cleaning:

(Check box which applies)

☐ 1. The interior of the sprinkler piping appears in satisfactory condition.

☐ 2. If interior of piping other than satisfactory, describe:

Signature and title of person conducting cleaning — Date of cleaning

Witness (owner or lessee of the property)

(All "NO" answers to be fully explained.)

Inspector's initial _____ Owner/designated rep. initial _____ Date: _____

(AFSA Form 94-107A)
Page 4 of 4

FIGURE B.1(e) *Continued*

OBH - O&M 409

ROA_01547

Report of Inspection & Testing

of Wet Standpipe Systems

ALL QUESTIONS ARE TO BE FULLY ANSWERED AND ALL BLANKS TO BE FILLED

Inspecting firm: (contractor) Inspection contract #

Name of property:

Inspector name: Date:

Page of Date of previous internal pipe inspection:

Inspection frequency: ☐ Monthly ☐ Quarterly ☐ Annually ☐ Other:

A-1.1 Supply water gauge: ____ psi

A-1.2 System water gauge: ____ psi

A-1.3 Top floor gauge: ____ psi

A-1.6 Class of service: I II III

A-2.1 Hose valve size: ____ in.

A-2.2 Hose valve with adapter size: ____ x ____ in.

A-2.3 Hose valve with ____ in. hose:

A-2.6 Type and size of nozzle:

Adjustable ____ in.

Straight stream ____ in.

Fog ____ in.

Non-adjustable ____ in.

A-3.1 Indicate the type and record the information for the TOP FLOOR hose valve:

Pressure reducing valves inlet pressure set ___ psi

Pressure reducing valves outlet pressure set ___ psi

Pressure restricting valve inlet pressure set ___ psi

Pressure restricting valve outlet pressure set ___ psi

Pressure regulating valve inlet pressure set ___ psi

Pressure regulating valve outlet pressure set ___ psi

(Attach supplemental sheet recording the gpm and pressure setting for EACH FLOOR hose valve.)

	Y	N/A	N
A-4.1 System in service on inspection:			
A-4.2 System equipped with flow switch:			
A-4.3 System equipped with alarm check valve:			
A-4.4 Trim piping leak tight:			
A-5.1 Control valves sealed open:			
A-5.2 Control valves locked/tamper open:			
A-5.6 Backflow asmb. valves sealed open:			
A-5.7 Backflow asmb. valves locked/tamper open:			
A-5.8 Backflow assembly operating OK:			
A-6.1 Wall hydrant sealed open:			
A-6.2 Wall hydrant locked/tamper open:			
A-6.6 Valve area clear of obstructions:			
A-6.7 Valve area accessible:			
A-6.9 Wall hydrant plainly visible:			
A-6.10 Wall hydrant easily accessible:			
A-6.11 Wall hydrant identification plate in place:			

	Y	N/A	N
A-6.12 Roof manifold control valve closed:			
A-7.1 Tamper switches appear operational:			
A-7.2 Alarm devices appear operational:			
A-7.5 Exterior of devices in good condition:			
A-7.6 Exterior bells, gongs unobstructed:			
A-7.7 Exterior fittings free of water leakage:			
Main drain:			
Alarm bell line:			
A-8.1 Hose valve free of physical damage:			
A-8.2 Hose valve outlets have caps:			
A-8.3 Hose valve outlet threads in good condition:			
A-8.6 System free of [illegible] water leaks:			
[illegible] hose valve outlets equipped with reducing couplings or adapter:			
[illegible].1 Inspection of cabinet per NFPA 1962:			
[illegible].2 Inspection of hose per NFPA 1962:			
A-9.3 Inspection of hose nozzle per NFPA 1962:			
A-9.6 Wall penetrations caulked/sealed:			
A-10.1 Roof manifold equipped with hose valves:			
A-10.2 Roof manifold hose valve caps in place:			
A-10.3 Roof manifold swivel rotation is nonbinding:			
A-10.4 Roof manifold valves good condition:			
A-10.5 Roof manifold ball drip operational:			
A-11.1 Caps or plugs on FDC:			
A-11.2 FDC swivel rotation nonbinding:			
A-11.3 FDC location plainly visible:			
A-11.4 FDC easily accessible:			
A-11.5 FDC identification plate in place:			
A-12.1 Piping free of physical damage:			
A-12.2 Piping (exterior) is free of corrosion:			
A-12.3 Piping appears to be leak tight:			
A-12.6 Ball drip drain drip tight:			
A-12.7 Main drain at supply ___ (in.): ___ psi			
A-12.9 Signage/identification plates in place:			
A-15.1 Alarm panel clear:			
A-15.2 All systems in service:			
A-16.1 Comments:			

SAMPLE

(All "NO" answers to be fully explained.)

Inspector's initial _____ Owner/designated rep. initial _____ Date: _____

(AFSA Form 94-108A)
Page 1 of 2

FIGURE B.1(f) AFSA Report of Inspection and Testing of Wet Standpipe Systems.

ROA_01548

Report of Inspection, Testing, & Maintenance of Wet Standpipe System . . . *continued*

Quarterly Testing of Wet Standpipe System

		Y	N/A	N
B-1.1	Main drain ___ (in.) flow at riser: ___ psi			
B-2.1	Alarm devices operated:			

Refer to NFPA 1962 for testing of standpipe system in addition to the task indicated herein.

Annual Testing

		Y	N/A	N
C-1.1	Test of hose per NFPA 1962:			
C-1.2	Test of hose nozzle per NFPA 1962:			

Five Year Inspection

		Y	N/A	N
D-1.1	Internal inspection of check valves: Date: _____			
D-1.1	Internal inspection of alarm ch... Date: _____			

Five Year Testing

		Y	N/A	N
E-1.1	Pressure gauges calibrated: Date: _____			
E-1.2	Pressure gauges replaced: Date: _____			
E-2.1	Hydrostatic test performed: Date: _____			
E-2.2	Water supply test performed: Date: _____			
E-3.1	Pressure regulating type hose valves flow tested: Date: _____			

(Attach additional pages to record the results of the flow test information indicated below which shall be provided for each type of hose valve connection including the roof manifold, for each floor and for each standpipe riser. The authority having jurisdiction shall be consulted prior to conducting the flow test.)

E-4.1	Volume of flow: ___ gpm			
E-4.2	Supply ___ psi			
E-4.3	Hose connection side: ___ psi			

SAMPLE

(All "NO" answers to be fully explained.)
Inspector's initial _____ Owner/designated rep. initial _____ Date: _____

(AFSA Form 94-108A)
Page 2 of 2

FIGURE B.1(f) *Continued*

OBH - O&M 411

ROA_01549

Report of Inspection, Testing, & Maintenance

of Fire Pumps

The following inspection, testing, and maintenance tasks are to be performed at the indicated frequencies. The required weekly tasks are also included on this list.

ALL QUESTIONS ARE TO BE FULLY ANSWERED AND ALL BLANKS TO BE FILLED

Inspecting firm: (contractor) Inspection contract #

Name of property:

Inspector name: Date:

Page of

Fire Pumps

		Y	N/A	N
A-1.0	**Inspection of Pump Enclosure:**			
A-1.1	Pump enclosure secured:			
A-1.2	Pump enclosure heated (40° F if diesel engine equipped with engine heater):			
A-1.3	Pump enclosure heated (70° F if diesel engine is not equipped with engine heater):			
A-1.4	Vent louvers operate:			
A-1.5	Vent louvers intake duct clean:			
A-1.6	Pump enclosure adequately lighted:			
A-2.0	**Electrical Pumps — Monthly Inspection and Maintenance:**			
A-2.1	Isolating switch and circuit breaker exercised:			
A-2.2	Inspect, check, clean and test circuit breakers: (replace as needed) (replace date: _____)			
A-3.0	**Diesel Pumps — Monthly Inspection and Maintenance:**			
A-3.1	Inspect and remove corrosion, battery case exterior clean and dry:			
A-3.2	Test specific or state of charge:			
A-3.3	Inspect charger and charger rate:			
A-3.4	Check equalize charge:			
A-4.0	**Diesel Pumps — Monthly Inspection and Maintenance:**			
A-4.1	Service fuel strainer, filter and/or dirt leg:			
A-4.2	Clean or replace crankcase breather:			
A-4.3	Check and clean water strainer:			
A-4.4	Inspect insulation and fire hazards:			
A-4.5	Inspect and check wire chafing where subject to movement:			

		Y	N/A	N
A-5.0	**Diesel Pumps — Semiannual Inspection and Maintenance:**			
A-5.1	Test antifreeze protection level:			
A-5.2	Inspect flexible exhaust section:			
A-5.3	Check and test operation of safeties and alarms:			
A-5.4	Clean boxes, panels and cabinets:			
A-6.0	**Maintenance to be Performed Annually or as Indicated:**			
A-6.1	Lubrication of bearings performed:			
A-6.2	Lubrication of coupling performed:			
A-6.3	Lubrication of right angle gear performed:			
A-6.4	Lubrication of motor bearings performed:			
A-7.1	Accuracy of pressure sensors checked:			
A-7.2	Calibrate pressure switch settings:			
A-8.1	Change oil (50 hours of operation):			
A-8.2	Change oil filter (50 hours of operation):			
A-17.0	**Fire pump controller in service:**			
A-18.0	**Jockey pump controller in service:**			
A-19.0	**Alarm panel clear:**			
A-20.0	**System in service:**			

A-21.0 Comments:

SAMPLE

(All "NO" answers to be fully explained.)

Inspector's initial _____ Owner/designated rep. initial _____ Date: _____

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FIGURE B.1(g) AFSA Report of Inspection, Testing, and Maintenance of Fire Pumps.

ROA_01550

Report of Inspection, Testing, & Maintenance of Fire Pumps . . . *continued*

		Y	N/A	N
B-1.0	Annual Inspection of Hydrolic System:			
B-1.1	Suction pressure gauge: _____ psi			
B-1.2	Discharge pressure gauge: _____ psi			
B-1.3	Pump starting pressure: _____ psi			
B-1.4	Suction line control valves sealed open:			
B-1.5	Discharge line control valves sealed open:			
B-1.6	By-pass line valves sealed open:			
B-1.7	All control valves accessible:			
B-1.8	Suction reservoir full:			
B-1.9	Shaft seals dripping water properly: (1 drop per second)			
B-1.10	System free of vibration or unusual noise:			
B-1.11	Packing boxes, bearings, pump casing free of overheating:			

Comments:

		Y	N/A	N
B-2.0	Annual Inspection of Electrical Pump System:			
B-2.6	Isolating switch closed-standby emergency source:			
B-2.7	Normal phase rotation pilot light "ON":			
B-2.8	Reverse phase alarm pilot light "OFF":			
B-2.9	Oil level in vertical motor sight glass is in the normal range:			

Comments:

		Y	N/A	N
B-3.0	Annual Inspection of Diesel Engine System:			
B-3.1	Diesel tank ⅔ full:			
B-3.2	Batteries fully charged:			
B-3.3	Battery charger operating properly:			
B-3.4	Battery terminals clean:			
B-3.5	Battery state of charge checked:			
B-3.6	Battery pilot lights "ON":			
B-3.7	Battery failure pilot lights "OFF":			
B-3.8	Electrolyte level in batteries normal:			
B-3.9	All alarm pilot lights "OFF":			
B-3.10	Engine running time meter recording pump operation properly:			
B-3.11	Oil level in right angle gear drive normal:			
B-3.12	Diesel engine oil level full:			
B-3.13	Diesel engine water level full:			
B-3.14	Water jacket heater appears working properly:			
B-3.15	Water jacket piping drip tight:			
B-3.16	Diesel engine [illegible] good condition:			
B-3.17	coolant antifreeze protection adequate:			
B-3.18	Cooling fin strainer clean:			
B-3.19	Solenoid valve operating correctly:			
B-3.20	Bearings and valves lubricated:			

Comments:

		Y	N/A	N
B-4.0	Annual Inspection of Steam Pump Systems:			
B-4.1	Steam pressure gauge reading normal: _____ psi			
B-4.2	Record time required to reach running speed: _____ min _____ sec			
B-4.3	Weekly test conducted and results recorded:			

Comments:

SAMPLE

(All "NO" answers to be fully explained.)

Inspector's Initial _____ Owner/designated rep. initial _____ Date: _____

(AFSA Form 94-110A)
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FIGURE B.1(g) *Continued*

Report of Inspection, Testing, & Maintenance of Fire Pumps . . . *continued*

	Y	N/A	N
C-1.0 Annual Test of Electric Pump Systems:			
C-1.1 Electric pump weekly 10-min test run results recorded: (water flow not required)			
C-1.2 Time controller on first step for reduced voltage or reduced current starting: ____ min ____ sec			
C-1.3 Record time pump runs after starting (for automatic stop controllers): ____ min ____ sec			
C-1.4 Time required for motor to reach full speed: ____ min ____ sec			

Comments:

	Y	N/A	N
C-2.0 Annual Test of Diesel Pump System:			
C-2.1 Weekly auto start/run 30 min and results recorded: (water flow not required)			
C-2.2 Auto. weekly test timer used for the starting procedure:			
C-2.3 Time required for engine to crank: ____ min ____ sec			
C-2.4 Time required to reach running speed: ____ min ____ sec			
C-2.5 Observations while engine operating:			
Oil pressure: ____ psi			
Speed indicator: ____ rpm			
Water temperature: ____ °F			
Oil temperature: ____ °F			
C-2.6 Pump operational without abnormalities:			
C-2.7 Heat exchanger cooling water flow normal:			
C-2.8 Alarm company notified of test run:			
C-2.9 Pump test run completed satisfactorily:			

SAMPLE

Fire Pump Test

Pump:
Make:
Type:
Rated capacity:
Rated pressure:
Rated rpm:

Power:
Type:
Supervision:

Controller:
Make:
Type:

Water Supply:
Source:

Electronic Characteristics:

Test Data:

Type of test (hydrant, drain or pump)	Static or suction pressure (psi)	Residual or discharge pressure (psi)	Net pump pressure (psi)	Pump speed (rpm/ amperes)	Pilot pressure	Dia. of nozzle openings flowed	No. of nozzle openings flowed	Flow at C=.90 C=.97 (gpm)	Opening coefficient C=___	Actual flow (gpm)

Notes:

Remarks on test:

Signature and title of person making test:

Company name and address:

Witness (owner or designated rep.):

Date of examination:

(All "NO" answers to be fully explained.)
Inspector's initial _____ Owner/designated rep. initial _____ Date: _____

(AFSA Form 94-110A)
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FIGURE B.1(g) *Continued*

OBH - O&M 414

ROA_01552

Annual Inspection and Test of Fire Pump Components: Conduct the Inspection and Test Tasks and Record Results as Applicable to the Type of Pump System:

		Y	N/A	N
D-1.0	Annual inspection of System Components:			
D-1.1	Pump in service on inspection:			
D-1.2	Pump identification no.: _____			
D-1.3	Casing relief valve free of damage:			
D-1.4	Pressure relief valve free of damage:			
D-1.5	ALL valves, fittings, pipe leak tight:			
D-1.6	Condensate drain trap clean:			
D-2.1	Fire pump controller power "ON":			
D-2.2	Transfer switch normal pilot light "ON":			
D-3.1	Jockey pump operational:			
D-3.2	Jockey pump controller power "ON":			
D-3.3	Jockey pump controller set on "AUTO":			
D-4.1	Fire pump shaft coupling appears properly aligned:			
D-4.2	Packing glands appear properly adjusted:			
D-5.1	Weekly test run records available:			
D-5.2	Date of last pump run test: _____			
D-5.3	Pump peak load at 150% capacity: _____			
D-6.1	Test header control valve closed:			
D-6.2	Test header in good condition:			
D-6.3	Test header [illegible] cap) in good condition:			
D-6.4	Test header valve [illegible] in good condition:			
D-6.5	Test header valve swivels rotation is nonbinding:			
D-7.1	By-pass control valves open:			
D-7.2	Control valves sealed/not tampered:			
D-7.3	Control valves locked/tampered:			
D-7.4	Control valves properly tagged and identified:			
D-7.5	Flow meter control valves closed:			
D-8.1	Relief valve and cone operational:			
D-8.2	Relief valve pressure appears properly adjusted:			
D-8.3	Suction gauge while flowing psi: _____			
D-8.4	Fire pump operating psi: _____			
D-8.5	Discharge gauge flowing psi: _____			

		Y	N/A	N
D-9.1	Automatic starts performed 10 times			
D-9.2	Automatic start function properly:			
D-9.3	Automatic stop function properly:			
D-9.4	Automatic start psi: _____			
D-9.5	Automatic stop psi: _____			
D-10.1	Manual starts performed 10 times			
D-10.2	Manual start function properly:			
D-10.3	Manual stop function properly:			
D-10.4	Manual start psi: _____			
D-10.5	Manual stop psi: _____			
D-11.1	Remote start function properly:			
D-11.2	Remote stop function properly:			
D-11.3	Remote start psi: _____			
D-11.4	Remote stop psi: _____			
D-12.1	Timer indicates [illegible]on time: _____ min			
D-12.2	Timer reset [illegible] graph paper changed:			
D-12.3	[illegible] data and [illegible] charts completed: (Attach all water [illegible]s, electrical [illegible] charts, performance curves, etc.)			
D-12.4	Fire pump electrical power readings recorded at each flow condition:			
D-12.5	Fire pump motor speed: _____ rpm			
D-12.6	Fire pump discharge flow: _____ gpm			
D-13.1	Jockey pump operational:			
D-13.2	Jockey pump appears properly aligned:			
D-13.3	Jockey pump valves open:			
D-13.4	Jockey pump "turn-on": _____ psi:			
D-13.5	Jockey pump "turn-off": _____ psi:			

D-20.0 Comments:

SAMPLE

Note: Pump performance curve should be plotted on page 5 of 5.

(All "NO" answers to be fully explained.)

Inspector's Initial _____ Owner/designated rep. initial _____ Date: _____

(AFSA Form 94-110A)
Page 4 of 5

FIGURE B.1(g) *Continued*

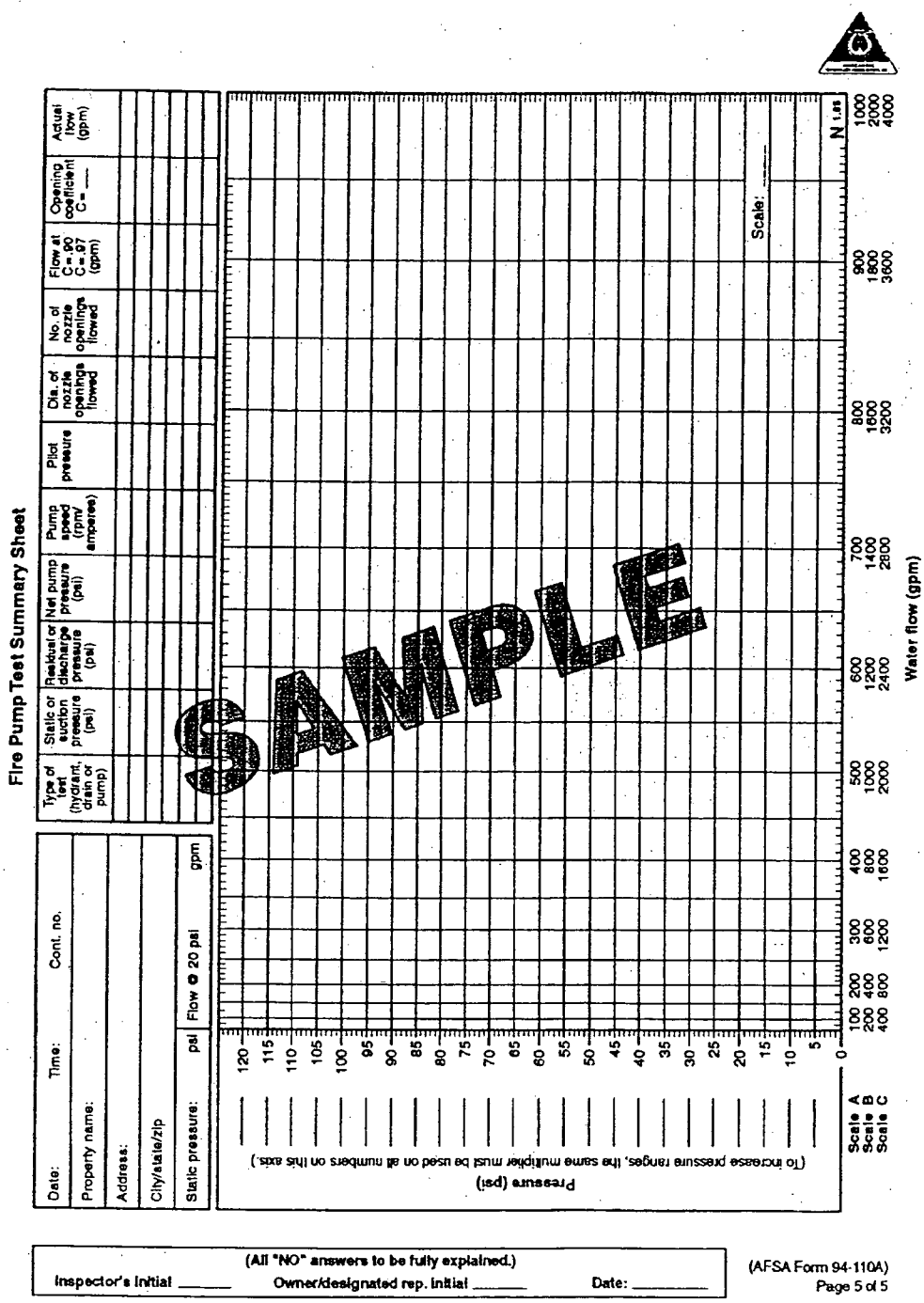

FIGURE B.1(g) *Continued*

ROA_01554

Form for Inspection, Testing and Maintenance of Dry-Pipe Fire Sprinkler Systems

Dry

NATIONAL FIRE SPRINKLER ASSOCIATION, INC.

Information on this form covers the minimum requirements of NFPA 25-2002 for fire sprinkler systems connected to distribution systems without supplemental tanks or fire pumps. Separate forms are available to inspect, test and maintain fire pumps, water tanks and other fire protection systems. More frequent inspection, testing and maintenance may be necessary depending on the conditions of the occupancy and the water supply.

Owner: _____ Owner's Phone Number: _____

Owner's Address: _____

Property Being Evaluated: _____

Property Address: _____

Date of Work: _____ All responses refer to the current work (inspection, testing and maintenance) performed on this date.

