Proposed 244,876 S.F. Data Center:

# QTS DEN1 DC2

1140 N GUN CLUB RD
AURORA, COLORADO 80018

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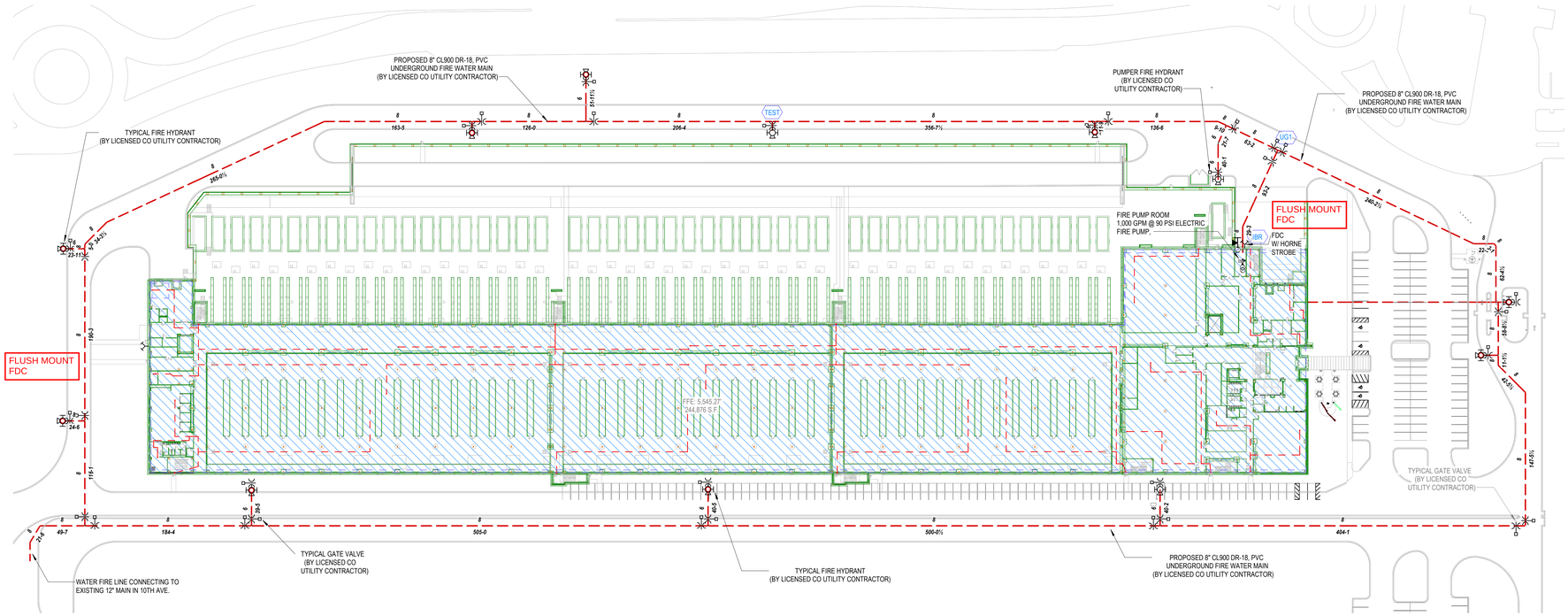
TOTAL SHEETS: 23

WATER FLOW TEST DATED 07/16/2025
PREPARED AND PROVIDED BY Aurora
AND WITNESSED BY Warter

LOCATION:
N Gun Club Rd. & E 14th Ave

ELEVATIONS
HYDRANT ELEVATION: 5540
BUILDING ELEVATION: 5544

ACTUAL:
STATIC PRESSURE: 71 PSI
RESIDUAL PRESSURE: 58 PSI
FLOW: 4000 GPM




## KEY TO UNDG. SYMBOLS

- UNDG. LEAD-IN LOCATION
- SIAMESE FIRE DEPT. CONNECTION
- STORZ FIRE DEPT. CONNECTION
- UNDG. GATE VALVE W/ ROADWAY BOX
- UNDG. GATE VALVE W/ YARD P.I.V.
- FIRE HYDRANT

ALL UNDERGROUND MAINS SHOWN ON THIS COVER ARE FOR HYDRAULIC PURPOSES ONLY AND INSTALLED BY OTHERS (LICENSED UTILITY CONTRACTOR). FOR DETAILED INSTALLATION DRAWINGS OF NEW UNDERGROUND MAINS REFER TO CIVIL DRAWINGS.