This work is (*check one*): ☐ Monthly ☐ Quarterly ☐ Annual ☐ Third Year ☐ Fifth Year

Notes: 1) All questions are to be answered *Yes*, *No*, or *Not Applicable*. All *No* answers are to be explained in Part III of this form.
2) Inspection, Testing and Maintenance are to be performed with water supplies (including fire pumps) in service, unless the impairment procedures of Chapter 11 of NFPA 25 are followed.

Part I - Owner's Section

A. Is the building occupied? ☐ Yes ☐ No

B. Has the occupancy classification and hazard of contents remained the same since the last inspection? ☐ Yes ☐ No

C. Are all fire protection systems in service? ☐ Yes ☐ No

D. Has the system remained in service without modification since the last inspection? ☐ Yes ☐ No

E. Was the system free of actuation of devices or alarms since the last inspection? ☐ Yes ☐ No

Owner or representative (print name) Signature and Date

Part II - Inspector's Section

A. Inspections

1. Daily and Weekly Items

A. Control valves supervised with seals in correct (open or closed) position? ☐ Yes ☐ No ☐ N/A

B. Dry-Pipe Valves: Enclosure [illegible] minimum of 40° F and [illegible] showing normal air and [illegible]? ☐ Yes ☐ No ☐ N/A

D. Backflow preventers:

1. Valves in correct (open[illegible]) position? ☐ Yes ☐ No ☐ N/A
2. Sealed, locked or supervised [illegible] accessible? ☐ Yes ☐ No ☐ N/A
3. Relief port on RPZ device not discharging? ☐ Yes ☐ No ☐ N/A

E. For freezer systems, is the gage near the compressor reading the same as the gage near the dry-pipe valve? ☐ Yes ☐ No ☐ N/A

4. Monthly Inspection Items (in addition to above items)

A. Control valves with locks or electrical supervision in correct (open or closed) position? ☐ Yes ☐ No ☐ N/A

B. Dry-Pipe Valves: Free from physical damage, trim valves in appropriate (open or closed) position, and no leakage from intermediate chamber? ☐ Yes ☐ No ☐ N/A

C. Sprinkler wrench with spare sprinklers? ☐ Yes ☐ No ☐ N/A

5. Quarterly Inspection Items (in addition to above items)

A. Pressure Reducing Valves: In open position, not leaking, maintaining downstream pressure per design criteria, and in good condition with handwheels not broken? ☐ Yes ☐ No ☐ N/A

B. Hydraulic nameplate (calculated systems) securely attached to riser and legible? ☐ Yes ☐ No ☐ N/A

C. Fire Department Connections: Visible, accessible, couplings and swivels not damaged and rotate smoothly, plugs or caps in place and undamaged, gaskets in place and in good condition, identification sign(s) in place, check valve is not leaking, clapper is in place and operating properly and automatic drain valve in place and operating properly? ☐ Yes ☐ No ☐ N/A

(If plugs or caps are not in place, inspect interior for obstructions.)

D. Alarm devices free from physical damage? ☐ Yes ☐ No ☐ N/A

6. Annual Inspection Items (in addition to above items)

A. Proper number and type of spare sprinklers? ☐ Yes ☐ No ☐ N/A

B. Visible sprinklers:

1. Free of corrosion and physical damage? ☐ Yes ☐ No ☐ N/A
2. Free of obstructions to spray patterns? ☐ Yes ☐ No ☐ N/A
3. Free of foreign materials including paint? ☐ Yes ☐ No ☐ N/A
4. Liquid in all glass bulb sprinklers? ☐ Yes ☐ No ☐ N/A

C. Visible pipe:

1. In good condition/no external corrosion? ☐ Yes ☐ No ☐ N/A
2. No mechanical damage and no leaks? ☐ Yes ☐ No ☐ N/A
3. Properly aligned and [illegible] loads? ☐ Yes ☐ No ☐ N/A

D. Visible [illegible] hangers [illegible] braces [illegible] tight and not loose? ☐ Yes ☐ No ☐ N/A

[illegible] passed [illegible] inspection? ☐ Yes ☐ No ☐ N/A

[illegible] free of liquid [illegible]?

Adequate [illegible] in areas with wet piping? ☐ Yes ☐ No ☐ N/A

Low temperature alarms functioning? ☐ Yes ☐ No ☐ N/A

3. Interior of pipe that passes through freezers free of ice blockage? ☐ Yes ☐ No ☐ N/A

G. Has an internal inspection of the pipe been performed by removing the flushing connection and one sprinkler near the end of a branch line within the last 5 years? ☐ Yes ☐ No ☐ N/A

(If the answer was "No," conduct an internal inspection.)

8. Fifth Year Inspection Items (in addition to above items)

A. Check valves internally inspected and all parts operate properly, move freely and are in good condition? ☐ Yes ☐ No ☐ N/A

B. Strainers, filters, restricted orifices and diaphragm chambers on dry-pipe valves passed internal inspection? ☐ Yes ☐ No ☐ N/A

B. Testing

The following tests are to be performed at the noted intervals. Report any failures on Part III of this form.

1. Quarterly Tests

A. Mechanical waterflow alarm devices passed tests by opening the inspector's test connection or bypass connection with alarms actuating and flow observed? ☐ Yes ☐ No ☐ N/A

B. Post indicating valves opened until spring or torsion is felt in the rod, then closed back one-quarter turn? ☐ Yes ☐ No ☐ N/A

C. Is the priming level correct and has the low air pressure signal passed its test? ☐ Yes ☐ No ☐ N/A

D. Quick opening devices passed test? ☐ Yes ☐ No ☐ N/A

E. Main drain test for system downstream of backflow or pressure reducing valve:

1. Record Static Pressure ____ psi and Residual Pressure ____ psi.
2. Was flow observed? ☐ Yes ☐ No ☐ N/A
3. Are results comparable to previous test? ☐ Yes ☐ No ☐ N/A

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FIGURE B.1(h) NFSA Form for Inspection, Testing, and Maintenance of Dry Pipe Fire Sprinkler Systems.

2. Semiannual Test (in addition to previous items)

A. Valve supervisory switches indicate movement? ☐ Yes ☐ No ☐ N/A

B. Electrical waterflow alarm devices passed tests by opening the inspector's test connection or bypass connection with alarms actuating and flow observed? ☐ Yes ☐ No ☐ N/A

3. Annual Tests (in addition to previous items)

A. Main drain test:

1. Record Static Pressure ____ psi and Residual Pressure ____ psi.
2. Was flow observed? ☐ Yes ☐ No ☐ N/A
3. Are results comparable to previous test? ☐ Yes ☐ No ☐ N/A

B. Are all sprinklers dated 1920 or later? ☐ Yes ☐ No ☐ N/A

C. Fast response sprinklers 20 or more years old replaced or successfully sample tested within last 10 years? ☐ Yes ☐ No ☐ N/A

D. Standard response sprinklers 50 or more years old replaced or successfully sample tested within last 10 years? ☐ Yes ☐ No ☐ N/A

E. Standard response sprinklers 75 or more years old replaced or successfully sample tested within last 5 years? ☐ Yes ☐ No ☐ N/A

F. Dry-type sprinklers replaced or successfully sample tested within last 10 years? ☐ Yes ☐ No ☐ N/A

G. All control valves operated through full range and returned to normal position? ☐ Yes ☐ No ☐ N/A

H. Low temperature alarms passed test? ☐ Yes ☐ No ☐ N/A

I. Dry-pipe valve partial flow trip test:

1. Record initial air pressure ____ psi and water pressure ____ psi.
2. Record tripping air pressure ____ psi and tripping time ____ (sec.).
3. Above results comparable to previous tests? ☐ Yes ☐ No ☐ N/A

J. Automatic air maintenance device passed test? ☐ Yes ☐ No ☐ N/A

K. Backflow devices passed [illegible]? ☐ Yes ☐ No ☐ N/A

L. Backflow devices passed full flow test? ☐ Yes ☐ No ☐ N/A

M. Pressure reducing valves passed partial flow test? ☐ Yes ☐ No ☐ N/A

4. Test to be done every third year:

Dry-pipe full flow trip test:

1. Record initial air pressure ____ psi and water pressure ____ psi.
2. Record tripping air pressure ____ psi and tripping time ____ (sec.).
3. Record water delivery time ____ (min.) ____ (sec.).

Water delivery time not required to be 60 sec. per NFPA 25

4. Above results comparable to previous tests? ☐ Yes ☐ No ☐ N/A

5. Tests to be done every fifth year: A. Sprinklers rated above High temperature tested? ☐ Yes ☐ No ☐ N/A

B. Gages checked by calibrated gage or replaced? ☐ Yes ☐ No ☐ N/A

C. Pressure reducing valves passed full flow test? ☐ Yes ☐ No ☐ N/A

C. Maintenance

1. Regular Maintenance Items

A. If sprinklers have been replaced, were they proper replacements? ☐ Yes ☐ No ☐ N/A

B. Air leaks in dry-pipe system resulting in air pressure loss more than 10 psi/week repaired? ☐ Yes ☐ No ☐ N/A

C. Dry-pipe systems maintained in dry condition? ☐ Yes ☐ No ☐ N/A

D. Have low point drains been emptied? ☐ Yes ☐ No ☐ N/A

1. Regular Maintenance Items (continued)

E. If any of the following were discovered, was an obstruction investigation conducted? ☐ Yes ☐ No ☐ N/A

Explain reason(s) and obstruction investigation findings in Part III.

1. Defective intake screen on pump with suction from open sources.
2. Obstructive material discharged during waterflow tests.
3. Foreign materials found in dry-pipe valves, check valves or pumps.
4. Foreign material in water during drain test or plugging of inspector's test connection.
5. Plugging of pipe or sprinklers found during activation or alteration.
6. Failure to flush yard piping or surrounding public mains following new installation or repairs.
7. Record of broken mains in the vicinity.
8. Abnormally frequent false-tripping of dry-pipe valves.
9. System is returned to service after an extended period out of service (greater than one year).
10. There is reason to believe the system contains sodium silicate or its derivatives or highly corrosive fluxes in copper pipe systems.

F. If conditions were found that required flushing, was flushing [illegible] conducted? ☐ Yes ☐ No ☐ N/A

2. Annual Maintenance Items (in addition to previous items)

[illegible] of all [illegible] valves lubricated, [illegible] ☐ Yes ☐ No ☐ N/A

[illegible] ☐ Yes ☐ No ☐ N/A

[illegible] low points drained prior to the onset of freezing weather? ☐ Yes ☐ No ☐ N/A

D. Sprinklers and spray nozzles protecting commercial cooking equipment and ventilating systems replaced except for bulb-type which show no signs of grease buildup? ☐ Yes ☐ No ☐ N/A

Part III - Comments *(Any "No" answers, test failures or other problems found with the sprinkler system must be explained here. Also, note here any products noticed on the system that have been the subject of a recall or a replacement program.*

Part IV - Inspector's Information

Inspector: _____ Company: _____

Company's Address: _____

I state that the information on this form is correct at the time and place of my inspection and that all equipment tested at this time was left in operational condition upon completion of this inspection except as noted in Part III above.

Signature of Inspector: _____

Date: _____

License or Certification Number (if applicable): _____

SAMPLE

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FIGURE B.1(h) *Continued*

ROA_01556

Form for Inspection, Testing and Maintenance of Wet Pipe Fire Sprinkler Systems

Wet

NATIONAL FIRE SPRINKLER ASSOCIATION, INC.

Information on this form covers the minimum requirements of NFPA 25-2002 for fire sprinkler systems connected to distribution systems without supplemental tanks or fire pumps. Separate forms are available to inspect, test and maintain fire pumps, water tanks and other fire protection systems. More frequent inspection, testing and maintenance may be necessary depending on the conditions of the occupancy and the water supply.

Owner: _____ Owner's Phone Number: _____

Owner's Address: _____

Property Being Evaluated: _____

Property Address: _____

Date of Work: _____ All responses refer to the current work (inspection, testing and maintenance) performed on this date.

This work is (*check one*): ☐ Monthly ☐ Quarterly ☐ Annual ☐ Third Year ☐ Fifth Year

Notes: 1) All questions are to be answered *Yes*, *No*, or *Not Applicable*. All *No* answers are to be explained in Part III of this form.
2) Inspection, Testing and Maintenance are to be performed with water supplies (including fire pumps) in service, unless the impairment procedures of Chapter 11 of NFPA 25 are followed.

Part I - Owner's Section

A. Is the building occupied? ☐ Yes ☐ No

B. Has the occupancy classification and hazard of contents remained the same since the last inspection? ☐ Yes ☐ No

C. Are all fire protection systems in service? ☐ Yes ☐ No

D. Has the system remained in service without modification since the last inspection? ☐ Yes ☐ No

E. Was the system free of actuation of devices or alarms since the last inspection? ☐ Yes ☐ No

Owner or representative (print name) Signature and Date

Part II - Inspector's Section

A. Inspections

1. Daily and Weekly Items

A. Control valves supervised with seals in correct (open or closed) position? ☐ Yes ☐ No ☐ N/A

B. Backflow preventers:

1. Valves in correct (open or closed) position? ☐ Yes ☐ No ☐ N/A
2. Sealed, locked or supervised? ☐ Yes ☐ No ☐ N/A
3. Relief port on RPZ device not discharging? ☐ Yes ☐ No ☐ N/A

4. Monthly Inspection Items (in addition to above items)

A. Control valves with locks or electrical supervision in correct (open or closed) position? ☐ Yes ☐ No ☐ N/A

B. Sprinkler wrench with spare sprinklers? ☐ Yes ☐ No ☐ N/A

C. Gauges on wet-pipe system in good condition and showing normal water supply pressure? ☐ Yes ☐ No ☐ N/A

D. Alarm Valves:

Gauges show normal supply water pressure, free from physical damage, valves in correct (open or closed) position and no leakage from retarding chamber or drains? ☐ Yes ☐ No ☐ N/A

5. Quarterly Inspection Items (in addition to above items)

A. Pressure Reducing Valves: In open position, not leaking, maintaining downstream pressure per design criteria, and in good condition with handwheels not broken? ☐ Yes ☐ No ☐ N/A

B. Hydraulic nameplate (calculated systems) securely attached to riser and legible? ☐ Yes ☐ No ☐ N/A

C. Fire Department Connections:

Visible, accessible, couplings and swivels not damaged and rotate smoothly, plugs or caps in place and undamaged, gaskets in place and in good condition, identification sign(s) in place, check valve is not leaking, clapper is in place and operating properly and automatic drain valve in place and operating properly? ☐ Yes ☐ No ☐ N/A

(If plugs or caps are not in place, inspect interior for obstructions.)

D. Alarm devices free from physical damage? ☐ Yes ☐ No ☐ N/A

6. Annual Inspection Items (in addition to above items)

A. Proper number and type of spare sprinklers? ☐ Yes ☐ No ☐ N/A

B. Visible sprinklers:

1. Free of corrosion and physical damage? ☐ Yes ☐ No ☐ N/A
2. Free of obstructions to spray patterns? ☐ Yes ☐ No ☐ N/A
3. Free of foreign materials including paint? ☐ Yes ☐ No ☐ N/A
4. Liquid in all glass bulb sprinklers? ☐ Yes ☐ No ☐ N/A

C. Visible pipe:

1. In good condition/no external corrosion? ☐ Yes ☐ No ☐ N/A
2. No mechanical damage and no leaks? ☐ Yes ☐ No ☐ N/A
3. Properly aligned and no external loads? ☐ Yes ☐ No ☐ N/A

D. Visible hangers and braces tight and not loose? ☐ Yes ☐ No ☐ N/A

Hose valves, couplings and nozzles on sprinkler system passed inspection in accordance with NFPA 1962? ☐ Yes ☐ No ☐ N/A

Adequate heat in areas with wet piping? ☐ Yes ☐ No ☐ N/A

Has an internal inspection of the pipe been performed by removing the flushing connection and one sprinkler near the end of a branch line within the last 5 years? ☐ Yes ☐ No ☐ N/A

(If the answer was "No," conduct an internal inspection.)

8. Fifth Year Inspection Items (in addition to above items)

A. Alarm valves and their associated strainers, filters and restriction orifices passed internal inspection? ☐ Yes ☐ No ☐ N/A

B. Check valves internally inspected and all parts operate properly, move freely and are in good condition? ☐ Yes ☐ No ☐ N/A

B. Testing

The following tests are to be performed at the noted intervals. Report any failures on Part III of this form.

1. Quarterly Tests

A. Mechanical waterflow alarm devices passed tests by opening the inspector's test connection or bypass connection with alarms actuating and flow observed? ☐ Yes ☐ No ☐ N/A

B. Post indicating valves opened until spring or torsion is felt in the rod, then closed back one-quarter turn? ☐ Yes ☐ No ☐ N/A

C. Main drain test for system downstream of backflow or pressure reducing valve:

1. Record Static Pressure_____ psi and Residual Pressure _____ psi.
2. Was flow observed? ☐ Yes ☐ No ☐ N/A
3. Are results comparable to previous test? ☐ Yes ☐ No ☐ N/A

2. Semiannual Test (in addition to previous items)

A. Valve supervisory switches indicate movement? ☐ Yes ☐ No ☐ N/A

B. Electrical waterflow alarm devices passed tests by opening the inspector's test connection or bypass connection with alarms actuating and flow observed? ☐ Yes ☐ No ☐ N/A

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FIGURE B.1(i) NFSA Form for Inspection, Testing, and Maintenance of Wet Pipe Fire Sprinkler Systems.

ROA_01557

3. Annual Tests (in addition to previous items)

A. Main drain test:
1. Record Static Pressure ____ psi and Residual Pressure ____ psi.
2. Was flow observed? ☐ Yes ☐ No ☐ N/A
3. Are results comparable to previous test? ☐ Yes ☐ No ☐ N/A

B. Are all sprinklers dated 1920 or later? ☐ Yes ☐ No ☐ N/A

C. Fast response sprinklers 20 or more years old replaced or successfully sample tested within last 10 years? ☐ Yes ☐ No ☐ N/A

D. Standard response sprinklers 50 or more years old replaced or successfully sample tested within last 10 years? ☐ Yes ☐ No ☐ N/A

E. Standard response sprinklers 75 or more years old replaced or successfully sample tested within last 5 years? ☐ Yes ☐ No ☐ N/A

F. Dry-type sprinklers replaced or successfully sample tested within last 10 years? ☐ Yes ☐ No ☐ N/A

G. Specific gravity of antifreeze correct? ☐ Yes ☐ No ☐ N/A

H. All control valves operated through full range and returned to normal position? ☐ Yes ☐ No ☐ N/A

I. Backflow devices passed backflow test? ☐ Yes ☐ No ☐ N/A

J. Backflow devices passed full flow test? ☐ Yes ☐ No ☐ N/A

K. Pressure reducing valves passed partial flow test? ☐ Yes ☐ No ☐ N/A

4. Test to be done every third year:

Hose (more than 5 years old) connected to the system has been service tested in accordance with NFPA 1962. Water discharged and water flow alarms operated? ☐ Yes ☐ No ☐ N/A

5. Tests to be done every fifth year.

A. Sprinklers rated above High temperature tested? ☐ Yes ☐ No ☐ N/A

B. Gages checked by calibrated gage or replaced? ☐ Yes ☐ No ☐ N/A

C. Pressure reducing valves passed full flow test? ☐ Yes ☐ No ☐ N/A

C. Maintenance

1. Regular Maintenance Items

A. If sprinklers have been [illegible] proper replacements? ☐ Yes ☐ No ☐ N/A

B. Used hose was cleaned, dried and dried before being placed back in service? Hose exposed to hazardous materials was disposed of or decontaminated in an approved manner? ☐ Yes ☐ No ☐ N/A

C. Systems normally filled with fresh water were drained and refilled twice if raw water got into the system? ☐ Yes ☐ No ☐ N/A

D. If any of the following were discovered, was an obstruction investigation conducted? ☐ Yes ☐ No ☐ N/A

Explain reason(s) and obstruction investigation findings in Part III.

1. Defective intake screen on pump with suction from open sources.
2. Obstructive material discharged during waterflow tests.
3. Foreign materials found in dry-pipe valves, check valves or pumps.
4. Foreign material in water during drain test or plugging of inspector's test connection.
5. Plugging of pipe or sprinklers found during activation or alteration.
6. Failure to flush yard piping or surrounding public mains following new installation or repairs.
7. Record of broken mains in the vicinity.
8. Abnormally frequent false-tripping of dry-pipe valves.
9. System is returned to service after an extended period out of service (greater than one year).
10. There is reason to believe the system contains sodium silicate or its derivatives or highly corrosive fluxes in copper pipe systems.

E. If conditions were found that required flushing, was flushing of system conducted? ☐ Yes ☐ No ☐ N/A

2. Annual Maintenance Items (in addition to previous items)

A. Operating stem of all OS&Y valves lubricated, completely closed, and reopened? ☐ Yes ☐ No ☐ N/A

D. Sprinklers and spray nozzles protecting commercial cooking equipment and ventilating systems replaced except for bulb-type which show no signs of grease buildup? ☐ Yes ☐ No ☐ N/A

Part III - Comments *(Any "No" answers, test failures or other problems found with the sprinkler system must be explained here. Also, note here any products noticed on the system that have been the subject of a recall or a replacement program.)*

Part IV - Inspector's Information

Inspector: _____

Company: _____

Company's Address: _____

I state that the information on this form is correct at the time and place of my inspection, and that all equipment tested at this time was left in operational condition upon completion of this inspection except as noted in Part III above.

Signature of Inspector: _____ Date: _____

License or Certification Number (if applicable): _____

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FIGURE B.1(i) *Continued*

Form for Inspection, Testing and Maintenance of Preaction and Deluge Fire Sprinkler Systems

Pre/Del

NATIONAL FIRE SPRINKLER ASSOCIATION, INC.

Information on this form covers the minimum requirements of NFPA 25-2002 for fire sprinkler systems connected to distribution systems without supplemental tanks or fire pumps. Separate forms are available to inspect, test and maintain fire pumps, water tanks and other fire protection systems. More frequent inspection, testing and maintenance may be necessary depending on the conditions of the occupancy and the water supply.

Owner: _____ Owner's Phone Number: _____

Owner's Address: _____

Property Being Evaluated: _____

Property Address: _____

Date of Work: _____ All responses refer to the current work (inspection, testing and maintenance) performed on this date.

This work is (*check one*): ☐ Monthly ☐ Quarterly ☐ Annual ☐ Third Year ☐ Fifth Year

Notes: 1) All questions are to be answered *Yes*, *No*, or *Not Applicable*. All *No* answers are to be explained in Part III of this form.
2) Inspection, Testing and Maintenance are to be performed with water supplies (including fire pumps) in service, unless the impairment procedures of Chapter 11 of NFPA 25 are followed.

Part I - Owner's Section

A. Is the building occupied? ☐ Yes ☐ No

B. Has the occupancy classification and hazard of contents remained the same since the last inspection? ☐ Yes ☐ No

C. Are all fire protection systems in service? ☐ Yes ☐ No

D. Has the system remained in service without modification since the last inspection? ☐ Yes ☐ No

E. Was the system free of actuation of devices or alarms since the last inspection? ☐ Yes ☐ No

Owner or representative (print name) Signature and Date

Part II - Inspector's Section

A. Inspections

1. Daily and Weekly Items

A. Control valves supervised with seals in correct (open or closed) position? ☐ Yes ☐ No ☐ N/A

B. Valve enclosures maintained at least 40°F? ☐ Yes ☐ No ☐ N/A

C. Gauges in good condition and showing normal air and water pressures? ☐ Yes ☐ No ☐ N/A

D. Backflow preventers:

1. In correct (open or closed) position? ☐ Yes ☐ No ☐ N/A
2. Sealed, locked or supervised & accessible? ☐ Yes ☐ No ☐ N/A
3. Relief port on RPZ device not discharging? ☐ Yes ☐ No ☐ N/A

E. For freezer systems, is the gage near the compressor reading the same as the gage near the preaction valve? ☐ Yes ☐ No ☐ N/A

4. Monthly Inspection Items (in addition to above items)

A. Control valves with locks or electrical supervision in correct (open or closed) position? ☐ Yes ☐ No ☐ N/A

B. Valves free from physical damage, trim valves in appropriate (open or closed) position, no leakage from valve seat, and all electrical components in service? ☐ Yes ☐ No ☐ N/A

C. Sprinkler wrench with spare sprinklers? ☐ Yes ☐ No ☐ N/A

5. Quarterly Inspection Items (in addition to above items)

A. Pressure Reducing Valves: In open position, not leaking, maintaining downstream pressure per design criteria, and in good condition with handwheels not broken? ☐ Yes ☐ No ☐ N/A

B. Hydraulic nameplate (calculated systems) securely attached to riser and legible? ☐ Yes ☐ No ☐ N/A

C. Fire Department Connections:

Visible, accessible, couplings and swivels not damaged and rotate smoothly, plugs or caps in place and undamaged, gaskets in place and in good condition, identification sign(s) in place, check valve is not leaking, clapper is in place and operating properly and automatic drain valve in place and operating properly? ☐ Yes ☐ No ☐ N/A

(If plugs or caps are not in place, inspect interior for obstructions.)

D. Alarm devices free from physical damage? ☐ Yes ☐ No ☐ N/A

6. Annual Inspection Items (in addition to above items)

A. Proper number and type of spare sprinklers? ☐ Yes ☐ No ☐ N/A

B. Visible sprinklers:

1. Free of corrosion and physical damage? ☐ Yes ☐ No ☐ N/A
2. Free of obstructions to spray patterns? ☐ Yes ☐ No ☐ N/A
3. Free of foreign materials including paint? ☐ Yes ☐ No ☐ N/A
4. Liquid in all glass bulb sprinklers? ☐ Yes ☐ No ☐ N/A

C. Visible pipe:

1. In good condition/no external corrosion? ☐ Yes ☐ No ☐ N/A
2. No mechanical damage and no leaks? ☐ Yes ☐ No ☐ N/A
3. Properly aligned and supported? ☐ Yes ☐ No ☐ N/A

D. Visible pipe hangers and seismic braces secure and not loose? ☐ Yes ☐ No ☐ N/A

E. [illegible] deluge valves operated to be sure they do not passed internal inspection? ☐ Yes ☐ No ☐ N/A

[illegible] be done during cold weather

1. Adequate heat in areas with wet piping? ☐ Yes ☐ No ☐ N/A
2. Low temperature alarms functioning? ☐ Yes ☐ No ☐ N/A
3. Pipe through freezers free of ice blockage? ☐ Yes ☐ No ☐ N/A

G. Has an internal inspection of the pipe been performed by removing the flushing connection and one sprinkler near the end of a branch line within the last 5 years? ☐ Yes ☐ No ☐ N/A

(If the answer was "No," conduct an internal inspection.)

8. Fifth Year Inspection Items (in addition to above items)

A. Check valves internally inspected and all parts operate properly, move freely and are in good condition? ☐ Yes ☐ No ☐ N/A

B. Strainers, filters, restricted orifices and diaphragm chambers passed internal inspection? ☐ Yes ☐ No ☐ N/A

C. Preaction and deluge valves that can be externally reset passed internal inspection? ☐ Yes ☐ No ☐ N/A

B. Testing

The following tests are to be performed at the noted intervals. Report any failures on Part III of this form.

1. Quarterly Tests

A. Mechanical waterflow alarm devices passed tests by opening the inspector's test connection or bypass connection with alarms actuating and flow observed? ☐ Yes ☐ No ☐ N/A

B. Post indicating valves opened until spring or torsion is felt in the rod, then closed back one-quarter turn? ☐ Yes ☐ No ☐ N/A

C. Is the priming level correct and has the low air pressure signal passed its test? ☐ Yes ☐ No ☐ N/A

D. Main drain test for system downstream of backflow or pressure reducing valve:

1. Record Static Pressure ____ psi and Residual Preasure ____ psi.
2. Was flow observed? ☐ Yes ☐ No ☐ N/A
3. Are results comparable to previous test? ☐ Yes ☐ No ☐ N/A

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FIGURE B.1(j) NFSA Form for Inspection, Testing, and Maintenance of Preaction and Deluge Fire Sprinkler Systems.

2. Semiannual Test (in addition to previous items)

A. Valve supervisory switches indicate movement? ☐ Yes ☐ No ☐ N/A

B. Electrical waterflow alarm devices passed tests by opening the inspector's test connection or bypass connection with alarms actuating and flow observed? ☐ Yes ☐ No ☐ N/A

3. Annual Tests (in addition to previous items)

A. Main drain test:

1. Record Static Pressure ____psi and Residual Pressure ____ psi.
2. Was flow observed? ☐ Yes ☐ No ☐ N/A
3. Are results comparable to previous test? ☐ Yes ☐ No ☐ N/A

B. Are all sprinklers dated 1920 or later? ☐ Yes ☐ No ☐ N/A

C. Fast response sprinklers 20 or more years old replaced or successfully sample tested within last 10 years? ☐ Yes ☐ No ☐ N/A

D. Standard response sprinklers 50 or more years old replaced or successfully sample tested within last 10 years? ☐ Yes ☐ No ☐ N/A

E. Standard response sprinklers 75 or more years old replaced or successfully sample tested within last 5 years? ☐ Yes ☐ No ☐ N/A

F. Dry-type sprinklers replaced or successfully sample tested within last 10 years? ☐ Yes ☐ No ☐ N/A

G. All control valves operated through full range and returned to normal position? ☐ Yes ☐ No ☐ N/A

H. Low temperature alarms passed test? ☐ Yes ☐ No ☐ N/A

I. Full flow trip test: *(Not required where water can't be discharged)*
(Test all systems together that will operate simultaneously.)

1. Discharge from all nozzles unimpeded? ☐ Yes ☐ No ☐ N/A
2. Pressure reading at hydraulically most remote nozzle _____psi.
3. Residual pressure reading at valve _____ psi.
4. Above readings comparable to design values? ☐ Yes ☐ No ☐ N/A
5. Manual activation devices passed test? ☐ Yes ☐ No ☐ N/A

J. Automatic air maintenance devices on dry-pipe and preaction systems passed test? ☐ Yes ☐ No ☐ N/A

K. Backflow devices passed [illegible] test? ☐ Yes ☐ No ☐ N/A

L. Backflow devices passed full flow test? ☐ Yes ☐ No ☐ N/A

M. Pressure reducing valves passed full flow test? ☐ Yes ☐ No ☐ N/A

4. Tests to be done every fifth year.

A. Sprinklers rated above High temperature tested? ☐ Yes ☐ No ☐ N/A

B. Gages checked by calibrated gage or replaced? ☐ Yes ☐ No ☐ N/A

C. Pressure reducing valves passed full flow test? ☐ Yes ☐ No ☐ N/A

C. Maintenance

1. Regular Maintenance Items

A. If sprinklers have been replaced, were they proper replacements? ☐ Yes ☐ No ☐ N/A

B. Have low point drains been emptied? ☐ Yes ☐ No ☐ N/A

C. If any of the following were discovered, was an obstruction investigation conducted? ☐ Yes ☐ No ☐ N/A

Explain reason(s) and obstruction investigation findings in Part III.

1. Defective intake screen on pump with suction from open sources.
2. Obstructive material discharged during waterflow tests.
3. Foreign materials found in dry-pipe valves, check valves or pumps.
4. Foreign material in water during drain test or plugging of inspector's test connection.
5. Plugging of pipe or sprinklers found during activation or alteration.
6. Failure to flush yard piping or surrounding public mains following new installation or repairs.
7. Record of broken mains in the vicinity.
8. Abnormally frequent false-tripping of dry-pipe valves.
9. System is returned to service after an extended period out of service (greater than one year).
10. There is reason to believe the system contains sodium silicate or its derivatives or highly corrosive fluxes in copper pipe systems.

D. If conditions were found that required flushing, was flushing of system conducted? ☐ Yes ☐ No ☐ N/A

2. Annual Maintenance Items (in addition to previous items)

A. Operating stem of all OS&Y valves lubricated, completely closed, and reopened? ☐ Yes ☐ No ☐ N/A

B. Low points drained prior to the onset of freezing weather? ☐ Yes ☐ No ☐ N/A

C. Sprinklers and spray nozzles protecting commercial cooking equipment and ventilating systems replaced except for bulb-type which show no signs of grease buildup? ☐ Yes ☐ No ☐ N/A

Part III - Comments *(Any "No" answers, test failures or other problems found with the sprinkler system must be explained here. Also, note here any products noticed on the system that have been the subject of a recall or a replacement program.)*

Part IV - Inspector's Information

Inspector: _____

Company: _____

Company's Address: _____

I state that the information on this form is correct at the time and place of my inspection, and that all equipment tested at this time was left in operational condition upon completion of this inspection except as noted in Part III above.

Signature of Inspector: _____ Date: _____

License or Certification Number (if applicable): _____

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FIGURE B.1(j) *Continued*

OBH - O&M 422

ROA_01560

Form for Inspection, Testing and Maintenance of Standpipe and Hose Systems

NATIONAL FIRE SPRINKLER ASSOCIATION, INC.

Information on this form covers the minimum requirements of NFPA 25-2002 for standpipe and hose systems. Where the standpipe system includes a fire pump or water tank, an additional form must be completed for inspection, testing and maintenance of the pump or tank. Forms are also available for fire sprinkler systems, private fire service mains, water spray fixed systems and foam-water sprinkler systems. More frequent inspection, testing and maintenance may be necessary depending on the conditions of the occupancy and the water supply.

Owner: _____ Owner's Phone Number: _____

Owner's Address: _____

Property Being Evaluated: _____

Property Address: _____

Date of Work: _____ All responses refer to the current work (inspection, testing and maintenance) performed on this date.

This work is (*check one*): ☐ Monthly ☐ Quarterly ☐ Semiannual ☐ Annual ☐ Third Year ☐ Fifth Year

Notes: 1) All questions are to be answered *Yes*, *No*, or *Not Applicable*. All "No" answers are to be explained in the comments portion of this form.
2) Inspection, Testing and Maintenance are to be performed with water supplies (including fire pumps) in service, unless the impairment procedures of Chapter 11 of NFPA 25 are followed.

Part I - Owner's Section

A. Is the building occupied? ☐ Yes ☐ No

B. Has the occupancy classification and hazard of contents remained the same since the last inspection? ☐ Yes ☐ No

C. Are all fire protection systems in service? ☐ Yes ☐ No

D. Has the system remained in service without modification since the last inspection? ☐ Yes ☐ No

E. Was the system free of actuation of devices or alarms since the last inspection? ☐ Yes ☐ No

Owner or representative (print name) _____ Signature and Date _____

Part II - Inspector's Section

A. Inspections

1. Daily and Weekly Inspection Items

A. Enclosures around dry-pipe valves (without low temperature alarms) maintaining a minimum of 40°F? ☐ Yes ☐ No ☐ N/A

B. Relief port on reduced pressure backflow [illegible] not continuously discharging? ☐ Yes ☐ No ☐ N/A

C. Gauges on dry system ([illegible] showing normal air and [illegible] pressure? ☐ Yes ☐ No ☐ N/A

D. Sealed control valves and [illegible] normal (open or closed) position, [illegible] with seals in place, free from external leaks, [illegible] with appropriate identification? ☐ Yes ☐ No ☐ N/A

2. Monthly Inspection Items (in addition to above items)

A. Dry-Pipe Valves:
Enclosures around valves (with low temperature alarms) maintaining a minimum of 40°F, free from physical damage, trim valves in appropriate (open or closed) position, and no leakage from intermediate chamber? ☐ Yes ☐ No ☐ N/A

B. Pressure Reducing Valves (Hose Connection):
1. Handwheels in place and in good condition? ☐ Yes ☐ No ☐ N/A
2. Hose threads in good condition? ☐ Yes ☐ No ☐ N/A
3. Valves not leaking? ☐ Yes ☐ No ☐ N/A
4. Reducers and caps in place & in good condition? ☐ Yes ☐ No ☐ N/A

C. Pressure Reducing Valves (Hose Rack):
1. Handwheels in place and in good condition? ☐ Yes ☐ No ☐ N/A
2. Valves not leaking? ☐ Yes ☐ No ☐ N/A

D. Gauges (on dry system with low pressure alarm or on wet system) in good condition and showing normal air and water pressure? ☐ Yes ☐ No ☐ N/A

E. Control Valves and Valves on Backflow Assemblies (with locks or electric supervision) in normal (open or closed) position with locks or supervision in place, accessible, free from external leaks, provided with appropriate wrenches, and provided with appropriate identification? ☐ Yes ☐ No ☐ N/A

F. Alarm devices free from physical damage? ☐ Yes ☐ No ☐ N/A

G. Alarm Valves free from physical damage, valves in correct (open or closed) position, no leakage from retard chamber or drains, gauges indicating normal water pressure? ☐ Yes ☐ No ☐ N/A

4. Quarterly Inspection Items (in addition to above items)

A. Hose Valve Outlets:
Valves not leaking and no visible obstructions with caps, hose connections, valve handle, cap gasket, restricting devices in place, undamaged and in good condition? ☐ Yes ☐ No ☐ N/A

B. Visible pipe and supports in good condition? ☐ Yes ☐ No ☐ N/A

C. Alarm devices free from physical damage? ☐ Yes ☐ No ☐ N/A

D. Fire Department Connections:
Visible, accessible, couplings and swivels not damaged and rotate smoothly, plugs or caps in place and undamaged, gaskets in place and in good condition, identification sign(s) in place, check valve [illegible] clapper is in place and operating properly and [illegible] drain valve in place and operating properly? ☐ Yes ☐ No ☐ N/A

[illegible] *are not in* [illegible] *interior for obstructions.)*

[illegible] Hose (in addition to above items)
[illegible] free [illegible] cuts and deterioration, couplings [illegible] compatible threads and undamaged, gaskets in place [illegible] in good condition, and hose connected? ☐ Yes ☐ No ☐ N/A

B. Hose Nozzles:
1. Nozzles and gaskets in place and good condition? ☐ Yes ☐ No ☐ N/A
2. No visible obstructions? ☐ Yes ☐ No ☐ N/A
3. Nozzles operate smoothly? ☐ Yes ☐ No ☐ N/A

C. Hose Storage Devices:
1. Hose properly racked or rolled? ☐ Yes ☐ No ☐ N/A
2. Nozzle clips in place and nozzles contained? ☐ Yes ☐ No ☐ N/A
3. Undamaged, unobstructed and operable? ☐ Yes ☐ No ☐ N/A
4. Will racks swing out of cabinet at least 90°? ☐ Yes ☐ No ☐ N/A

D. Storage Cabinets:
1. Cabinets have no corroded or damaged parts, are easy to fully open, and are accessible and identified? ☐ Yes ☐ No ☐ N/A
2. Door glazings in good condition? ☐ Yes ☐ No ☐ N/A
3. Locks functioning in break-glass type cabinets? ☐ Yes ☐ No ☐ N/A
4. All parts, valves, hoses and fire extinguishers accessible? ☐ Yes ☐ No ☐ N/A

E. Adequate heat available to areas where wet pipe is located? *(Must be done before cold weather)* ☐ Yes ☐ No ☐ N/A

F. Interior of dry-pipe valves (which must be open to be reset) passed internal inspection? ☐ Yes ☐ No ☐ N/A

6. Fifth Year Inspection Items (in addition to previous items)

A. Interior of dry-pipe valves (which can be reset without opening) passed internal inspection? ☐ Yes ☐ No ☐ N/A

B. Alarm valves and their associated strainers, filters and restriction orifices passed internal inspection? ☐ Yes ☐ No ☐ N/A

C. Check valves internally inspected and all parts operate properly, move freely and are in good condition? ☐ Yes ☐ No ☐ N/A

D. Strainers, filters, restricted orifices and diaphragm chambers on dry-pipe valves passed internal inspection? ☐ Yes ☐ No ☐ N/A

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FIGURE B.1(k) NFSA Form for Inspection, Testing, and Maintenance of Standpipe and Hose Systems.

ROA_01561

B. Testing

The following tests are to be performed at the noted intervals. Report any failures on Part III of this form.

1. Quarterly Tests

A. Mechanical waterflow alarm devices passed tests by opening the inspector's test connection or bypass connection with alarms actuating and flow observed? ☐ Yes ☐ No ☐ N/A

B. Post indicator valves opened until spring or torsion is felt in the rod, then closed back one quarter turn? ☐ Yes ☐ No ☐ N/A

C. Priming water level (dry-pipe) passed test? ☐ Yes ☐ No ☐ N/A

D. Low air pressure signal (dry-pipe) passed test? ☐ Yes ☐ No ☐ N/A

E. Quick opening device passed test? ☐ Yes ☐ No ☐ N/A

F. Main Drain Test for system downstream of backflow or pressure reducing valve (automatic water supply):

1. Record static pressure _____ psi and residual pressure _____ psi.
2. Was flow observed? ☐ Yes ☐ No ☐ N/A
3. Are results comparable to previous test? ☐ Yes ☐ No ☐ N/A

2. Semiannual Test (in addition to above items)

A. Electrical waterflow alarm devices passed tests by opening the inspector's test connection or bypass connection with alarms actuating and flow observed? ☐ Yes ☐ No ☐ N/A

B. Valve supervisory devices indicate movement? ☐ Yes ☐ No ☐ N/A

3. Annual Tests (in addition to above items)

A. System Main Drain Test (automatic water supply)

1. Record static pressure _____ psi and residual pressure _____ psi.
2. Was flow observed? ☐ Yes ☐ No ☐ N/A
3. Are results comparable to previous test? ☐ Yes ☐ No ☐ N/A

B. Specific gravity of antifreeze correct? ☐ Yes ☐ No ☐ N/A

C. All control valves operated through full range and returned to normal position? ☐ Yes ☐ No ☐ N/A

D. Low temperature alarms in dry-pipe enclosures passed test? ☐ Yes ☐ No ☐ N/A

E. Dry-pipe valve partial flow trip test:

1. Record initial air pressure _____ psi and water pressure _____ psi.
2. Record tripping air pressure _____ psi and time _____ (sec).
3. Above results comparable to previous tests? ☐ Yes ☐ No ☐ N/A

F. Automatic air maintenance devices on dry-pipe system passed test? ☐ Yes ☐ No ☐ N/A

G. Backflow devices passed backflow test? ☐ Yes ☐ No ☐ N/A

H. Backflow devices passed full flow test? ☐ Yes ☐ No ☐ N/A

I. Pressure reducing valves passed partial flow test? ☐ Yes ☐ No ☐ N/A

4. Third Year Tests (in addition to above items)

A. Dry-Pipe Valve Full Flow Trip Test:

1. Record initial air pressure _____ psi and water pressure _____ psi.
2. Record tripping air pressure _____ psi and tripping time _____ (sec).
3. Was water delivered to inspectors test connection? ☐ Yes ☐ No ☐ N/A
4. Above results comparable to previous tests? ☐ Yes ☐ No ☐ N/A

B. Is hose less than five years old? ☐ Yes ☐ No ☐ N/A

If "no," has hose been tested within three years? ☐ Yes ☐ No ☐ N/A

If "no," test hose now and every three years.

5. Fifth Year Tests

A. Gauges tested against calibrated one or replaced? ☐ Yes ☐ No ☐ N/A

B. Automatic standpipe systems tested at required flows:

1. Record static pressure _____ psi and residual pressure _____ psi.
2. Record total flow _____ gpm.
3. Above flows and pressures acceptable? ☐ Yes ☐ No ☐ N/A

C. Manual systems not a part of a sprinkler/standpipe system passed hydrostatic test? ☐ Yes ☐ No ☐ N/A

D. All hose connection and hose rack assembly pressure reducing and valves passed full flow test? ☐ Yes ☐ No ☐ N/A

C. Maintenance

1. Regular Maintenance Items

A. Items found missing or in disrepair during inspection or testing repaired or replaced? ☐ Yes ☐ No ☐ N/A

B. Air leaks in dry-pipe systems resulting in air pressure loss more than 10 psi/week repaired? ☐ Yes ☐ No ☐ N/A

C. Dry systems being maintained in dry condition? ☐ Yes ☐ No ☐ N/A

D. If any of the following were discovered, was an obstruction investigation conducted? ☐ Yes ☐ No ☐ N/A

Explain reason(s) and obstruction investigation findings in Part III.

1. Defective intake screen for pumps taking suction from open sources.
2. Obstructive material discharged during waterflow test.
3. Foreign materials found in dry-pipe valves, check valves or pumps.
4. Heavy discoloration of water during drain test or plugging of inspector's test connection.
5. Plugging found in piping dismantled during alterations.
6. Failure to flush yard piping or surrounding public mains following new installation or repairs.
7. Record of broken mains in the vicinity.
8. Abnormally frequent false tripping of dry-pipe valves.
9. System is returned to service after an extended period out of service (greater than one year).
10. There is reason to believe the system contains sodium silicate or its derivatives.