NORTH

1 SITE PLAN
1" = 60'-0"

15' 0' 30' 60'
SCALE 1" = 60'-0"

**SCOPE OF WORK:**

SHAMBAUGH & SON, LP IS TO PROVIDE AND INSTALL:
- **(16) PREACTION PIPE SYSTEM TO PROTECT DATA HALLS, ELECTRICAL ROOMS, SEE DESIGN TABLES.**
- (4) WET PIPE SYSTEM TO PROTECT OFFICES AREA. SEE DESIGN TABLES.
- (2) DRY PIPE SYSTEMS TO PROTECT DOCK AREAS. SEE DESIGN TABLES.
- (1) 1,000 GPM @ 90 PSI PRIMARY ELECTRIC FIRE PUMP.
- THERE ARE (6) INTERIOR HOSE VALVES ON LEVEL 1 & THERE ARE (8) INTERIOR HOSE VALVES ON LEVEL 1, PER LOCAL A.H.J.
- WATER FLOW AND SUPERVISORY SWITCHES (WIRED BY OTHERS)

WORK PROVIDED AND INSTALLED BY OTHERS:
- ALL UNDERGROUND WATER PIPING
- FIRE PUMP HOUSES CONSTRUCTION, INCLUDING ALL MECHANICAL AND ELECTRICAL WORK
- CONCRETE PUMP PADS AND GROUTING OF PUMP BASES
- ALL FIRE ALARM WORK
- WIRING OF ALL WATER FLOW AND SUPERVISORY SWITCHES INSTALLED BY SHAMBAUGH
- PAINTING OF SPRINKLER PIPE
- INSTALLATION AND REMOVAL OF TEMPORARY COVERING TO PROTECT SPRINKLERS FROM PAINTING
- FIRE EXTINGUISHERS

CODE INFORMATION:
- 2023 NATIONAL FIRE PROTECTION ASSOCIATION NATIONAL ELECTRIC CODE
- 2021 INTERNATIONAL FIRE PREVENTION CODE
- NFPA 13 - 2019 EDITION "INSTALLATION OF SPRINKLER SYSTEMS"

BUILDING DESIGN INFORMATION:
- BUILDING AREA - **244,876 S.F.**
- BUILDING USE GROUP: B (OFFICE), S-2 (ELECTRONIC DATA PROCESSING)
- CONSTRUCTION TYPE PER NFPA # 13 - NON COMBUSTIBLE (METAL DECK ON STEEL BEAMS, GIRDERS, & BAR JOISTS. CONCRETE SLAB) UNOBSTRUCTED WITH SMOOTH CEILINGS AS DEFINED IN NFPA 13.
- CONSTRUCTION TYPE PER IBC - IIB NONCOMBUSTIBLE UNPROTECTED
- NUMBER OF STORIES - (2) TWO
- BUILDING HEIGHT - 86'-0" TO TOP/STEEL AT PEAK

SPRINKLER SYSTEM PIPE AND FITTING NOTES
- ALL MATERIAL AND RELATED EQUIPMENT SHALL BE UL APPROVED AND LISTED FOR FIRE PROTECTION USE.

PIPING:
- 1" THREADED BRANCH LINE PIPING SHALL BE BLACK STEEL SCH. 40 PIPE, MANUFACTURED PER ASTM-A135 STANDARDS.
- 1½" - 10" PREACTION & DRY PIPING - BLACK SCH. 40 (CRR 1.0 OR GREATER) WITH GROOVED END AND WELDED OUTLETS.
- 2½"-10" WET PIPING - **BLACK SCH. 10 WITH GROOVED ENDS AND WELDED OUTLETS.**

VALVES
- ALL VALVES CONTROLLING WATER TO SPRINKLERS SHALL BE TAMPERED (WIRING BY OTHERS). ALL VALVES SHALL BE ACCESSIBLE AT ALL TIMES AND PERMANENTLY IDENTIFIED.