E. If conditions were found that required flushing, was flushing program conducted? ☐ Yes ☐ No ☐ N/A

2. Annual Maintenance Items (in addition to above items)

A. Lubrication of all O.S.&Y. valves lubricated, cycled, and returned? ☐ Yes ☐ No ☐ N/A

B. Gaskets replaced, if needed? Records do not indicate in sample tested? ☐ Yes ☐ No ☐ N/A

C. Interior of dry-pipe valves cleaned? ☐ Yes ☐ No ☐ N/A

D. Low points drained in dry systems prior to onset of freezing weather? ☐ Yes ☐ No ☐ N/A

Part III - Comments *(Any "No" answers, test failures or other problems found with the standpipe and hose system must be explained here.)*

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Part IV - Inspector's Information

Inspector: _____

Company: _____

Company's Address: _____

I state that the information on this form is correct at the time and place of my inspection, and that all equipment tested at this time was left in operational condition upon completion of this inspection except as noted in Part III above.

Signature of Inspector: _____ Date: _____

License or Certification Number (if applicable): _____

SAMPLE

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FIGURE B.1(k) *Continued*

OBH - O&M 424

ROA_01562

Form for Inspection, Testing and Maintenance of Private Fire Service Mains

NATIONAL FIRE SPRINKLER ASSOCIATION, INC.

Information on this form covers the minimum requirements of NFPA 25-2002 for Private Fire Service Mains. Separate forms are available to inspect, test and maintain other portions of the fire protection system of which the private fire service main is a part. More frequent inspection, testing and maintenance may be necessary depending on conditions of the occupancy and water supply.

Owner: _____ Owner's Phone Number: _____

Owner's Address: _____

Property Being Evaluated: _____

Property Address: _____

Date of Work: _____ All responses refer to the current work (inspection, testing and maintenance) performed on this date.

This inspection is *(check one)*: ☐ Monthly ☐ Quarterly ☐ Semiannual ☐ Annual ☐ Fifth Year

Notes: 1) All questions are to be answered *Yes*, *No* or *Not Applicable*. All *No* answers are to be explained in the comments portion of this form.
2) Inspection, Testing and Maintenance are to be performed with water supplies (including fire pumps) in service, unless the impairment procedures of Chapter 11 of NFPA 25 are followed.

Part I - Owner's Section

A. Is the private fire service main in service? ☐ Yes ☐ No
B. Remained in service since the last inspection? ☐ Yes ☐ No
C. Were the systems supplied by the fire main free from actuation of devices or alarms since the last inspection? ☐ Yes ☐ No

_____ _____
Owner or representative (print name) Signature and Date

Part II - Inspector's Section

A. Inspection

1. Weekly Inspection Items

a. Relief port on reduced pressure backflow prevention assemblies free of continuous discharge? ☐ Yes ☐ No ☐ N/A
b. Sealed control valves & valves on backflow assemblies:
1. In normal (open or closed) position? ☐ Yes ☐ No ☐ N/A
2. Accessible with seals in place? ☐ Yes ☐ No ☐ N/A
3. Free from external leaks? ☐ Yes ☐ No ☐ N/A
4. Provided with appropriate identification? ☐ Yes ☐ No ☐ N/A

2. Monthly Inspection Item (in addition to above items)
Control valves and valves on backflow assemblies with locks or electric supervision):
In normal (open or closed) position, lock or electric supervision in place, accessible, free from external leaks, provided with appropriate identification? ☐ Yes ☐ No ☐ N/A

3. Quarterly Inspection Item (in addition to above items)
Hose/hydrant houses accessible, free from physical damage and fully equipped? ☐ Yes ☐ No ☐ N/A

4. Semiannual Inspection Item (in addition to above items)
Monitor nozzles free of leaks, damage & corrosion? ☐ Yes ☐ No ☐ N/A

5. Annual Inspection Items (in addition to above items)

a. Dry Barrel and Wall Hydrants:
1. Accessible and operating wrench available? ☐ Yes ☐ No ☐ N/A
2. Outlets lubricated? ☐ Yes ☐ No ☐ N/A
3. Free from ice or water in barrel? ☐ Yes ☐ No ☐ N/A
4. Free from leaks and cracks? ☐ Yes ☐ No ☐ N/A
5. Threads in good condition? ☐ Yes ☐ No ☐ N/A
6. Operating nut in good condition? ☐ Yes ☐ No ☐ N/A
b. Wet Barrel Hydrants:
1. Accessible and operating wrench available? ☐ Yes ☐ No ☐ N/A
2. Free from leaks at outlets and top of hydrant? ☐ Yes ☐ No ☐ N/A
3. Free from cracks in hydrant barrel? ☐ Yes ☐ No ☐ N/A
4. Outlets lubricated? ☐ Yes ☐ No ☐ N/A
5. Threads in good condition? ☐ Yes ☐ No ☐ N/A
6. Operating nut in good condition? ☐ Yes ☐ No ☐ N/A
c. Mainline strainers free from plugging and corrosion? ☐ Yes ☐ No ☐ N/A
d. Exposed piping is free from leaks, physical damage and corrosion? ☐ Yes ☐ No ☐ N/A
e. Exposed piping is properly restrained? ☐ Yes ☐ No ☐ N/A

6. Fifth Year Inspection Item (in addition to above items)
Check valves internally inspected and all parts operate properly, move freely and are in good condition? ☐ Yes ☐ No ☐ N/A

B. Testing

1. Quarterly Test
Post indicator valves opened until spring or torsion is felt in rod, then closed back one quarter turn? ☐ Yes ☐ No ☐ N/A

2. Semiannual Test (in addition to the above items)
Valve supervisory devices indicate movement? ☐ Yes ☐ No ☐ N/A

3. Annual Tests (in addition to the above items)
a. Monitor nozzles move through full range? ☐ Yes ☐ No ☐ N/A
b. Monitor nozzles flowed an acceptable amount of water? ☐ Yes ☐ No ☐ N/A
c. Hydrants flowed until clear (at least 1 minute)? ☐ Yes ☐ No ☐ N/A
d. Dry barrel hydrants drain in at least one hour? ☐ Yes ☐ No ☐ N/A
e. Dry barrel hydrants requiring pumping are identified? ☐ Yes ☐ No ☐ N/A
f. All control valves operated through full range and returned to normal position? ☐ Yes ☐ No ☐ N/A
g. Backflow devices passed [illegible] test? ☐ Yes ☐ No ☐ N/A
[illegible] devices passed [illegible] flow test? ☐ Yes ☐ No ☐ N/A
[illegible] Tests: Exposed [illegible] ground [illegible] tested at least at expected flows? ☐ Yes ☐ No ☐ N/A

C. Maintenance

1. Annual Maintenance Items
a. Mainline strainers cleaned? ☐ Yes ☐ No ☐ N/A
b. Hose/hydrant houses and equipment in usable condition? ☐ Yes ☐ No ☐ N/A
c. Hydrant caps, stems, plugs, and threads lubricated? ☐ Yes ☐ No ☐ N/A
d. Hydrants free of ice, snow and damage? ☐ Yes ☐ No ☐ N/A
e. Monitor nozzles are lubricated? ☐ Yes ☐ No ☐ N/A

Part III - Comments *(any "No" answers, test failures or other problems found with the system must be explained here)*

_____
_____
_____
_____
_____
_____
_____

Part IV - Inspector's Information

I state that the information on this form is correct at the time and place of my inspection and that all equipment tested at this time was left in operational condition upon completion of this inspection except as noted in Part III above.

Inspector: _____
Company: _____
Company Address: _____

Signature of Inspector: _____ Date: _____
License or Certification Number (if applicable): _____

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SAMPLE

FIGURE B.1(l) NFSA Form for Inspection, Testing, and Maintenance of Private Fire Service Mains.

OBH - O&M 425

ROA_01563

Form for Inspection, Testing and Maintenance of Fire Pumps

NATIONAL FIRE SPRINKLER ASSOCIATION, INC.

Information on this form covers the minimum requirements of NFPA 25-2002 for centrifugal fire pumps.

Separate forms are available to inspect, test and maintain the rest of the fire protection system of which the fire pump is a part. More frequent inspection, testing and maintenance may be necessary depending on the conditions of the occupancy and water supply.

Owner: _____ Owner's Phone Number: _____

Owner's Address: _____

Property Being Evaluated: _____

Property Address: _____

Date of Work: _____ All responses refer to the current work (inspection, testing and maintenance) performed on this date.

This inspection is (*check one*): ☐ Weekly ☐ Monthly ☐ Quarterly ☐ Semiannual ☐ Annual

Notes: 1) All questions are to be answered *Yes*, *No*, or *Not Applicable*. All *No* answers are to be explained in the comments portion of this form.
2) Inspection, Testing and Maintenance are to be performed with water supplies (including fire pumps) in service, unless the impairment procedures of Chapter 11 of NFPA 25 are followed.

Part I - Owner's Section

A. Is the fire pump in service? ☐ Yes ☐ No ☐ N/A

B. Has the fire pump remained in service since the last inspection? ☐ Yes ☐ No ☐ N/A

C. Was the system (of which the fire pump is a part) free from actuation of devices or alarms since the last inspection? ☐ Yes ☐ No ☐ N/A

Note to owner: Periodic tests of transfer switches and emergency generators are to be performed in accordance with NFPA 110 by a qualified electrical contractor.

Owner or representative (print name) _____ Signature and Date _____

Part II - Inspector's Section

A. Inspections - All to be performed weekly.

1. Pump house/room proper temperature (at least 70° F for diesels without engine heaters or 40° F for others)? ☐ Yes ☐ No ☐ N/A
2. Ventilating louvers free to operate? ☐ Yes ☐ No ☐ N/A
3. Suction, discharge and bypass valves open? ☐ Yes ☐ No ☐ N/A
4. Piping free from leaks? ☐ Yes ☐ No ☐ N/A
5. Suction and system pressure gauges normal? ☐ Yes ☐ No ☐ N/A
6. Suction reservoir, if provided, full? ☐ Yes ☐ No ☐ N/A
7. Electric Motor Driven Pumps
   a. Controller indicating power on, transfer switch indicating normal situation and isolation switch closed? ☐ Yes ☐ No ☐ N/A
   b. Reverse phase alarm indicator off or normal phase rotation indicator on? ☐ Yes ☐ No ☐ N/A
   c. Oil level in vertical motor sight normal? ☐ Yes ☐ No ☐ N/A
8. Diesel Engine Driven Pumps
   a. Fuel tank at least two thirds full? ☐ Yes ☐ No ☐ N/A
   b. Controller selector switch in Auto position? ☐ Yes ☐ No ☐ N/A
   c. Battery voltage and charger readings normal? ☐ Yes ☐ No ☐ N/A
   d. Battery indicators on or failure indicators off? ☐ Yes ☐ No ☐ N/A
   e. All alarm indicators off? ☐ Yes ☐ No ☐ N/A
   f. Record engine running time meter reading. _____ Is this appropriately higher than previous reading? ☐ Yes ☐ No ☐ N/A
   g. Oil level in right angle gear drive normal? ☐ Yes ☐ No ☐ N/A
   h. Crankcase oil level normal? ☐ Yes ☐ No ☐ N/A
   i. Cooling water level normal? ☐ Yes ☐ No ☐ N/A
   j. Electrolyte level in batteries normal? ☐ Yes ☐ No ☐ N/A
   k. Battery terminals free from corrosion? ☐ Yes ☐ No ☐ N/A
   l. Water-jacket heater operating? ☐ Yes ☐ No ☐ N/A
9. Steam pressure gauge for steam driven pump reading normal? ☐ Yes ☐ No ☐ N/A
10. Circulation relief valve flowing water while pump churns? ☐ Yes ☐ No ☐ N/A
11. Pressure relief valves operating with proper pressure downstream while pump is operational? ☐ Yes ☐ No ☐ N/A

B. Tests

1. Weekly Test Items

A. Electric Motor-Driven Pumps
1. Pump started automatically? ☐ Yes ☐ No ☐ N/A
   Record starting pressure. _____ psi.
2. Pump run for at least 10 minutes? ☐ Yes ☐ No ☐ N/A
   Record suction _____ and discharge _____ pressure while running.
3. Pump packing gland showing slight discharge? *Adjust if necessary.* ☐ Yes ☐ No ☐ N/A
4. Free from unusual noises or vibrations? ☐ Yes ☐ No ☐ N/A
5. Packing boxes, bearings and pump casing free from overheating? ☐ Yes ☐ No ☐ N/A
6. Record time for motor to come up to full speed. _____
   For reduced voltage or reduced current starting, record time controller is on first step. _____
   For autotransformer controllers, record time pump runs after starting. _____
7. All times and pressures in Part A acceptable? ☐ Yes ☐ No ☐ N/A

B. Diesel Engine-Driven Pumps
1. Pump started automatically? ☐ Yes ☐ No ☐ N/A
   Record starting pressure. _____ psi.
2. Pump run for at least 30 minutes? ☐ Yes ☐ No ☐ N/A
   Record suction _____ and discharge _____ pressure while running.
3. Pump packing gland showing slight discharge? ☐ Yes ☐ No ☐ N/A
   Adjust if necessary.
4. Free from unusual noises or vibrations? ☐ Yes ☐ No ☐ N/A
5. Packing boxes, bearings and pump casing free from overheating? ☐ Yes ☐ No ☐ N/A
6. Record time for engine to crank. _____
7. Record time for engine to reach running speed. _____
8. Engine oil pressure gauge, speed indicator, water and oil temperature indicators all reading normal? ☐ Yes ☐ No ☐ N/A
9. Cooling water flowing from heat exchanger? ☐ Yes ☐ No ☐ N/A
10. All times and pressures in Part B acceptable? ☐ Yes ☐ No ☐ N/A

C. Steam Turbine-driven Pumps
1. Record pump starting pressure _____, suction _____ and discharge _____ pressures while running.
3. Pump packing gland showing slight discharge? ☐ Yes ☐ No ☐ N/A
   Adjust if necessary.
4. Free from unusual noises or vibrations? ☐ Yes ☐ No ☐ N/A
5. Packing boxes, bearings and pump casing free from overheating? ☐ Yes ☐ No ☐ N/A
6. Record steam pressure gauge reading. _____
7. Record time for turbine to reach running speed. _____
8. All times and pressures in Part C acceptable? ☐ Yes ☐ No ☐ N/A

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FIGURE B.1(m) NFSA Form for Inspection, Testing, and Maintenance of Fire Pumps.

ROA_01564

2. Annual Tests

Annual pump test was run using the following method: (*check one*)

☐ Method A. Discharge of flow through hose streams. Flow readings taken at each hose stream.

☐ Method B. Discharge through by-pass flow meter to drain or suction reservoir. Flow readings taken by flow meter.

☐ Method C. Discharge through by-pass flow meter directly returned to pump suction. Flow readings taken by flow meter.

Note: At least once every three years method A or B must be used.

Pump Test Results

	No Flow	Rated Flow	Peak Flow
Suction Pressure			
Discharge Pressure			
Flow	N/A		
Electric Voltage and Current	N/A		
Pump Speed			

A. Are the values in the above table acceptable? ☐ Yes ☐ No ☐ N/A

B. No-flow (churn) test run for 30 min? ☐ Yes ☐ No ☐ N/A

C. Circulation relief valve and pressure relief valve operated properly during all flow tests? ☐ Yes ☐ No ☐ N/A

D. No alarm indicators or other visible abnormalities observed during no flow test? ☐ Yes ☐ No ☐ N/A

E. Suction screens cleaned after flow? ☐ Yes ☐ No ☐ N/A

F. Low Suction Throttling Device

1. Low suction pressure alarm tested? ☐ Yes ☐ No ☐ N/A
   Free from abnormalities during operation? ☐ Yes ☐ No ☐ N/A
2. Free from abnormalities in return to full flow? ☐ Yes ☐ No ☐ N/A

G. Automatic Transfer Switch

1. Power failure simulated during peak flow? ☐ Yes ☐ No ☐ N/A
   Connection made to alternate power source? ☐ Yes ☐ No ☐ N/A
2. After termination of simulated power failure did motor reconnect to the normal power source? ☐ Yes ☐ No ☐ N/A

H. All alarm conditions simulated? ☐ Yes ☐ No ☐ N/A
   All alarms operated? ☐ Yes ☐ No ☐ N/A

C. Maintenance

A maintenance schedule must be established in accordance with the manufacturer's instructions. In the absence of such a schedule, the following must be used:

1. Weekly Maintenance Items for Diesel Engine Systems:

A. Fuel tank level, tank float switch, and solenoid valve operation acceptable? ☐ Yes ☐ No ☐ N/A

B. Diesel fuel system free of water? ☐ Yes ☐ No ☐ N/A

C. Flexible hoses and connectors in fuel and coolant systems acceptable? ☐ Yes ☐ No ☐ N/A

D. Oil level and lube oil heater acceptable? ☐ Yes ☐ No ☐ N/A

E. Coolant level acceptable? ☐ Yes ☐ No ☐ N/A

F. Water pump for coolant system operating? ☐ Yes ☐ No ☐ N/A

G. Jacket water heater for coolant system acceptable? ☐ Yes ☐ No ☐ N/A

H. Exhaust system free of leakage? ☐ Yes ☐ No ☐ N/A

I. Drain condensate trap on exhaust system operational? ☐ Yes ☐ No ☐ N/A

J. Electrolyte level in batteries acceptable? ☐ Yes ☐ No ☐ N/A

K. Connections to electrical system acceptable? ☐ Yes ☐ No ☐ N/A

2. Monthly Maintenance Items

A. Isolation switch and circuit breaker exercised? ☐ Yes ☐ No ☐ N/A

B. Battery case clean, dry and free of corrosion and battery's specific gravity or state of charge passed test? ☐ Yes ☐ No ☐ N/A

C. Charger and charge rate passed visual inspection and battery charge being equalized? ☐ Yes ☐ No ☐ N/A

D. Circuit breakers appear clean? ☐ Yes ☐ No ☐ N/A

3. Quarterly Maintenance Items

A. Cleaned strainer, filter or dirt leg in diesel fuel system? ☐ Yes ☐ No ☐ N/A

B. Cleaned or replaced crank case breather in lubrication system? ☐ Yes ☐ No ☐ N/A

C. Cleaned water strainer in coolant system? ☐ Yes ☐ No ☐ N/A

D. Insulation acceptable and fire hazards eliminated from exhaust system? ☐ Yes ☐ No ☐ N/A

E. Battery terminals clean and tight? ☐ Yes ☐ No ☐ N/A

F. Electrical system free of wire chafing? ☐ Yes ☐ No ☐ N/A

4. Semiannual Maintenance Items

A. Manual starting means on electrical systems operated and doors, panels and cabinets cleaned? ☐ Yes ☐ No ☐ N/A

B. Antifreeze tested in coolant system? ☐ Yes ☐ No ☐ N/A

C. Flexible exhaust section acceptable? ☐ Yes ☐ No ☐ N/A

D. Alarms operated on electrical portions of diesel engine systems? ☐ Yes ☐ No ☐ N/A

5. Annual Maintenance Items

A. Changed pump bearing lubrication? ☐ Yes ☐ No ☐ N/A

B. Shaft end play acceptable? ☐ Yes ☐ No ☐ N/A

C. Transmission coupling [illegible] gear drive [illegible] moving parts lubricated? ☐ Yes ☐ No ☐ N/A

[illegible] passed [illegible]? ☐ Yes ☐ No ☐ N/A

[illegible] means operated without power? ☐ Yes ☐ No ☐ N/A

[illegible]lectrical connections secure? ☐ Yes ☐ No ☐ N/A

[illegible] Pressure switch settings calibrated? ☐ Yes ☐ No ☐ N/A

H. Motor bearings greased? ☐ Yes ☐ No ☐ N/A

I. Fuel tank free of water and foreign material, tank vents and overflow pipes free of obstructions, fuel piping acceptable, and oil and filters changed in diesel systems? ☐ Yes ☐ No ☐ N/A

J. Antifreeze changed in coolant system? ☐ Yes ☐ No ☐ N/A

K. Heater exchanger cleaned out? ☐ Yes ☐ No ☐ N/A

L. Duct work and louvers (combustion air) acceptable? ☐ Yes ☐ No ☐ N/A

M. Exhaust system free of back pressure? ☐ Yes ☐ No ☐ N/A

N. Exhaust system hangers and supports acceptable? ☐ Yes ☐ No ☐ N/A

O. Control and power wiring tight? ☐ Yes ☐ No ☐ N/A

Part III - Comments (*Any "No" answers, test failure or other problems found with the fire pump must be explained here.*)

Part IV - Inspector's Information

Inspector: _____

Company: _____

Company's Address: _____

I state that the information on this form is correct at the time and place of my inspection, and that all equipment tested at this time was left in operational condition upon completion of this inspection except as noted in Part III above.

Signature of Inspector: _____ Date: _____

License or Certification Number (if applicable): _____

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FIGURE B.1(m) *Continued*

ROA_01565

Form for Inspection, Testing and Maintenance of Water Storage Tanks

NATIONAL FIRE SPRINKLER ASSOCIATION, INC.

Information on this form covers the minimum requirements of NFPA 25-2002 for water storage tanks. Separate forms are available to inspect, test and maintain the rest of the fire protection system of which the water tank is a part. More frequent inspection, testing, and maintenance may be necessary depending on the conditions of the occupancy and water supply.

Owner: _____ Owner's Phone Number: _____

Owner's Address: _____

Property Being Evaluated: _____

Property Address: _____

Date of Work: _____ All responses refer to the current work (inspection, testing and maintenance) performed on the date shown above.

This inspection is *(check one)*: ☐ Daily ☐ Monthly ☐ Semiannual ☐ Annual ☐ Two Years ☐ Third Year ☐ Fifth Year

Notes: 1) All questions are to be answered *Yes*, *No* or *Not Applicable*. All *No* answers are to be explained in the comments portion of this form.
2) Inspection, Testing and Maintenance are to be performed with water supplies (including fire pumps) in service, unless the impairment procedures of Chapter 11 of NFPA 25 are followed.

Part I - Owner's Section

A. Is the water storage tank in service? ☐ Yes ☐ No

B. Has the tank remained in service since the last inspection? ☐ Yes ☐ No

C. Was the system (of which the tank is a part) free from actuation of devices or alarms since the last inspection? ☐ Yes ☐ No

Owner or representative (print name) Signature and Date

Part II - Inspector's Section

A. Inspection

1. **Daily items during cold weather where tank is subject to freezing which can be weekly if tank is electronically supervised**
   a. Heating system operational? ☐ Yes ☐ No ☐ N/A
   b. Record water temperature. _____ Acceptable? ☐ Yes ☐ No ☐ N/A
2. **Weekly Inspection Item (in addition to above items)**
   Sealed valves in proper (open or closed) position? ☐ Yes ☐ No ☐ N/A
3. **Monthly Inspection Items (in addition to above items)**
   a. Embankment-Supported [illegible] tanks free from erosion [illegible]
   b. Locked and supervised [illegible] (open or closed) position? ☐ Yes ☐ No ☐ N/A
   c. Gages in good condition, [illegible] pressure? ☐ Yes ☐ No ☐ N/A
4. **Monthly items which can be done quarterly when tank is electronically supervised (in addition to above items)**
   a. Water level and condition correct? ☐ Yes ☐ No ☐ N/A
   b. Air pressure in pressure tanks correct? ☐ Yes ☐ No ☐ N/A
5. Quarterly Inspection Items (in addition to above items)
   a. Exterior of tank, support structure, foundation, condition of water in tank, catwalks and ladders strong and free from obvious damage? ☐ Yes ☐ No ☐ N/A
   b. Area surrounding tank free from combustibles, materials which could accelerate corrosion and ice? ☐ Yes ☐ No ☐ N/A
   c. Tank vents clean? ☐ Yes ☐ No ☐ N/A
6. **Annual Inspection Items (in addition to above items)**
   a. Exterior coated and insulated surfaces of tank and supporting structure free from degradation? ☐ Yes ☐ No ☐ N/A
   b. Expansion joints not leaking or cracking? ☐ Yes ☐ No ☐ N/A
   c. Hoops and grills on wooden tanks in acceptable condition? ☐ Yes ☐ No ☐ N/A
7. **Interior Inspection to be performed once every three years on pressure tanks and steel tanks without corrosion protection and once every five years on all other tanks**
   Interior coating in good condition, center columns of tubular design not holding water, center columns not permanently attached to the floor, tanks on ring type foundations with sand in the middle have no voids beneath the floor, heating system components and piping in good condition, and anti-vortex plates in good condition? ☐ Yes ☐ No ☐ N/A

B. Testing

1. **Monthly Tests**
   a. Low water temperature alarms passed test? ☐ Yes ☐ No ☐ N/A
   b. High temperature limit switches on tank heating system passed test? *Only test when heating system is on.* ☐ Yes ☐ No ☐ N/A
2. **Quarterly Test (in addition to above items)**
   b. High water level alarm passed test? ☐ Yes ☐ No ☐ N/A
   c. Low water level alarm passed test? ☐ Yes ☐ No ☐ N/A
3. **Semiannual Test (in addition to above items)**
   Valve supervisory devices indicate movement? ☐ Yes ☐ No ☐ N/A
4. **Annual Test - Before Freezing Weather (in addition to above)**
   Tank heating system in proper working order? ☐ Yes ☐ No ☐ N/A
5. **Interior tests to be performed every third or fifth year with the Internal Inspection [illegible] of this form**
   a. Tank coating passed adhesion [illegible] coating thickness tests? ☐ Yes ☐ No ☐ N/A
   [illegible] bottoms passed ultrasonic test if [illegible] ☐ Yes ☐ No ☐ N/A
   [illegible] bottom passed vacuum box test? ☐ Yes ☐ No ☐ N/A
   c. **Every Fifth Year Tests**
   a. Level indicators accurate and free to move? ☐ Yes ☐ No ☐ N/A
   b. Gages compared to calibrated gage or replaced? ☐ Yes ☐ No ☐ N/A

C. Maintenance

1. **Semiannual Maintenance**
   Sediment drained or flushed from the tank? ☐ Yes ☐ No ☐ N/A
2. **Annual Maintenance (in addition to above items)**
   Cathodic protection maintained in accordance with manufacturer's instructions, all tank drains fully opened then closed, and tank vents cleaned? ☐ Yes ☐ No ☐ N/A

Part III - Comments

(Any "No" answers, test failures or other problems found with the water storage tank must be explained here).

_____

_____

_____

_____

_____

_____

_____

Part IV - Inspector's Information

Inspector: _____

Company: _____

Company Address: _____

I state that the information on this form is correct at the time and place of my inspection, and that all equipment tested at this time was left in operational condition upon completion of this inspection except as noted in Part III above.

Signature of Inspector: _____ Date: _____

License or Certification Number (if applicable): _____

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FIGURE B.1(n) NFSA Form for Inspection, Testing, and Maintenance of Water Storage Tanks.

ROA_01566

Form for Inspection, Testing and Maintenance of Water Spray Fixed Systems

NATIONAL FIRE SPRINKLER ASSOCIATION, INC.

Information on this form covers the minimum requirements of NFPA 25-2002 for water spray fixed systems. Where the spray system includes a fire pump or water tank, an additional form must be completed for inspection, testing and maintenance of the pump or tank. Forms are also available for fire sprinkler systems, standpipe and hose systems, private fire service mains, and foam-water sprinkler systems. More frequent inspection, testing and maintenance may be necessary depending on the conditions of the occupancy and the water supply.

Owner: _____ Owner's Phone Number: _____

Owner's Address: _____

Property Being Evaluated: _____

Property Address: _____

Date of Work: _____ All responses refer to the current work (inspection, testing and maintenance) performed on this date.

This inspection is (*check one*): ☐ Daily ☐ Weekly ☐ Monthly ☐ Quarterly ☐ Annual ☐ Fifth Year

Notes: 1) All questions are to be answered *Yes*, *No*, or *Not Applicable*. All *No* answers are to be explained in the comments portion of this form.
2) Inspection, Testing and Maintenance are to be performed with water supplies (including fire pumps) in service, unless the impairment procedures of Chapter 11 of NFPA 25 are followed.

Part I - Owner's Section

Note: Periodic inspection and testing of detection systems must be performed in accordance with NFPA 72E by a qualified alarm contractor.

A. Has the hazard being protected remained the same since the last inspection? ☐ Yes ☐ No ☐ N/A

B. Are all fire protection systems in service? ☐ Yes ☐ No ☐ N/A

C. Has the system remained in service without modification since the last inspection? ☐ Yes ☐ No ☐ N/A

D. Was the system free of actuations of devices or alarms since the last inspection? ☐ Yes ☐ No ☐ N/A

Owner or representative (print name) _____ Signature and Date

Part II - Inspector's Section

A. Inspections

1. Daily Inspection Item

Deluge valve enclosures (without low temperature alarms) maintained at 40°F? ☐ Yes ☐ No ☐ N/A

2. Weekly Items (in addition to above items)

A. Sealed control valves and backflow prevention assemblies in normal (open or closed) position, locks in place, accessible and free from external leaks and provided with appropriate identification? ☐ Yes ☐ No ☐ N/A

B. Relief port on reduced pressure backflow prevention assemblies free of continuous discharge? ☐ Yes ☐ No ☐ N/A

C. Gages on system in good condition and showing normal water pressure? ☐ Yes ☐ No ☐ N/A

3. Monthly Items (in addition to above items)

A. Deluge Valves:

Enclosures (with low temperature alarms) maintained at 40°F, free from physical damage, trim valves in appropriate condition, and electrical components in service? ☐ Yes ☐ No ☐ N/A

B. Low point drains are in good condition? ☐ Yes ☐ No ☐ N/A

C. Rubber gasketed fittings are in proper location? ☐ Yes ☐ No ☐ N/A

D. Water Spray Nozzles:

1. In proper location? ☐ Yes ☐ No ☐ N/A
2. Aimed in proper direction? ☐ Yes ☐ No ☐ N/A
3. Free from external loading and corrosion? ☐ Yes ☐ No ☐ N/A
4. Capped or plugged (when required)? ☐ Yes ☐ No ☐ N/A

E. Control valves and valves on backflow assemblies (with locks or electronic supervision):

1. In normal (open or closed) position? ☐ Yes ☐ No ☐ N/A
2. Lock or supervision in place? ☐ Yes ☐ No ☐ N/A
3. Accessible and free from external leaks? ☐ Yes ☐ No ☐ N/A
4. Provided with appropriate wrenches? ☐ Yes ☐ No ☐ N/A
5. Provided with appropriate identification? ☐ Yes ☐ No ☐ N/A

F. Gages in good condition and showing normal pressure? ☐ Yes ☐ No ☐ N/A

4. Quarterly Items (in addition to above items)

A. Hangers and supports in good condition, secured to structural supports and in proper location? ☐ Yes ☐ No ☐ N/A

B. Drainage system in good condition? ☐ Yes ☐ No ☐ N/A

C. Piping and fittings free from mechanical damage, corrosion, and misalignment? ☐ Yes ☐ No ☐ N/A

B. Testing

1. Quarterly Tests

A. Post indicator valves opened until spring or torsion is felt in the rod, then closed back one-quarter turn? ☐ Yes ☐ No ☐ N/A

B. Mechanical Water Flow Alarm Test: Bypass connection opened, alarms actuated and flow observed? ☐ Yes ☐ No ☐ N/A

C. Main drain test for system downstream of backflow or pressure [illegible]:

1. Record static _____ psi and residual _____ psi pressures.
2. Was flow observed? ☐ Yes ☐ No ☐ N/A
3. Pressures comparable to those from last test? ☐ Yes ☐ No ☐ N/A

2. Semiannual Tests (in addition to above items)

A. Valve supervisory devices indicate movement? ☐ Yes ☐ No ☐ N/A

B. Electrical Water Flow Alarm Test: Bypass connection opened, alarms actuated and flow observed? ☐ Yes ☐ No ☐ N/A

3. Annual Tests (in addition to above items)

A. System Main Drain Test:

1. Record static _____ psi and residual _____ psi pressures.
2. Was flow observed? ☐ Yes ☐ No ☐ N/A
3. Pressures comparable to those from last test? ☐ Yes ☐ No ☐ N/A

B. Operational Test: (Test all systems together which will operate simultaneously)

1. Record response time _____ and discharge time _____.
2. Record pressure at most remote nozzle _____ psi.
3. Record pressure at deluge valve _____ psi.
4. Nozzle discharge was not impeded, area of operation was totally covered, and strainers were cleaned after the test? ☐ Yes ☐ No ☐ N/A
5. Are above pressures and times acceptable? ☐ Yes ☐ No ☐ N/A
6. Connection to riser flushed? ☐ Yes ☐ No ☐ N/A

C. Manual actuation devices operated properly? ☐ Yes ☐ No ☐ N/A

D. Control valves operated through full range and returned to normal position? ☐ Yes ☐ No ☐ N/A

E. Backflow devices passed backflow test? ☐ Yes ☐ No ☐ N/A

F. Backflow devices passed full flow test? ☐ Yes ☐ No ☐ N/A

G. Pressure reducing valves passed partial flow test? ☐ Yes ☐ No ☐ N/A

4. Fifth Year Tests (in addition to above items)

A. Gages tested against calibrated one or replaced? ☐ Yes ☐ No ☐ N/A

B. Pressure reducing valves passed full flow test? ☐ Yes ☐ No ☐ N/A

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FIGURE B.1(o) NFSA Form for Inspection, Testing, and Maintenance of Water Spray Fixed Systems.

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C. Maintenance

1. Regular Maintenance Items

A. Mainline strainers flushed after each flow or test? ☐ Yes ☐ No ☐ N/A

B. If any of the following were discovered, was an obstruction investigation conducted? ☐ Yes ☐ No ☐ N/A

1. Defective intake screen for pumps taking suction from open sources.
2. Obstructive material discharged during waterflow tests.
3. Foreign materials found in check valves or pumps.
4. Heavy discoloration of water during drain test or plugging of inspector's test connection or pipe dismantled during alterations.
5. Failure to flush yard piping or surrounding public mains following new installation or repairs.
6. Record of broken mains in the vicinity.
7. System is returned to service after an extended period out of service (greater than one year).
8. There is reason to believe the system contains sodium silicate or its derivatives.

2. Annual Maintenance Items (In addition to above items)

A. Operating stems of OS&Y valves lubricated, completely closed and re... ☐ Yes ☐ No ☐ N/A

B. Interior of deluge valves that ... ☐ Yes ☐ No ☐ N/A

3. Fifth Year Maintenance Items (In addition to above items)

Mainline strainers removed and cleaned? ☐ Yes ☐ No ☐ N/A

D. Fire Department Connections:

Visible, accessible, couplings and swivels not damaged and rotate smoothly, plugs or caps in place and undamaged, gaskets in place and in good condition, identification sign(s) in place, check valve is not leaking, clapper is in place and operating properly and automatic drain valve in place and operating properly? ☐ Yes ☐ No ☐ N/A

(If plugs or caps are not in place, inspect interior for obstructions.)

5. Annual Item

Interior of deluge valves (which must be open to be reset) in good condition? ☐ Yes ☐ No ☐ N/A

6. Fifth Year Items

A. Interior of deluge valves (which can be reset without opening) in good condition? ☐ Yes ☐ No ☐ N/A

B. Strainers, filters and orifices in good condition? ☐ Yes ☐ No ☐ N/A

C. All check valve interiors in good condition? ☐ Yes ☐ No ☐ N/A

Part III - Comments *(Any "No" answers, test failures or other problems found with the system must be explained here.)*

Part IV - Inspector's Information

Inspector: _____

Company: _____

Company Address: _____

I state that the information on this form is correct at the time and place of my inspection, and that all equipment tested at this time was left in operational condition upon completion of this inspection except as noted in Part III above.

Signature of Inspector: _____ Date: _____

License or Certification Number (if applicable): _____

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FIGURE B.1(o) *Continued*

Annex C Possible Causes of Pump Troubles

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

This annex is extracted from NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection.*

C.1 Causes of Pump Troubles. This annex contains a partial guide for locating pump troubles and their possible causes *(see Figure C.1)*. It also contains a partial list of suggested remedies. *(For other information on this subject, see Hydraulic Institute Standard for Centrifugal, Rotary and Reciprocating Pumps.)* The causes listed here are in addition to possible mechanical breakage that would be obvious on visual inspection. In case of trouble it is suggested that those troubles that can be checked easily should be corrected first or eliminated as possibilities.

C.1.1 Air Drawn into Suction Connection Through Leak(s). Air drawn into suction line through leaks causes a pump to lose suction or fail to maintain its discharge pressure. Uncover suction pipe and locate and repair leak(s).

C.1.2 Suction Connection Obstructed. Examine suction intake, screen, and suction pipe and remove obstruction. Repair or provide screens to prevent recurrence.

C.1.3 Air Pocket in Suction Pipe. Air pockets cause a reduction in delivery and pressure similar to an obstructed pipe. Uncover suction pipe and rearrange to eliminate pocket.

C.1.4 Well Collapsed or Serious Misalignment. Consult a reliable well drilling company and the pump manufacturer regarding recommended repairs.

C.1.5 Stuffing Box Too Tight or Packing Improperly Installed, Worn, Defective, Too Tight, or of Incorrect Type. Loosen gland swing bolts and remove stuffing box gland halves. Replace packing.

C.1.6 Water Seal or Pipe to Seal Obstructed. Loosen gland swing bolt and remove stuffing box gland halves along with the water seal ring and packing. Clean the water passage to and in the water seal ring. Replace water seal ring, packing

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Backflow Prevention Assembly Test and Maintenance Record

I. General information

Address:		
Location of assembly	Date of installation	Incoming line pressure
Manufacturer	Model no.	Serial number
Size	Assembly type ☐ RP ☐ RP detector ☐ DC detector ☐ PVB	

II. Tests and repairs information

	Check valve no. 1	Check valve no. 2	Differential pressure relief valve
Initial test	☐ Leaked ☐ Closed tight Pressure drop across the first check valve is _____ psid	☐ Leaked ☐ Closed tight Pressure drop across the second check valve is _____ psid	☐ Opened at _____ psid ☐ Did not open
Repairs	List repairs and corrections	List repairs and corrections	List repairs and corrections
Final test	☐ Closed tight	☐ Closed tight	☐ Opened at _____ psid

Condition of no. 2 control valve: ☐ Closed tight ☐ Leaked

Remarks: ☐ Assembly failed ☐ Assembly passed

III. Approvals

"I hearby certify that this data is accurate and reflects the proper operation and maintenance of the assembly and that all control valves were left in the full open position."

Name of certified technician	Technician phone	Name of witness to test	
Signature of certified technician	Technician certification #	Date	Witness phone #

FIGURE B.1(p) Backflow Prevention Assembly Test and Maintenance Record.

gland, and packing in accordance with manufacturer's instructions.

C.1.7 Air Leak into Pump Through Stuffing Boxes. Same as possible cause C.1.6.

C.1.8 Impeller Obstructed. Does not show on any one instrument, but pressures fall off rapidly when an attempt is made to draw a large amount of water.

For horizontal split-case pumps, remove upper case of pump and remove obstruction from impeller. Repair or provide screens on suction intake to prevent recurrence.

For vertical shaft turbine-type pumps, lift out column pipe and pump bowls from wet pit or well and disassemble pump bowl to remove obstruction from impeller.

For close-coupled, vertical in-line pumps, lift motor on top pull-out design and remove obstruction from impeller.

C.1.9 Wearing Rings Worn. Remove upper case and insert feeler gauge between case wearing ring and impeller wearing ring. Clearance when new is 0.19 mm (0.0075 in.). Clearances of more than 0.38 mm (0.015 in.) are excessive.

C.1.10 Impeller Damaged. Make minor repairs or return to manufacturer for replacement. If defect is not too serious, order new impeller and use damaged one until replacement arrives.

C.1.11 Wrong Diameter Impeller. Replace with impeller of proper diameter.

	Suction				Pump																Driver and/or Pump					Driver							
Fire pump troubles	1 Air drawn into suction connection through leak(s)	2 Suction connection obstructed	3 Air pocket in suction pipe	4 Well collapsed or serious misalignment	5 Stuffing box too tight or packing improperly installed, worn, defective, too tight, or incorrect type	6 Water seal or pipe to seal obstructed	7 Air leak into pump through stuffing boxes	8 Impeller obstructed	9 Wearing rings worn	10 Impeller damaged	11 Wrong diameter impeller	12 Actual net head lower than rated	13 Casing gasket defective permitting internal leakage (single-stage and multistage pumps)	14 Pressure gauge is on top of pump casing	15 Incorrect impeller adjustment (vertical shaft turbine-type pump only)	16 Impellers locked	17 Pump is frozen	18 Pump shaft or shaft sleeve scored, bent, or worn	19 Pump not primed	20 Sealing improperly located in stuffing box, preventing water from entering space to form seal	21 Excess bearing friction due to lack of lubrication, wear, dirt, rusting, failure, or improper installation	22 Rotating element binds against stationary element	23 Pump and driver misaligned	24 Foundation not rigid	25 Engine-cooling system obstructed	26 Faulty driver	27 Lack of lubrication	28 Speed too low	29 Wrong direction of rotation	30 Speed too high	31 Rated motor voltage different from line voltage	32 Faulty electric circuit, obstructed fuel system, obstructed steam pipe, or dead battery
1					X													X					X								
2					X	X		X			X				X			X	X	X	X	X	X	X			X		X	X	X	
3					X										X	X	X				X						X					X
4	X	X	X					X											X													
5				X	X			X		X											X	X	X	X	X		X		X	X	X	
6				X	X				X		X		X		X			X			X	X	X	X			X		X	X	X	
7	X	X	X			X	X													X												
8				X		X	X																									
9				X	X			X		X											X	X	X	X			X		X	X	X	
10				X	X	X		X	X		X		X		X			X			X	X	X	X			X		X	X	X	
11	X	X	X																	X												
12	X	X	X			X	X													X												
13	X	X	X		X	X	X	X	X	X	X	X	X	X		X																
14	X	X	X																	X												
15	X	X	X																	X												
16	X	X	X																	X												
17	X	X	X																	X												
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27	X	X	X																	X												
28	X	X	X																	X												
29	X	X	X																	X												
30	X	X	X																	X												
31	X	X	X																	X												
32	X	X	X																	X												

FIGURE C.1 Possible Causes of Fire Pump Troubles.

C.1.12 Actual Net Head Lower than Rated. Check impeller diameter and number and pump model number to make sure correct head curve is being used.

C.1.13 Casing Gasket Defective Permitting Internal Leakage (Single-Stage and Multistage Pumps). Replace defective gasket. Check manufacturer's drawing to see whether gasket is required.

C.1.14 Pressure Gauge Is on Top of Pump Casing. Place gauges in correct location.

C.1.15 Incorrect Impeller Adjustment (Vertical Shaft Turbine-Type Pump Only). Adjust impellers according to manufacturer's instructions.

C.1.16 Impellers Locked. For vertical shaft turbine-type pumps, raise and lower impellers by the top shaft adjusting nut. If this adjustment is not successful, follow the manufacturer's instructions.

For horizontal split-case pumps, remove upper case and locate and eliminate obstruction.

C.1.17 Pump Is Frozen. Provide heat in the pump room. Disassemble pump and remove ice as necessary. Examine parts carefully for damage.

C.1.18 Pump Shaft or Shaft Sleeve Scored, Bent, or Worn. Replace shaft or shaft sleeve.

C.1.19 Pump Not Primed. If a pump is operated without water in its casing, the wearing rings are likely to seize. The first warning is a change in pitch of the sound of the driver. Shut down the pump.

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For vertical shaft turbine-type pumps, check water level to determine whether pump bowls have proper submergence.

C.1.20 Seal Ring Improperly Located in Stuffing Box, Preventing Water from Entering Space to Form Seal. Loosen gland swing bolt and remove stuffing box gland halves along with the water-seal ring and packing. Replace, putting seal ring in proper location.

C.1.21 Excess Bearing Friction Due to Lack of Lubrication, Wear, Dirt, Rusting, Failure, or Improper Installation. Remove bearings and clean, lubricate, or replace as necessary.

C.1.22 Rotating Element Binds Against Stationary Element. Check clearances and lubrication and replace or repair the defective part.

C.1.23 Pump and Driver Misaligned. Shaft running off center because of worn bearings or misalignment. Align pump and driver according to manufacturer's instructions. Replace bearings according to manufacturer's instructions.

C.1.24 Foundation Not Rigid. Tighten foundation bolts or replace foundation if necessary.

C.1.25 Engine-Cooling System Obstructed. Heat exchanger or cooling water systems too small. Cooling pump faulty. Remove thermostats. Open bypass around regulator valve and strainer. Check regulator valve operation. Check strainer. Clean and repair if necessary. Disconnect sections of cooling system to locate and remove possible obstruction. Adjust engine-cooling water-circulating pump belt to obtain proper speed without binding. Lubricate bearings of this pump.

If overheating still occurs at loads up to 150 percent of rated capacity, contact pump or engine manufacturer so that necessary steps can be taken to eliminate overheating.