HYDRAULIC PLACARDS
- SHAMBAUGH & SON, L.P. IS TO PROVIDE HYDRAULIC PLACARDS AS PER HYDRAULIC CALCULATIONS - TO BE LOCATED ON THE FIRE SPRINKLER RISERS.

SPRINKLER HEAD WRENCH
- SHAMBAUGH & SON, L.P. IS TO PROVIDE SPRINKLER HEAD WRENCHES FOR EACH TYPE OF SPRINKLER HEADS USED THROUGHOUT THE PROJECT. SPRINKLER HEAD WRENCHES ARE ONLY TO BE USED ON THE SPRINKLER HEADS FOR WHICH THEY ARE MADE AND FOR NO OTHER USE. IF SPRINKLER HEADS ARE TO BE REMOVED BY PERSONS OTHER THAN SHAMBAUGH & SON, L.P., THE USE OF ANY OTHER TOOL (INCLUDING BUT NOT LIMITED TO CHANNEL-LOCKS AND CRESCENT WRENCH) SHALL IMMEDIATELY INDEMNIFY SHAMBAUGH & SON, L.P. AGAINST ANY LOSSES DUE TO REMOVAL AND REPLACEMENT OF THE SPRINKLERS.

AUXILIARY DRAINS
- AUXILIARY DRAINS SHALL BE PROVIDED WHERE CHANGING IN ELEVATIONS PREVENTS DRAINAGE THROUGH MAIN DRAIN.

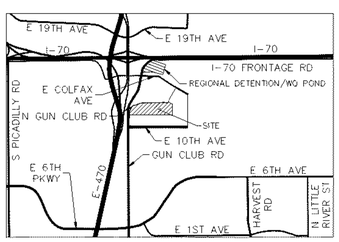
OVERHEAD PIPE TESTING
- ALL PIPE IS TO BE HYDROSTATICALLY TESTED AT 225 PSI FOR 2 HOURS.
- THE LOCAL FIRE DEPARTMENT IS TO BE NOTIFIED 48 HOURS IN ADVANCE OF THE TEST
- WHEN THE SYSTEM(S) IS (ARE) COMPLETE AND IN THE PRESENCE OF THE FIRE MARSHALL, A 2" MAIN DRAIN TEST WILL BE PROVIDED.
- ALL SPRINKLER SYSTEM WORK UNDER THE SCOPE OF WORK SHALL BE FIELD VERIFIED BY INSPECTION PERSONAL.

UNDERGROUND TESTING AND FLUSHING
- THE AUTHORITY HAVING JURISDICTION SHALL BE NOTIFIED (BY UNDERGROUND PIPING INSTALLING CONTRACTOR) PRIOR TO COVERING THE UNDERGROUND FIRE MAIN AND THRUST BLOCKS FOR A VISUAL INSPECTION AT THE AUTHORITIES DISCRETION.
- ALL UNDERGROUND PIPE IS TO BE TESTED AND FLUSHED PER NFPA 24 STANDARDS BY THE INSTALLING CONTRACTOR BEFORE SHAMBAUGH & SON, L.P. CONNECTS ANY OVERHEAD PIPING TO IT.
- FLUSHING OPERATION SHALL BE CONTINUED FOR A SUFFICIENT TIME TO ENSURE THOROUGH CLEANING. THE MINIMUM RATE OF THE FLOW SHALL NOT BE LESS THAN REQUIRED PER NFPA 13 (2019) TABLE 6.10.2.1.3.
- TESTING OF THE NEW UNDERGROUND (BY UNDERGROUND INSTALLING CONTRACTOR) SHALL BE PER NFPA AND WITNESSED BY THE AUTHORITY HAVING JURISDICTION.
- COMPLETED CONTRACTOR'S MATERIAL TEST CERTIFICATE SHALL BE PROVIDED FOR THE BELOW GROUND & ABOVE GROUND PIPING TO THE A.H.J. PRIOR TO ACCEPTANCE TESTING.