C.1.26 Faulty Driver. Check electric motor, internal combustion engine, or steam turbine, in accordance with manufacturer's instructions, to locate reason for failure to start.

C.1.27 Lack of Lubrication. If parts have seized, replace damaged parts and provide proper lubrication. If not, stop pump and provide proper lubrication.

C.1.28 Speed Too Low. For electric motor drive, check that rated motor speed corresponds to rated speed of pump, voltage is correct, and starting equipment is operating properly.

Low frequency and low voltage in the electric power supply prevent a motor from running at rated speed. Low voltage can be due to excessive loads and inadequate feeder capacity or (with private generating plants) low generator voltage. The generator voltage of private generating plants can be corrected by changing the field excitation. When low voltage is from the other causes mentioned, it can be necessary to change transformer taps or increase feeder capacity.

Low frequency usually occurs with a private generating plant and should be corrected at the source. Low speed can result in older type squirrel-cage-type motors if fastenings of copper bars to end rings become loose. The remedy is to weld or braze these joints.

For steam turbine drive, check that valves in steam supply pipe are wide open; boiler steam pressure is adequate; steam pressure is adequate at the turbine; strainer in the steam supply pipe is not plugged; steam supply pipe is of adequate size; condensate is removed from steam supply pipe, trap, and turbine; turbine nozzles are not plugged; and setting of speed and emergency governor is correct.

For internal combustion engine drive, check that setting of speed governor is correct; hand throttle is opened wide; and there are no mechanical defects such as sticking valves, timing off, or spark plugs fouled, and so forth. The latter can require the services of a trained mechanic.

C.1.29 Wrong Direction of Rotation. Instances of an impeller turning backward are rare but are clearly recognizable by the extreme deficiency of pump delivery. Wrong direction of rotation can be determined by comparing the direction in which the flexible coupling is turning with the directional arrow on the pump casing.

With polyphase electric motor drive, two wires must be reversed; with dc driver, the armature connections must be reversed with respect to the field connections. Where two sources of electrical current are available, the direction of rotation produced by each should be checked.

C.1.30 Speed Too High. See that pump- and driver-rated speed correspond. Replace electric motor with one of correct rated speed. Set governors of variable-speed drivers for correct speed. Frequency at private generating stations can be too high.

C.1.31 Rated Motor Voltage Different from Line Voltage. For example, a 220- or 440-V motor on 208- or 416-V line. Obtain motor of correct rated voltage or larger size motor.

C.1.32 Faulty Electric Circuit, Obstructed Fuel System, Obstructed Steam Pipe, or Dead Battery. Check for break in wiring open switch, open circuit breaker, or dead battery. If circuit breaker in controller trips for no apparent reason, make sure oil is in dash pots in accordance with manufacturer's specifications. Make sure fuel pipe is clear, strainers are clean, and control valves open in fuel system to internal combustion engine. Make sure all valves are open and strainer is clean in steam line to turbine.

C.2 Warning. Chapters 6 and 7 of NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection*, include electrical requirements that discourage the installation of disconnect means in the power supply to electric motor–driven fire pumps. This requirement is intended to ensure the availability of power to the fire pumps. When equipment connected to those circuits is serviced or maintained, the employee can have unusual exposure to electrical and other hazards. It can be necessary to require special safe work practices and special safeguards, personal protective clothing, or both.

C.3 Maintenance of Fire Pump Controllers After a Fault Condition.

C.3.1 Introduction. In a fire pump motor circuit that has been properly installed, coordinated, and in service prior to the fault, tripping of the circuit breaker or the isolating switch indicates a fault condition in excess of operating overload.

It is recommended that the following general procedures be observed by qualified personnel in the inspection and repair of the controller involved in the fault. These procedures are not intended to cover other elements of the circuit, such as wiring and motor, which can also require attention.

C.3.2 Caution. All inspections and tests are to be made on controllers that are de-energized at the line terminal, disconnected, locked out, and tagged so that accidental contact cannot be made with live parts and so that all plant safety procedures will be observed.

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C.3.2.1 Enclosure. Where substantial damage to the enclosure, such as deformation, displacement of parts, or burning has occurred, replace the entire controller.

C.3.2.2 Circuit Breaker and Isolating Switch. Examine the enclosure interior, circuit breaker, and isolating switch for evidence of possible damage. If evidence of damage is not apparent, the circuit breaker and isolating switch can continue to be used after closing the door.

If there is any indication that the circuit breaker has opened several short-circuit faults, or if signs of possible deterioration appear within either the enclosure, circuit breaker, or isolating switch (e.g., deposits on surface, surface discoloration, insulation cracking, or unusual toggle operation), replace the components. Verify that the external operating handle is capable of opening and closing the circuit breaker and isolating switch. If the handle fails to operate the device, this would also indicate the need for adjustment or replacement.

C.3.2.3 Terminals and Internal Conductors. Where there are indications of arcing damage, overheating, or both, such as discoloration and melting of insulation, replace the damaged parts.

C.3.2.4 Contactor. Replace contacts showing heat damage, displacement of metal, or loss of adequate wear allowance of the contacts. Replace the contact springs where applicable. If deterioration extends beyond the contacts, such as binding in the guides or evidence of insulation damage, replace the damaged parts or the entire contactor.

C.3.2.5 Return to Service. Before returning the controller to service, check for the tightness of electrical connections and for the absence of short circuits, ground faults, and leakage current.

Close and secure the enclosure before the controller circuit breaker and isolating switch are energized. Follow operating procedures on the controller to bring it into standby condition.

Annex D Obstruction Investigation

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

D.1 For effective control and extinguishment of fire, automatic sprinklers should receive an unobstructed flow of water. Although the overall performance record of automatic sprinklers has been very satisfactory, there have been numerous instances of impaired efficiency because sprinkler piping or sprinklers were plugged with pipe scale, corrosion products, including those produced by microbiologically influenced corrosion, mud, stones, or other foreign material. If the first sprinklers to open in a fire are plugged, the fire in that area cannot be extinguished or controlled by prewetting of adjacent combustibles. In such a situation, the fire can grow to an uncontrollable size, resulting in greater fire damage and excessive sprinkler operation and even threatening the structural integrity of the building, depending on the number of plugged sprinklers and fire severity.

Keeping the inside of sprinkler system piping free of scale, silt, or other obstructing material is an integral part of an effective loss prevention program.

D.2 Obstruction Sources.

D.2.1 Pipe Scale. Loss studies have shown that dry pipe sprinkler systems are involved in the majority of obstructed sprinkler fire losses. Pipe scale was found to be the most frequent obstructing material (it is likely that some of the scale was composed of corrosion products, including those produced by microbiologically influenced corrosion). Dry pipe systems that have been maintained wet and then dry alternately over a period of years are particularly susceptible to the accumulation of scale. Also, in systems that are continuously dry, condensation of moisture in the air supply can result in the formation of a hard scale, microbiological materials, and corrosion products along the bottom of the piping. When sprinklers open, the scale is broken loose and carried along the pipe, plugging some of the sprinklers or forming obstructions at the fittings.

D.2.2 Careless Installation or Repair. Many obstructions are caused by careless workers during installation or repair of yard or public mains and sprinkler systems. Wood, paint brushes, buckets, gravel, sand, and gloves have been found as obstructions. In some instances, with welded sprinkler systems and systems with holes for quick-connect fittings, the cutout discs or coupons have been left within the piping, obstructing flow to sprinklers.

D.2.3 Raw Water Sources. Materials can be sucked up from the bottoms of rivers, ponds, or open reservoirs by fire pumps with poorly arranged or inadequately screened intakes and then forced into the system. Sometimes floods damage intakes. Obstructions include fine, compacted materials such as rust, mud, and sand. Coarse materials, such as stones, cinders, cast-iron tubercles, chips of wood, and sticks, also are common.

D.2.4 Biological Growth. Biological growth has been known to cause obstructions in sprinkler piping. The Asiatic clam has been found in fire protection systems supplied by raw river or lake water. With an available food supply and sunlight, these clams grow to approximately 9 mm to 11 mm (⅜ in. to 7/16 in.) across the shell in 1 year and up to 54 mm (2⅛ in.) and larger by the sixth year. However, once in fire mains and sprinkler piping, the growth rate is much slower. The clams get into the fire protection systems in the larval stage or while still small clams. They then attach themselves to the pipe and feed on bacteria or algae that pass through.

Originally brought to Washington state from Asia in the 1930s, the clams have spread throughout at least 33 states and possibly are present in every state. River areas reported to be highly infested include the Ohio River, Tennessee River Valley, Savannah River (S. Carolina), Altamaha River (Georgia), Columbia River (Washington), and Delta-Mendota Canal (California).

D.2.5 Sprinkler Calcium Carbonate Deposits. Natural fresh waters contain dissolved calcium and magnesium salts in varying concentrations, depending on the sources and location of the water. If the concentration of these salts is high, the water is considered hard. A thin film composed largely of calcium carbonate, $CaCO_3$, affords some protection against corrosion where hard water flows through the pipes. However, hardness is not the only factor to determine whether a film forms. The ability of $CaCO_3$ to precipitate on the metal pipe surface also depends on the water's total acidity or alkalinity, the concentration of dissolved solids in the water, and its pH. In soft water, no such film can form.

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In automatic sprinkler systems, the calcium carbonate scale formation tends to occur on the more noble metal in the electrochemical series, which is copper, just as corrosion affects the less noble metal, iron. Consequently, scale formation naturally forms on sprinklers, often plugging the orifice. The piping itself could be relatively clear. This type of sprinkler obstruction cannot be detected or corrected by normal flushing procedures. It can only be found by inspection of sprinklers in suspected areas and then removed.

Most public water utilities in very hard water areas soften their water to reduce consumer complaints of scale buildup in water heaters. Thus, the most likely locations for deposits in sprinkler systems are where sprinklers are not connected to public water but supplied without treatment directly from wells or surface water in areas that have very hard water. These areas generally include the Mississippi basin west of the Mississippi River and north of the Ohio River, the rivers of Texas and the Colorado basin, and other white areas in Figure D.2.5(a). (The water of the Great Lakes is only moderately hard.)

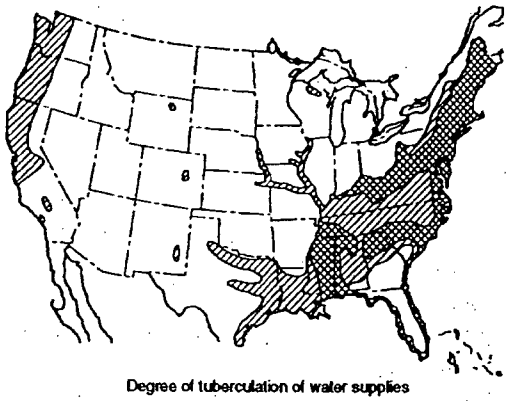

FIGURE D.2.5(a) Map of Hard Water Areas. *(Courtesy of Cast Iron Pipe Research Association.)*

Within individual plants, the sprinklers most likely to have deposits are located as follows:

(1) In wet systems only.
(2) In high temperature areas, except where water has unusually high pH *[see Figure D.2.5(b)]*. High temperature areas include those near dryers, ovens, and skylights or at roof peaks.
(3) In old sprinkler systems that are frequently drained and refilled.
(4) In pendent sprinklers that are located away from air pockets and near convection currents.

D.2.6 Microbiologically Influenced Corrosion (MIC). The most common biological growths in sprinkler system piping are those formed by microorganisms, including bacteria and fungi. These microbes produce colonies (also called biofilms, slimes) containing a variety of types of microbes. Colonies form on the surface of wetted pipe in both wet and dry systems. Microbes also deposit iron, manganese, and various salts onto the pipe surface, forming discrete deposits (also termed

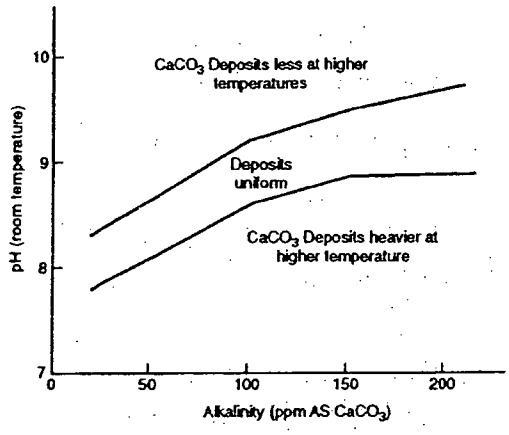

FIGURE D.2.5(b) Scale Deposition as a Function of the Alkalinity/pH Ratio.

nodules, tubercles, and carbuncles). These deposits can cause obstruction to flow and dislodge causing plugging of fire sprinkler components. Subsequent under-deposit pitting can also result in pinhole leaks.

Microbiologically influenced corrosion (MIC) is corrosion influenced by the presence and activities of microorganisms. MIC almost always occurs with other forms of corrosion (oxygen corrosion, crevice corrosion, and under-deposit corrosion). MIC starts as microbial communities (also called biofilms, slimes) growing on the interior surface of the wetted sprinkler piping components in both wet and dry systems. The microbial communities contain many types of microbes, including slime formers, acid-producing bacteria, iron-depositing bacteria, and sulfate-reducing bacteria, and are most often introduced into the sprinkler system from the water source. The microbes deposit iron, manganese, and various salts onto the pipe surface, forming discrete deposits (also termed nodules, tubercles, and carbuncles). These deposits can cause obstruction to flow and dislodge, causing plugging of fire sprinkler components. MIC is most often seen as severe pitting corrosion occurring under deposits. Pitting is due to microbial activities such as acid production, oxygen consumption, and accumulation of salts. Oxygen and salts, especially chloride, can greatly increase the severity of MIC and other forms of corrosion.

In steel pipe, MIC is most often seen as deposits on the interior surface of the pipes. The deposits may be orange, red, brown, black, and white (or combinations thereof), depending on local conditions and water chemistry. The brown, orange, and red forms are most common in oxygenated portions of the system and often contain oxidized forms of iron and other materials on the outside, with reduced (blacker) corrosion products on the inside. Black deposits are most often in smaller diameter piping farther from the water source and contain reduced forms (those with less oxygen) of corrosion products. White deposits often contain carbonate scales.

MIC of copper and copper alloys occurs as discrete deposits of smaller size, which are green to blue in color. Blue slimes may also be produced in copper piping or copper components (e.g., brass heads).

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MIC is often first noticed as a result of pinhole leaks after only months to a few years of service. Initial tests for the presence of MIC should involve on-site testing for microbes and chemical species (iron, pH, oxygen) important in MIC. This information is also very important in choosing treatment methods. These tests can be done on water samples from source waters and various locations in the sprinkler system (e.g., main drain, inspector's test valve). Confirmation of MIC can be made by examination of interior of pipes for deposits and under-deposit corrosion with pit morphology consistent with MIC (cup-like pits within pits and striations).

The occurrence and severity of MIC is enhanced by the following:

(1) Using untreated water to test and fill sprinkler piping. This is made worse by leaving the water in the system for long periods of time.
(2) Introduction of new and untreated water containing oxygen, microbes, salts, and nutrients into the system on a frequent basis (during repair, renovation, and/or frequent flow tests).
(3) Leaving dirt, debris, and especially oils, pipe joint compound, and so forth in the piping. These provide nutrients and protection for the microbes, often preventing biocides and corrosion inhibitors from reaching the microbes and corrosion sites.

Once the presence of MIC has been confirmed, the system should be assessed to determine the extent and severity of MIC. Severely affected portions should be replaced or cleaned to remove obstructions and pipe not meeting minimal mechanical specifications.

D.3 Investigation Procedures. If unsatisfactory conditions are observed as outlined in Section 13.2, investigations should be made to determine the extent and severity of the obstructing material. From the fire protection system plan, determine the water supply sources, age of underground mains and sprinkler systems, types of systems, and general piping arrangement. Consider the possible sources of obstruction material.

Examine the fire pump suction supply and screening arrangements. If necessary, have the suction cleaned before using the pump in tests and flushing operations. Gravity tanks should be inspected internally with the exception of steel tanks that have been recently cleaned and painted. If possible, have the tank drained and determine whether loose scale is on the shell or if sludge or other obstructions are on the tank bottom. Cleaning and repainting could be in order, particularly if it has not been done within the previous 5 years.

Investigate yard mains first, then sprinkler systems.

Where fire protection control valves are closed during investigation procedures, the fire protection impairment precautions outlined in Chapter 14 should be followed.

Large quantities of water are needed for investigation and for flushing. It is important to plan the safest means of disposal in advance. Cover stock and machinery susceptible to water damage and keep equipment on hand for mopping up any accidental discharge of water.

D.3.1 Investigating Yard Mains. Flow water through yard hydrants, preferably near the extremes of selected mains, to determine whether mains contain obstructive material. It is preferable to connect two lengths of 65-mm (2½-in.) hose to the hydrant. Attach burlap bags to the free ends of the hose from which the nozzles have been removed to collect any material flushed out, and flow water long enough to determine the condition of the main being investigated. If there are several water supply sources, investigate each independently, avoiding any unnecessary interruptions to sprinkler protection. In extensive yard layouts, repeat the tests at several locations, if necessary, to determine general conditions.

If obstructive material is found, all mains should be flushed thoroughly before investigating the sprinkler systems. *(See D.5.)*

D.3.2 Investigating Sprinkler Systems. Investigate dry systems first. Tests on several carefully selected, representative systems usually are sufficient to indicate general conditions throughout the plant. If, however, preliminary investigations indicate the presence of obstructing material, this justifies investigating all systems (both wet and dry) before outlining needed flushing operations. Generally, the system can be considered reasonably free of obstructing material, provided the following conditions apply:

(1) Less than ½ cup of scale is washed from the cross mains.
(2) Scale fragments are not large enough to plug a sprinkler orifice.
(3) A full, unobstructed flow is obtained from each branch line checked.

Where other types of foreign material are found, judgment should be used before considering the system unobstructed. Obstruction potential is based on the physical characteristics and source of the foreign material.

In selecting specific systems or branch lines for investigation, the following should be considered:

(1) Lines found obstructed during a fire or during maintenance work
(2) Systems adjacent to points of recent repair to yard mains, particularly if hydrant flow shows material in the main

Tests should include flows through 65-mm (2½-in.) fire hose directly from cross mains *[see Figure D.3.2(a) and Figure D.3.2(b)]* and flows through 40-mm (1½-in.) hose from representative branch lines. Two or three branch lines per system is a representative number of branch lines where investigating for scale accumulation. If significant scale is found, investigation of additional branch lines is warranted. Where investigating for foreign material (other than scale), the number of branch lines needed for representative sampling is dependent on the source and characteristic of the foreign material.

If provided, fire pumps should be operated for the large line flows, since maximum flow is desirable. Burlap bags should be used to collect dislodged material as is done in the investigation of yard mains. Each flow should be continued until the water clears (i.e., a minimum of 2 to 3 minutes at full flow for sprinkler mains). This is likely to be sufficient to indicate the condition of the piping interior.

D.3.3 Investigating Dry Pipe Systems. Flood dry pipe systems one or two days before obstruction investigations to soften pipe scale and deposits. After selecting the test points of a dry pipe system, close the main control valve and drain the system. Check the piping visually with a flashlight while it is being dismantled. Attach hose valves and 40-mm (1½-in.) hose to the ends of the lines to be tested, shut the valves, have air pressure restored on the system, and reopen the control valve. Open the hose valve on the end branch line, allowing the system to trip in simulation of normal action. Any obstructions should be cleared from the branch line before proceeding with further tests.

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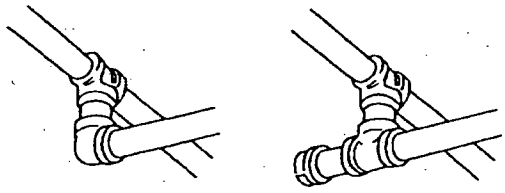

FIGURE D.3.2(a) Replacement of Elbow at End of Cross Main with a Flushing Connection Consisting of a 50-mm (2-in.) Nipple and Cap.

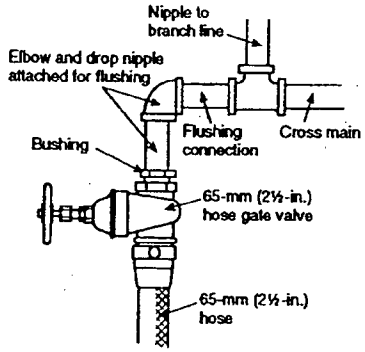

FIGURE D.3.2(b) Connection of 65-mm (2½-in.) Hose Gate Valve with a 50-mm (2-in.) Bushing and Nipple and Elbow to 50-mm (2-in.) Cross Main.

After flowing the small end line, shut its hose valve and test the feed or cross main by discharging water through a 65-mm (2½-in.) fire hose, collecting any foreign material in a burlap bag.

After the test, the dry pipe valve should be cleaned internally and reset. Its control valve should be locked open and a drain test performed.

D.3.4 Investigating Wet Pipe Systems. Testing of wet systems is similar to that of dry systems, except that the system should be drained after closing the control valve to permit installation of hose valves for the test. Slowly reopen the control valve and make a small hose flow as specified for the branch line, followed by the 65-mm (2½-in.) hose flow for the cross main.

In any case, if lines become plugged during the tests, piping should be dismantled and cleaned, the extent of plugging noted, and a clear flow obtained from the branch line before proceeding further.

Perform similar tests on representative systems to indicate the general condition of the wet systems throughout the plant, keeping a detailed record of the procedures performed.

D.3.5 Other Obstruction Investigation Methods. Other obstruction investigation methods, such as technically proven ultrasonic and X-ray examination, have been evaluated and if applied correctly, are successful at detecting obstructions.

The sources of the obstructing material should be determined and steps taken to prevent further entrance of such material. This entails work such as inspection and cleaning of pump suction screening facilities or cleaning of private reservoirs. If recently laid public mains appear to be the source of the obstructing material, waterworks authorities should be requested to flush their system.

D.4 Obstruction Prevention Program.

D.4.1 Dry Pipe and Preaction Systems — Scale.

(1) Dry pipe and preaction systems using noncoated ferrous piping should be thoroughly investigated for obstruction from corrosion after they have been in service for 15 years, 25 years, and every 5 years thereafter.
(2) Dry pipe systems with noncoated ferrous piping should be kept on air year-round, rather than on air and water alternately, to inhibit formation of rust and scale.
(3) Piping that has been galvanized internally for new dry pipe and preaction sprinkler system installations should be used. Fittings, couplings, hangers, and other appurtenances are not required to be galvanized. Copper or stainless steel piping also is permitted.

D.4.2 Flushing Connections. Sprinkler systems installed in accordance with recent editions of NFPA 13, *Standard for the Installation of Sprinkler Systems*, should have provisions for flushing each cross main. Similarly, branch lines on gridded systems should be capable of being readily "broken" at a simple union or flexible joint. Owners of systems installed without these provisions should be encouraged to provide them when replacement or repair work is being done.

D.4.3 Suction Supplies.

(1) Screen pump suction supplies and screens should be maintained. Connections from penstocks should be equipped with strainers or grids, unless the penstock inlets themselves are so equipped. Pump suction screens of copper or brass wire tend to promote less aquatic growth.
(2) Extreme care should be used to prevent material from entering the suction piping when cleaning tanks and open reservoirs. Materials removed from the interior of gravity tanks during cleaning should not be allowed to enter the discharge pipe.
(3) Small mill ponds could need periodic dredging where weeds and other aquatic growth are inherent.

D.4.4 Asian Clams. Effective screening of larvae and small-size, juvenile Asian clams from fire protection systems is very difficult. To date, no effective method of total control has been found. Such controls can be difficult to achieve in fire protection systems.

D.4.5 Calcium Carbonate. For localities suspected of having hard water, sample sprinklers should be removed and inspected yearly. Section D.2.5 outlines sprinkler locations prone to the accumulation of deposits where hard water is a problem. Sprinklers found with deposits should be replaced and adjacent sprinklers should be checked.

D.4.6 Zebra Mussels. Several means of controlling the zebra mussel are being studied, including molluscides, chlorines, ozone, shell strainers, manual removal, robotic cleaning, water jetting, line pigging, sonic pulses, high-voltage electrical fields, and thermal backwashing. It is believed that these controls might need to be applied only during spawning periods when water temperatures are 14°C to 16°C (57°F to 61°F) and veligers are present. Several silicon grease-based coatings also are being investigated for use within piping systems.

While it appears that the use of molluscides could provide the most effective means of controlling the mussel, these

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chemicals are costly. It is believed that chlorination is the best available short-term treatment, but there are problems associated with the use of chlorine, including strict Environmental Protection Agency regulations on the release of chlorine into lakes and streams. The use of nonselective poison, such as chlorine, in the amounts necessary to kill the mussels in large bodies of water could be devastating to entire ecosystems.

To provide an effective means of control against zebra mussels in fire protection systems, control measures should be applied at the water source, instead of within the piping system. Effective controls for growth of the zebra mussel within fire protection systems include the following:

(1) Selecting a water source that is not subject to infestation. This could include well water or potable or pretreated water.
(2) Implementing a water treatment program that includes biocides or elevated pH, or both.
(3) Implementing a water treatment program to remove oxygen, which ensures control of biological growth within piping.
(4) Relying on a tight system approach to deny oxygen and nutrients that are necessary to support growth.

D.5 Flushing Procedures.

D.5.1 Yard Mains. Yard mains should be flushed thoroughly before flushing any interior piping. Flush yard piping through hydrants at dead ends of the system or through blow-off valves, allowing the water to run until clear. If the water is supplied from more than one direction or from a looped system, close divisional valves to produce a high-velocity flow through each single line. A velocity of at least 3 m/sec (10 ft/sec) is necessary for scouring the pipe and for lifting foreign material to an aboveground flushing outlet. Use the flow specified in Table D.5.1 or the maximum flow available for the size of the yard main being flushed.

Connections from the yard piping to the sprinkler riser should be flushed. These are usually 6-in. (150-mm) mains. Although flow through a short, open-ended 2-in. (50-mm) drain can create sufficient velocity in a 6-in. (150-mm) main to move small obstructing material, the restricted waterway of the globe valve usually found on a sprinkler drain might not allow stones and other large objects to pass. If the presence of large size material is suspected, a larger outlet is needed to pass such material and to create the flow necessary to move it. Fire department connections on sprinkler risers can be used as flushing outlets by removing the clappers. Yard mains also can be flushed through a temporary Siamese fitting attached to the riser connection before the sprinkler system is installed. *[See Figure D.5.1.]*

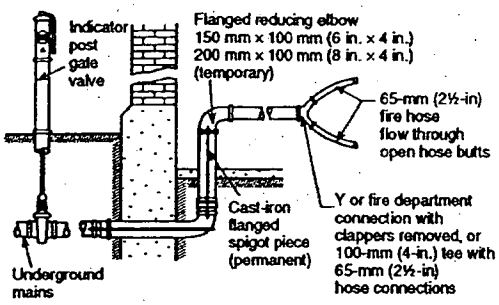

FIGURE D.5.1 Arrangement for Flushing Branches from Underground Mains to Sprinkler Risers.

D.5.2 Sprinkler Piping. Two methods commonly are used for flushing sprinkler piping:

(1) The hydraulic method
(2) The hydropneumatic method

The hydraulic method consists of flowing water from the yard mains, sprinkler risers, feed mains, cross mains, and branch lines, respectively, in the same direction in which water would flow during a fire.

The hydropneumatic method uses special equipment and compressed air to blow a charge of about 114 dm^3 (30 gal) of water from the ends of branch lines back into feed mains and down the riser, washing the foreign material out of an opening at the base of the riser.

Table D.5.1 Flushing Rates to Accomplish Flow of 10 ft/sec (3 m/sec)

	Steel			Copper				Polybutylene	
Pipe Size	SCH 10 (gpm)	SCH 40 (gpm)	XL (gpm)	K (gpm)	L (gpm)	M (gpm)	CPVC (gpm)	CTS (gpm)	IPS (gpm)
¾	—	—	—	14	15	16	19	12	17
1	29	24	30	24	26	27	30	20	27
1¼	51	47	52	38	39	41	48	30	43
1½	69	63	70	54	55	57	63	42	57
2	114	105	114	94	96	99	98	72	90
2½	170	149	163	145	149	152	144	—	—
3	260	230	251	207	212	217	213	—	—
4	449	396	—	364	373	379	—	—	—
5	686	623	—	565	582	589	—	—	—
6	989	880	—	807	836	846	—	—	—
8	1665	1560	—	1407	1460	1483	—	—	—
10	2632	2440	—	2185	2267	2303	—	—	—
12	—	3520	—	—	—	—	—	—	—

For SI units: 1 gpm = 3.785 L/min.

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The choice of method depends on conditions at the individual plant and the type of material installed. If examination indicates the presence of loose sand, mud, or moderate amounts of pipe scale, the piping generally can be flushed satisfactorily by the hydraulic method. Where the material is more difficult to remove and available water pressures are too low for effective scouring action, the hydropneumatic method generally is more satisfactory. The hydropneumatic method should not be used with listed CPVC sprinkler piping.

In some cases, where obstructive material is solidly packed or adheres tightly to the walls of the piping, the pipe needs to be dismantled and cleaned by rodding or other means.

Dry pipe systems should be flooded one or two days before flushing to soften pipe scale and deposits.

Successful flushing by either the hydraulic or hydropneumatic method is dependent on establishing sufficient velocity of flow in the pipes to remove silt, scale, and other obstructive material. With the hydraulic method, water should be moved through the pipe at least at the rate of flow indicated in Table D.5.1.

Where flushing a branch line through the end pipe, sufficient water should be discharged to scour the largest pipe in the branch line. Lower rates of flow can reduce the efficiency of the flushing operation. To establish the recommended flow, remove the small end piping and connect the hose to a larger section, if necessary.

Where pipe conditions indicate internal or external corrosion, a section of the pipe affected should be cleaned thoroughly to determine whether the walls of the pipe have seriously weakened. Hydrostatic testing should be performed as outlined in NFPA 13, *Standard for the Installation of Sprinkler Systems.*

Pendent sprinklers should be removed and inspected until it is reasonably certain that all are free of obstruction material.

Painting the ends of branch lines and cross mains is a convenient method for keeping a record of those pipes that have been flushed.

D.5.3 Hydraulic Method. After the yard mains have been thoroughly cleaned, flush risers, feed mains, cross mains, and finally the branch lines. In multistory buildings, systems should be flushed by starting at the lowest story and working up. Branch line flushing in any story can immediately follow the flushing of feed and cross mains in that story, allowing one story to be completed at a time. Following this sequence prevents drawing obstructing material into the interior piping.

To flush risers, feed mains, and cross mains, attach 65-mm (2½-in.) hose gate valves to the extreme ends of these lines *[see Figure D.5.3]*. Such valves usually can be procured from the manifold of fire pumps or hose standpipes. As an alternative, an adapter with 65-mm (2½-in.) hose thread and standard pipe thread can be used with a regular gate valve. A length of fire hose without a nozzle should be attached to the flushing connection. To prevent kinking of the hose and to obtain maximum flow, an elbow usually should be installed between the end of the sprinkler pipe and the hose gate valve. Attach the valve and hose so that no excessive strain will be placed on the threaded pipe and fittings. Support hose lines properly.

Where feed and cross mains and risers contain pipe 100 mm, 125 mm, and 150 mm (4 in., 5 in., and 6 in.) in diameter, it could be necessary to use a Siamese with two hose connections to obtain sufficient flow to scour this larger pipe.

Flush branch lines after feed and cross mains have been thoroughly cleared. Equip the ends of several branch lines with gate valves, and flush individual lines of the group consecutively. This eliminates the need for shutting off and draining the sprinkler system to change a single hose line. The hose should be 40 mm (1½ in.) in diameter and as short as practicable. Branch lines can be permitted to be flushed in any order that expedites the work.

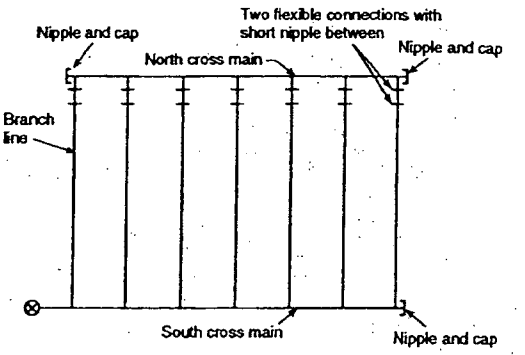

FIGURE D.5.3 Gridded Sprinkler System Piping.

Branch lines also may be permitted to be flushed through pipe 40 mm (1½ in.) in diameter or larger while extended through a convenient window. If pipe is used, 45-degree fittings should be provided at the ends of branch lines. Where flushing branch lines, hammering the pipes is an effective method of moving obstructions.

Figure D.5.3 shows a typical gridded piping arrangement prior to flushing. The flushing procedure is as follows:

(1) Disconnect all branch lines and cap all open ends.
(2) Remove the cap from the east end of the south cross main, flush the main, and replace the cap.
(3) Remove the cap from branch line 1, flush the line, and replace the cap.
(4) Repeat step (3) for the remaining branch lines.
(5) Reconnect enough branch lines at the west end of the system so that the aggregate cross-sectional area of the branch lines approximately equals the area of the north cross main. For example, three 32-mm (1¼-in.) branch lines approximately equal a 65-mm (2½-in.) cross main. Remove the cap from the east end of the north cross main, flush the main, and replace the cap.
(6) Disconnect and recap the branch lines. Repeat step (5), but reconnect branch lines at the east end of the system and flush the north cross main through its west end.
(7) Reconnect all branch lines and recap the cross main. Verify that the sprinkler control valve is left in the open and locked position.

D.5.4 Hydropneumatic Method. The apparatus used for hydropneumatic flushing consists of a hydropneumatic machine, a source of water, a source of compressed air, 25-mm (1-in.) rubber hose for connecting to branch lines, and 65-mm (2½-in.) hose for connecting to cross mains.

The hydropneumatic machine *[see Figure D.5.4(a)]* consists of a 114-dm^3 (4-ft^3) (30-gal) water tank mounted over a 700-dm^3 (25-ft^3) (185-gal) compressed air tank. The compressed air tank is connected to the top of the water tank through a 50-mm (2-in.) lubricated plug cock. The bottom of the water tank is connected through hose to a suitable water supply. The compressed air tank is connected through suitable air hose to either the plant air system or a separate air compressor.

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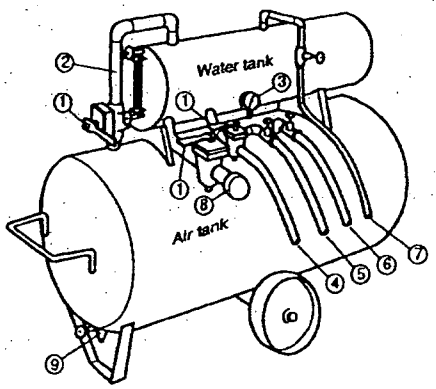

1 Lubricated plug cocks
2 Pipe connection between air and water tanks (This connection is open when flushing sprinkler system.)
3 Air pressure gauge
4 25-mm (1-in.) rubber hose (air type) (Used to flush sprinkler branch lines.)
5 Hose connected to source of water (Used to fill water tank.)
6 Hose connected to ample source of compressed air (Used to supply air tank.)
7 Water tank overflow hose
8 65-mm (2½-in.) pipe connection [Where flushing large interior piping, connect woven jacket fire hose here and close 25-mm (1-in.) plug cock hose connection (4) used for flushing sprinkler branch lines.]
9 Air tank drain valve

FIGURE D.5.4(a) Hydropneumatic Machine.

To flush the sprinkler piping, the water tank is filled with water, the pressure is raised to 6.9 bar (100 psi) in the compressed air tank, and the plug cock between tanks is opened to put air pressure on the water. The water tank is connected by hose to the sprinkler pipe to be flushed. The lubricated plug cock on the discharge outlet at the bottom of the water tank then is snapped open, allowing the water to be "blown" through the hose and sprinkler pipe by the compressed air. The water tank and air tank should be recharged after each blow.

Outlets for discharging water and obstructing material from the sprinkler system should be arranged. With the clappers of dry pipe valves and alarm check valves on their seats and cover plates removed, sheet metal fittings can be used for connection to 65-mm (2½-in.) hose lines or for discharge into a drum [maximum capacity per blow is approximately 114 dm^3 (30 gal)]. If the 50-mm (2-in.) riser drain is to be used, the drain valve should be removed and a direct hose connection made. For wet pipe systems with no alarm check valves, the riser should be taken apart just below the drain opening and a plate inserted to prevent foreign material from dropping to the base of the riser. Where dismantling of a section of the riser for this purpose is impractical, the hydropneumatic method should not be used.

Before starting a flushing job, each sprinkler system to be cleaned should be studied and a schematic plan prepared showing the order of the blows.

To determine that the piping is clear after it has been flushed, representative branch lines and cross mains should be investigated, using both visual examination and sample flushings.

(1) *Branch Lines.* With the yard mains already flushed or known to be clear, the sprinkler branch lines should be flushed next. The order of cleaning individual branch lines should be laid out carefully if an effective job is to be done. In general, the branch lines should be flushed starting with the branch closest to the riser and working toward the dead end of the cross main. *[See Figure D.5.4(b).]* The order for flushing the branch lines is shown by the circled numerals. In this example, the southeast quadrant is flushed first, then the southwest, followed by the northeast, and, finally, the northwest. Air hose 25 mm (1 in.) in diameter is used to connect the machine with the end of the branch line being flushed. This hose air pressure should be allowed to drop to 5.9 bar (85 psi) before the valve is closed. The resulting short slug of water experiences less friction loss and a higher velocity and, therefore, cleans more effectively than if the full 114 dm^3 (30 gal) of water were to be used. One blow is made for each branch line.

(2) *Large Piping.* Where flushing cross mains, fill the water tank completely and raise the pressure in the air receiver to 6.9 bar (690 kPa) (100 psi). Connect the machine to the end of the cross main to be flushed with no more than 15.2 m (50 ft) of 65-mm (2½-in.) hose. After opening the valve, allow air pressure in the machine to drop to zero (0). Two to six blows are necessary at each location, depending on the size and length of the main. In Figure D.5.4(b), the numerals in squares indicate the location and order of the cross main blows. Since the last branch line blows performed were located west of the riser, clean the cross main located east of the riser first. Where large cross mains are to be cleaned, it is best, if practical, to make one blow at 38, one at 39, the next again at 38, then again at 39, alternating in this manner until the required number of blows has been made at each location.

(3) Where flushing cross mains and feed mains, arrange the work so that the water passes through a minimum of right-angle bends. In Figure D.5.4(b), blows at 38 should be adequate to flush the cross mains back to the riser. Do not attempt to clean the cross main from location A to the riser by backing out branch line 16 and connecting the hose to the open side of the tee. If this were to be done, a considerable portion of the blow would pass northward up the 76-mm (3-in.) line supplying branches 34 to 37, and the portion passing eastward to the riser could be ineffective. Where the size, length, and condition of cross mains necessitate blowing from a location corresponding to location A, the connection should be made directly to the cross main corresponding to the 90-mm (3½-in.) pipe so that the entire flow travels to the riser. Where flushing through a tee, always flush the run of the tee after flushing the branch. Note the location of blows 35, 36, and 37 in Figure D.5.4(b). Gridded systems can be flushed in a similar fashion. With branch lines disconnected and capped, begin flushing the branch line closest to the riser (branch line 1 in Figure D.5.3), working toward the most remote line. Then flush the south cross main in Figure D.5.3 by connecting the hose to the east end. Flushing the north cross main involves connecting the hose to one end while discharging to a safe location from the other end.

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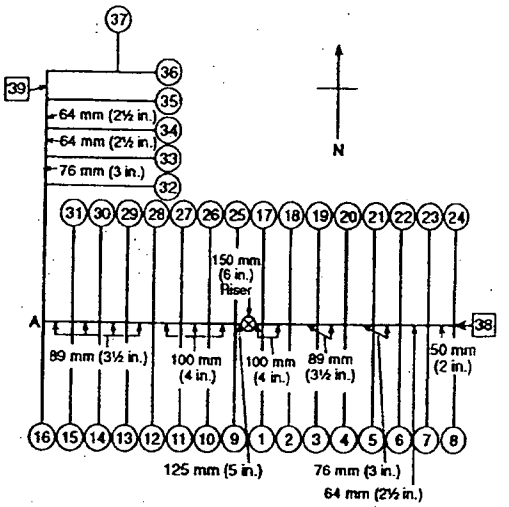

FIGURE D.5.4(b) Schematic Diagram of Sprinkler System Showing Sequence to Be Followed Where Hydropneumatic Method Is to Be Utilized.

Annex E Informational References

E.1 Referenced Publications. The following documents or portions thereof are referenced within this standard for informational purposes only and are thus not part of the requirements of this document unless also listed in Chapter 2.

E.1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 1999 edition.

NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection*, 1999 edition.

NFPA 72®, National Fire Alarm Code®, 1999 edition.

NFPA 780, *Standard for the Installation of Lightning Protection Systems*, 2000 edition.

E.1.2 Other Publications.

E.1.2.1 ASTM Publication. American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

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E.1.2.2 AWWA Publications. American Water Works Association, 6666 West Quincy Avenue, Denver, CO 80235.

AWWA D102, *Standard for Coating Steel Water-Storage Tanks*, 1997.

AWWA, *Manual of Water Supply Practices — M42 Steel Water-Storage Tanks*, 1998.

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Hydraulic Institute Standards for Centrifugal, Rotary and Reciprocating Pumps, 14th edition, 1983.

E.1.2.4 SSPC Publication. Society of Protective Coatings, 40 24th Street, Pittsburgh, PA 15222.

Systems and Specifications, Steel Structures Painting Manual, 1999.

E.2 Informational References. The following documents or portions thereof are listed here as informational resources only. They are not a part of the requirements of this document.

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SSPC Paint 9, *White (or Colored) Vinyl Paint*, 1995.

SSPC-SP 6, *Commercial Blast Cleaning*, 1994.

SSPC-SP 8, *Pickling*, 1991.

SSPC-SP 10, *Near-White Blast Cleaning*, 1994.

E.2.2.3 U.S. Government Publications. U.S. Government Printing Office, Washington, DC 20402.

Bureau of Reclamation Specification VR-3.

Federal Specification TT- P-86, *Specifications for Vinyl Resin Paint*, M-54, 1995.

E.3 References for Extracts. The following documents are listed here to provide reference information, including title and edition, for extracts given throughout this standard as indicated by a reference in brackets [ ] following a section or paragraph. These documents are not a part of the requirements of this document unless also listed in Chapter 2 for other reasons.

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 1999 edition.

NFPA 14, *Standard for the Installation of Standpipe, Private Hydrant, and Hose Systems*, 2000 edition.

NFPA 16, *Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems*, 1999 edition.

NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection*, 1999 edition.

NFPA 820, *Standard for Fire Protection in Wastewater Treatment and Collection Facilities*, 1999 edition.

NFPA 1141, *Standard for Fire Protection in Planned Building Groups*, 1998 edition.

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ROA_01584

DIVISION 15 – MECHANICAL & PLUMBING

PLUMBING – BUDGET MECHANICAL

ROA_01585

WARRANTY AGREEMENT

Project: Belle Hall Condominiums

Owner: Belle Hall Direct 101, LP
Contractor: TCR NC Construction I Limited Partnership

Subcontractor: Budget Mechanical Plumbing, Inc.

Subcontractor hereby expressly warrants and guarantees that all labor, materials, and equipment furnished and work performed in conjunction with the above referenced project are in accordance with the plans, specifications, the Subcontract Agreement and authorized modifications thereto. All labor, materials and equipment shall be free from defects, due to defective materials and/or workmanship, for a period of one (1) year from the date of Certificate of Occupancy for each building/structure, unless otherwise stated in the Subcontract Agreement.

Should any defects develop during the warranty period due to improper workmanship and/or arrangement, the same shall, upon notice, be made good by this Subcontractor at no expense to the Contractor, Owner, or Owner's Representative. Nothing in the above shall be deemed to apply to work or equipment which has been abused, neglected or altered by the Contractor, Owner, or Owner's Representative.

Unless otherwise stated in the Subcontract Agreement, warranty work shall be responded to within twenty-four (24) hours of notification by the Contractor, Owner, or Owner's Representative, including weekends and holidays. Warranty notices received before 10:00 am shall be responded to on the same day. Should Subcontractor fail to respond within twenty-four (24) hours of notification or correct the defective work or equipment within seventy-two (72) hours, the Contractor, Owner, or Owner's Representative shall proceed with the correction of the defective work. All costs associated with this corrective action shall be reimbursed by this Subcontractor or charged against its account. Subcontractor shall remit payment for such charges within five (5) calendar days of notification by the Contractor, Owner, or Owner's Representative.

Signature: James Lynn Ballict

Printed Name: James Lynwood Ballict

Position/Title: President

Date: 13 Dec 2006

Ferguson Enterprises, Inc.
3610 Wrightsboro Road
Augusta, GA 30909

Belle Hall
Operations and Maintenance Manual
Mount Pleasant, SC

Budget Mechanical
733 Tallwood Road
James Island, South Carolina 29412

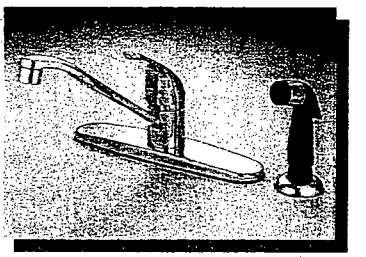
ROA_01587

Kitchen Faucet

PIONEER

PARTS BREAKDOWN SHEET

BUILDER SERIES SINGLE HANDLE KITCHEN FAUCET



882600 SHOWN * ADA

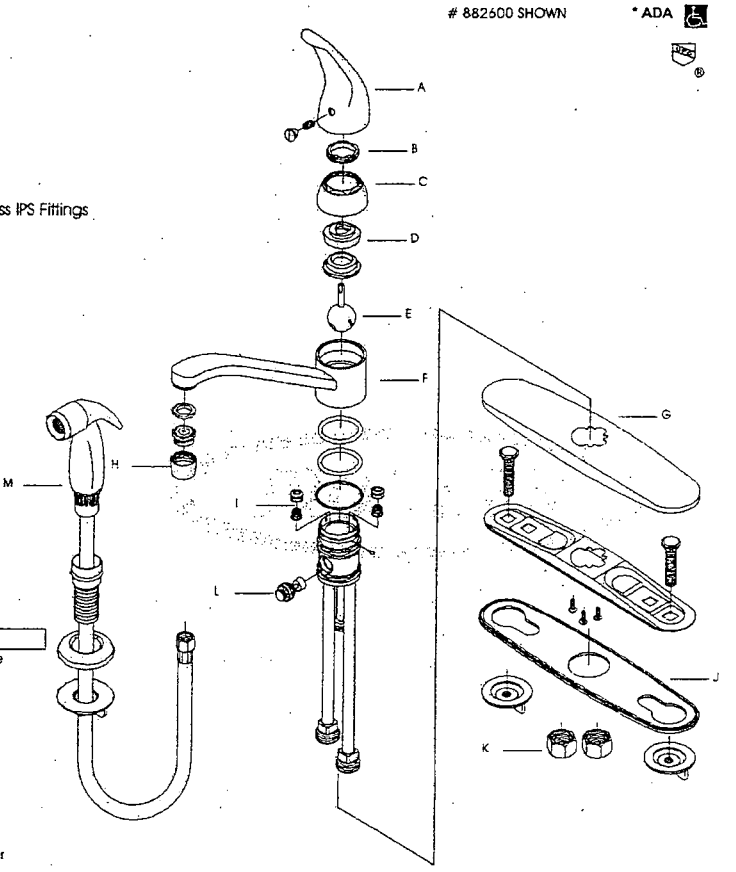
DESCRIPTION
Metal Construction
½" IPS Connections with Brass Supply nuts
Copper Tubing Waterways
6" - 8" Centers
Stainless Steel Ball Operation
Metal Lever Handle
Side Spray
4 Hole Installation
Brass Housing

FLOW
Aerator is limited to 2.0 gpm

STANDARDS
ASME A112.18.1M
ANSI A117.1
ANSI / NSF 61, SECTION 9
IAPMO LISTED
ADA Compliant

PRODUCT NUMBERS
#882600
#882600B Builder Tract Pack
#882600B-P Builder Tract Pack – Less IPS Fittings

FINISHES
CP Chrome



	ITEM #	DESCRIPTION
A	441934	4413 Series Lever Handle
B	882008	Retainer Ring
C	882009	Cap
D	882078	Cam
E	882011	Stainless Steel Ball
F	882033	8820 Series "D" Spout
G	882038	8820 Series Housing
H	220108	Female Thread Aerator
I	882004	Springs and Seats
J	882080	Deck Plate
K	882044	Mounting Kit
L	882651	8826 Series Spray Diverter
M	231403	Side Spray Assembly

Commerce, CA 90040
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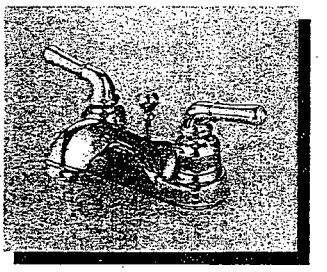
Lavatory Faucet

PIONEER

PARTS BREAKDOWN SHEET

DECO SERIES TWO HANDLE LAVATORY FAUCET



447400 SHOWN * ADA

DESCRIPTION
Metal Construction
½" IPS Connections with Brass Supply nuts
Brass Waterways
4" Centers
1/4 Turn Washerless Operation
Brass Deco Aerator
Deco Lever Handles

FLOW
Aerator limited to 2.0 gpm

STANDARDS
ASME A112.18.1M
ANSI A117.1
ANSI / NSF 61, SECTION 9
IAPMO LISTED

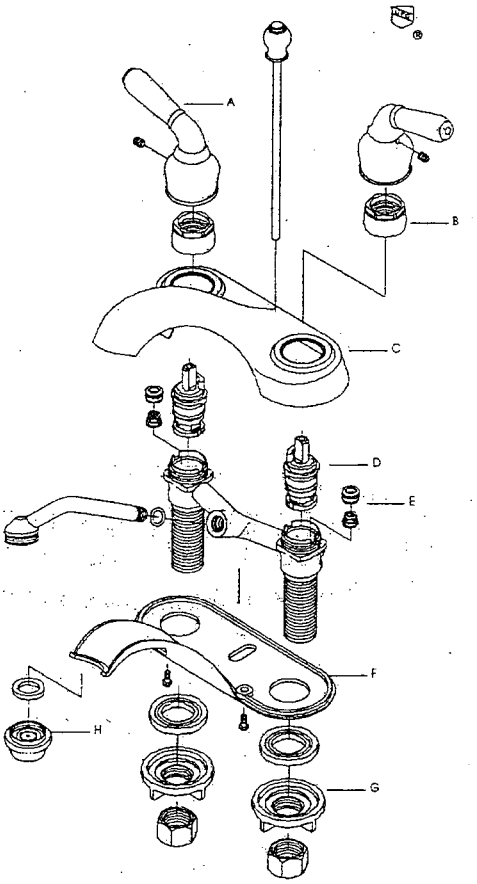
PRODUCT NUMBERS

#447400	Brass Pop-Up Drain Supplied
#447500	Less Pop-Up Drain
#448400CB	Brass Pop-Up Drain Supplied
#448500CB	Less Pop-Up Drain

FINISHES

BN	PVD Brushed Nickel
BP	PVD Black Pearl
CB	Chrome w/ PVD Polished Brass Accents
CP	Chrome
PB	PVD Polished Brass
PN	PVD Polished Nickel
TB	PVD Tuscany Bronze

	ITEM #	DESCRIPTION
A	880234 C,H	8802 Series Handle Hub C,H
	880231	8802 Series Handle Insert
B	447401	Cartridge Bonnet Nut
C	447438	4474 Series Housing
D	447001	Stem Unit - Brass Post
E	882004	Springs and Seats
F	***	Deck Plate
G	221144	Mounting Kit
H	447109	4474 Series Brass Aerator
I	447430	Deco Brass Pop-Up Assembly



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Shower Faucet

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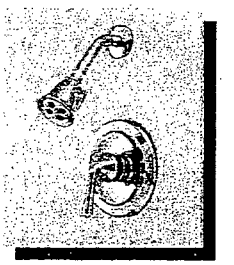
PARTS BREAKDOWN SHEET

BUILDER SERIES PRESSURE BALANCE SHOWER SET



990812DC SHOWN * ADA

DESCRIPTION
Solid Brass Valve
Replaceable Scald Guard Cartridge & Parts
Stainless Steel Pressure Balancing Spool Assembly
Brass Deco Trim
Brass Showerhead
Shower Arm and Flange

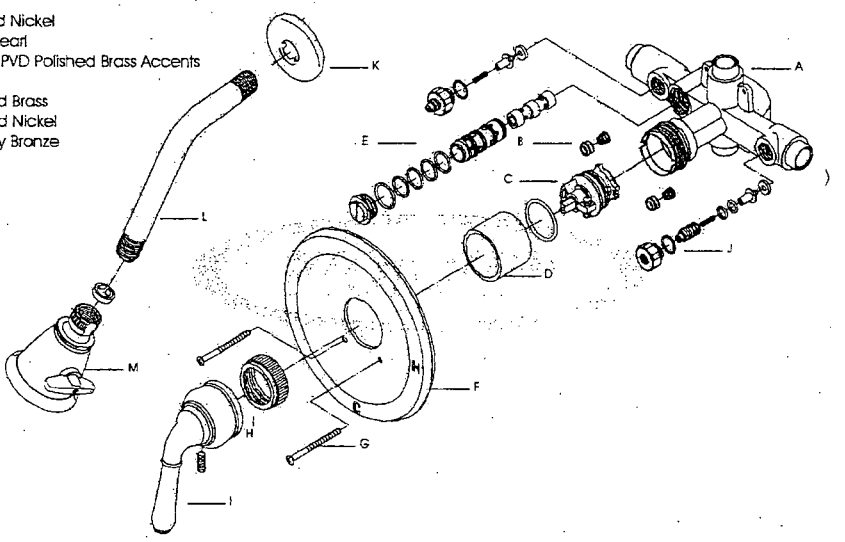
FLOW
Showerhead is limited to 2.5 gpm

STANDARDS
ASME A112.18.1M
ANSI A117.1
ANSI / NSF 61, SECTION 9
IAPMO LISTED

PRODUCT NUMBERS
#990812DC ½" CxC Inlets Brass Screwdriver Stops

FINISHES

BN	PVD Brushed Nickel
BP	PVD Black Pearl
CB	Chrome w/ PVD Polished Brass Accents
CP	Chrome
PB	PVD Polished Brass
PN	PVD Polished Nickel
TB	PVD Tuscany Bronze



	ITEM #	DESCRIPTION
A	996240	All Brass Valve Body – CxC
B	882004	Springs and Seats
C	996101	Cartridge Unit
D	996147	Valve Sleeve Tube
E	996151	Stainless Steel Assembly
F	990654	Face Plate
G	996142	4" SST Screws
H	996141	Valve Retainer Ring
I	996834	Deco Series Handle Hub
	881131	Deco Series Handle Insert
J	996120	Integral Screwdriver Stop
K	241102	Shower Flange
L	241101	Shower Arm
M	242200	Deco Series Brass Showerhead

Commerce, CA 90040
www.pioneerind.com

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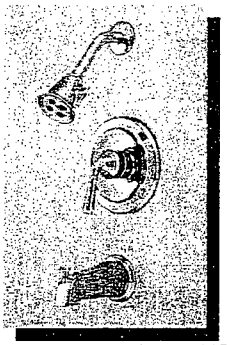
Tub and Shower Faucet

PIONEER

PARTS BREAKDOWN SHEET

DECO SERIES PRESSURE BALANCE TUB & SHOWER SET



990612PN SHOWN *ADA

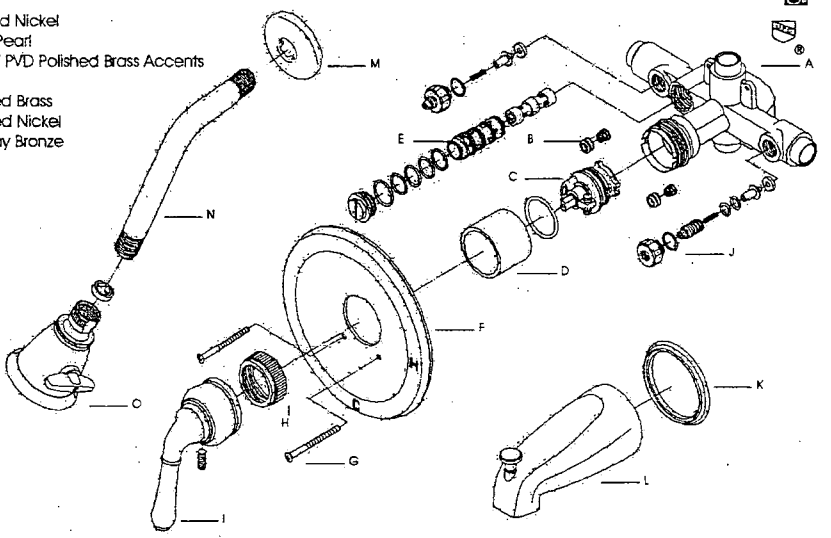
DESCRIPTION
Solid Brass Valve
Replaceable Scald Guard Cartridge & Parts
Stainless Steel Pressure Balancing Spool Assembly
Brass Deco Trim
Diverter Tub Spout
Brass Showerhead
Shower Arm and Flange

FLOW
Showerhead is limited to 2.5 gpm

STANDARDS
ASME A112.18.1M
ANSI A117.1
ANSI / NSF 61, SECTION 9
IAPMO LISTED

PRODUCT NUMBERS
#990612DC ½" CxC Inlets Brass Screwdriver Stops

FINISHES
BN	PVD Brushed Nickel
BP	PVD Black Pearl
CB	Chrome w/ PVD Polished Brass Accents
CP	Chrome
PB	PVD Polished Brass
PN	PVD Polished Nickel
TB	PVD Tuscany Bronze



	ITEM #	DESCRIPTION
A	996240	All Brass Valve Body - CxC
B	882004	Springs and Seats
C	996101	Cartridge Unit
D	996147	Valve Sleeve Tube
E	996151	Stainless Steel Assembly
F	990654	Face Plate
G	996142	4" SST Screws
H	996141	Valve Retainer Ring
I	996834	Deco Series Handle Hub
	881131	Deco Series Handle Insert
J	996120	Integral Screwdriver Stop
K	241564	Brass Tub Spout Flange
L	240105	Diverter Tub Spout - Slip On
M	241102	Shower Flange
N	241101	Shower Arm
O	242200	Deco Series Brass Showerhead

Commerce, CA 90040
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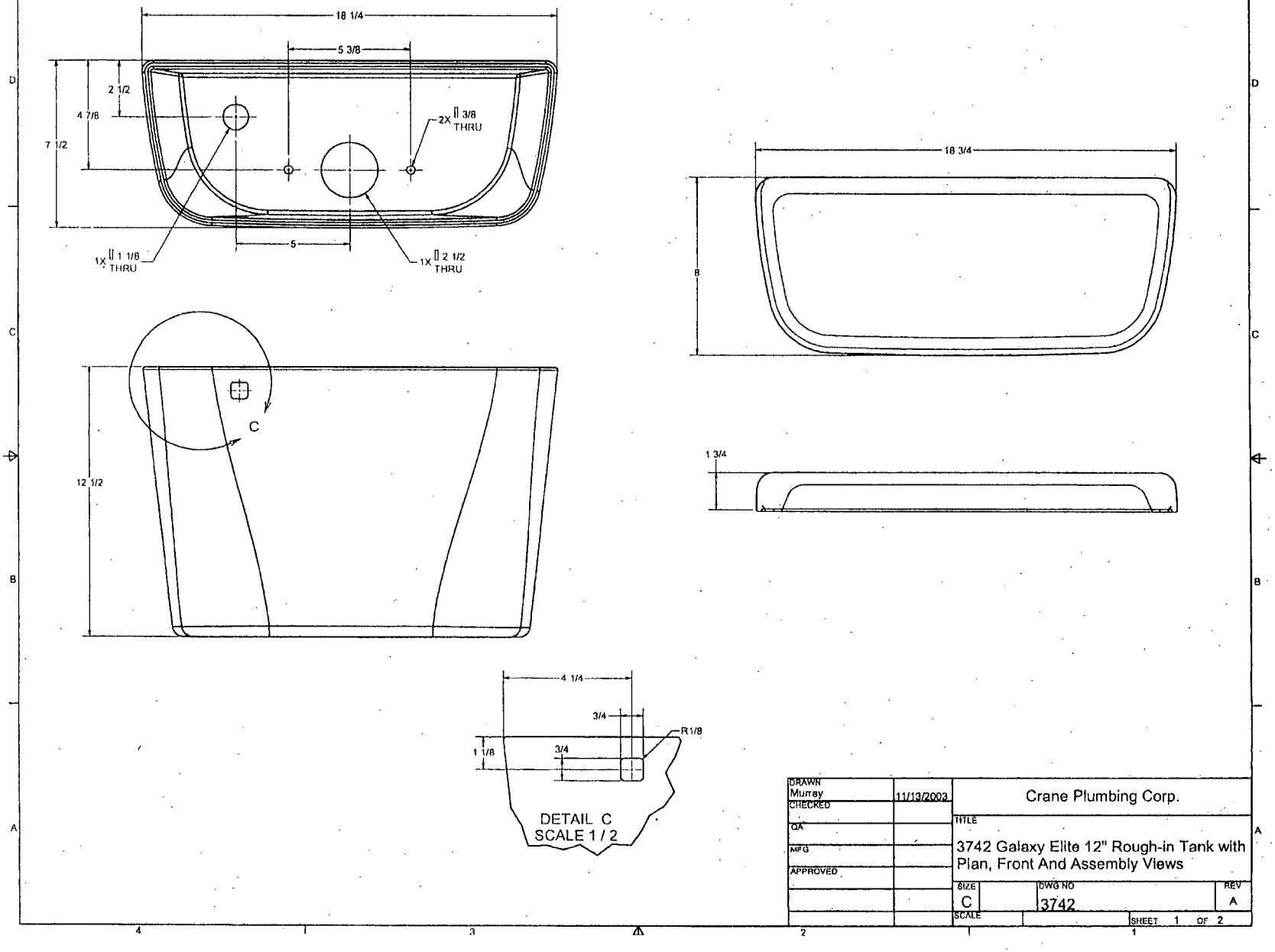
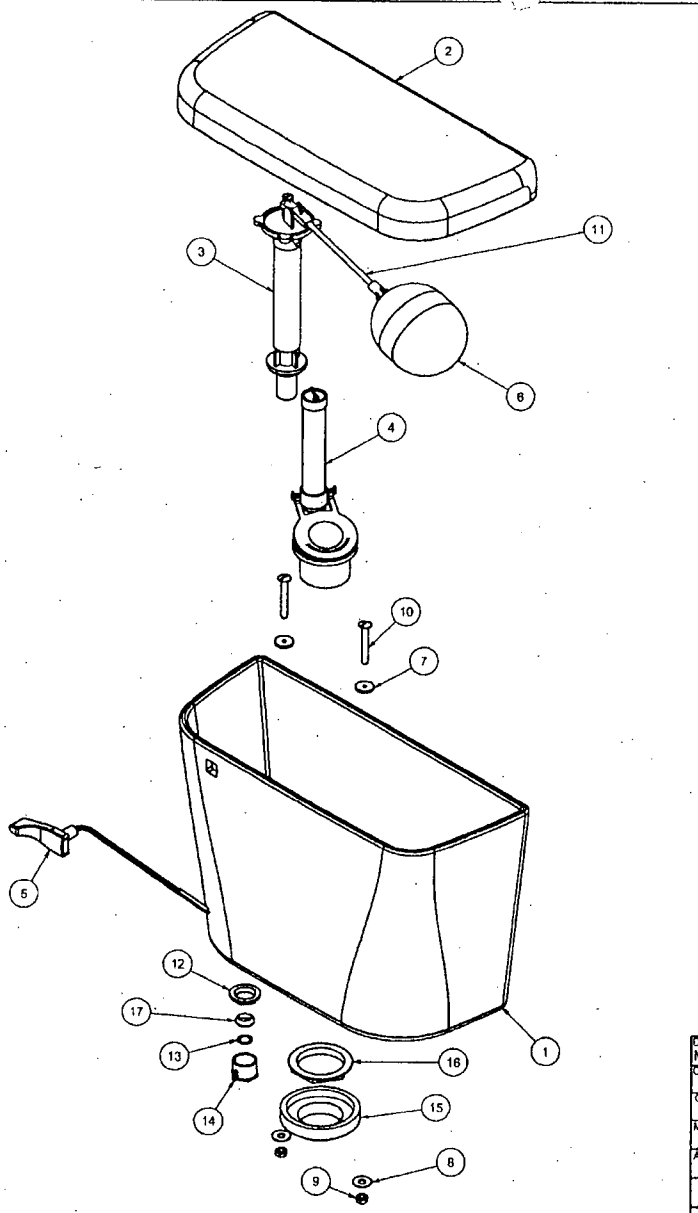
Water Closet


18 1/4
5 3/8
2 1/2
4 7/8
7 1/2
2X ⌀ 3/8 THRU
1X ⌀ 1 1/8 THRU
5
1X ⌀ 2 1/2 THRU
18 3/4
8
1 3/4
C
12 1/2
4 1/4
3/4
R1/8
1 1/8
3/4
DETAIL C
SCALE 1 / 2
DRAWN
Murray
11/13/2003
CHECKED
QA
MFG
APPROVED
Crane Plumbing Corp.
TITLE
3742 Galaxy Elite 12" Rough-in Tank with Plan, Front And Assembly Views
SIZE
C
DWG NO
3742
REV
A
SCALE
SHEET 1 OF 2

ROA_01597



Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	3742	3742 Galaxy Elite Tank
2	1	3742	3742 Galaxy Elite Cover
3	1	P030166	P030166 Ballcock
4	1	P030216	P030216 Flushvalve
5	1	P030385	P030385 Triplever
6	1	P030102	P030102 Floatball 4 In Diameter
7	2	P303411	P030411 Rubber Washer
8	2	P030407	P030407 Steel Washer
9	2	P030406	P030406 5/16 Steel Nut
10	2	P030405	P030405 5/16 Steel Bolt
11	1	P030131	P030131 Float Rod - 1/4" X 6 1/4" Brass
12	1	P030441	P030441 Ballcock Nut
13	1	P030444	P030444 Friction Coupling Washer
14	1	P030442	P030442 Coupling Nut
15	1	P030426	P030426 Tank To Bowl Gasket
16	1	P030446	P030446 Flush Valve Flange Nut
17	1	P030403	P030403 Rubber Cone Gasket

DRAWN Murray	11/13/2003	Crane Plumbing Corp.	
CHECKED		TITLE	
QA		3742 Galaxy Elite 12" Rough-in Tank with Plan, Front And Assembly Views	
MFG		SIZE C	DWG NO 3742 REV A
APPROVED		SCALE	SHEET 2 OF 2

ROA_01598

OBH - O&M 460