NFPA 25
- THE OWNER WILL BE PROVIDED WITH THE APPROPRIATE MAINTENANCE INFORMATION AND A COPY OF NFPA # 25 - STANDARD FOR THE INSPECTION, TESTING, AND MAINTENANCE OF WATER-BASED FIRE PROTECTION SYSTEMS.

FITTINGS
- THREADED BRANCH LINE FITTINGS SHALL BE D.I. THREADED, CLASS 125 STANDARD, MANUFACTURED PER ANSI B16.4, U.L. LISTED FOR FIRE PROTECTION USE UP TO 175 PSI WORKING PRESSURE.
- CROSS MAIN FITTINGS SHALL BE VICTAULIC "FIRELOCK" GROOVED FITTINGS UL/FM APPROVED TO 300 PSI FOR FIRE PROTECTION SERVICE WITH VICTAULIC "FIRELOCK" RIGID COUPLINGS UL/FM APPROVED TO 300 PSI FOR FIRE PROTECTION SERVICE. GASKETS SHALL BE "GRADE E (TYPE A)" EPDM RUBBER COMPOUND RATED AT -30 DEG F to +150 DEG F.
- WELDED LINE FITTINGS SHALL BE VICAULIC GROOVED INSTALLATION-READY FITTINGS UL/FM APPROVED TO 300 PSI FOR FIRE PROTECTION SERVICE. GASKETS SHALL BE "GRADE E (TYPE A) EPDM RUBBER COMPOUND RATED AT -30 DEG F TO +150 DEG F.
- CROSS MAIN AND BRANCH LINE WELDED OUTLETS SHALL BE WELDED BRANCH OUTLET FITTINGS, MERIT WELD MISER TEE-LET, UL/FM APPROVED TO 300 PSI FOR FIRE PROTECTION.
- FLANGED FITTING SHALL BE CAST IRON, CLASS 125 (STANDARD) MANUFACTURED PER ANSI B16.1 AND MARKED 125.

HANGERS
- HANGER RINGS TO BE ADJUSTABLE SWIVEL RING CADIUM PLATED AS MANUFACTURED BY ERICO HANGER.
- HANGER ROD TO BE 3/8" A.T. ROD FOR PIPE DIAMETERS 4" AND SMALLER, ½" A.T. ROD FOR PIPE DIAMETERS 6" & 8", AND 5/8" A.T. ROD FOR PIPE DIAMETERS 10".
- ALL HANGER LOCATIONS TO BE PER NFPA 13 (2019).
- WHERE A BRANCH LINE ABOVE A CEILING SUPPLIES SPRINKLERS IN A PENDENT POSITION BELOW THE CEILING, THE HANGER ASSEMBLY SUPPORTING THE PIPE SUPPLYING THE END SPRINKLER IN A PENDENT POSITION SHALL BE OF A TYPE THAT PREVENTS UPWARD MOVEMENT OF THE PIPE.
- THIS CONTRACT DOES NOT INCLUDE SUPPLYING AND INSTALLATION OF ANY MATERIALS OR DEVICES TO IMPROVE THE STRUCTURAL STRENGTH OF THE BUILDING TO ENABLE IT TO BEAR THE WEIGHT OF THE SPRINKLER SYSTEM.




Aurora Water — City of Aurora
Planning & Engineering
26791 E Quincy Ave
Aurora, CO 80015
303.739.7478

SITE: N Gun Club Rd & E 14th Ave
HYDRANT: 95U-06
SCENARIO: 2024 Summer Sky
DATE: 07-16-2025

| Hydraulic Zone | Fire-Flow Demand (gpm) | Static Pressure (psi) | Fire-Flow Demand (mgd) | Residual Pressure (psi) | Available Flow at Hydrant @ 20 psi (gpm) |
|---|---|---|---|---|---|
| 2 | 7,500 | 77 | 2.16 | 65 | 8,500 |
| 3 | 5,500 | 71 | 3.60 | 64 | 6,500 |
| 4 | 4,000 | 71 | 5.76 | 58 | 5,500 |

The City of Aurora performs fireflow simulations on the City's Water Distribution Model, using InfoWater Pro software by Autodesk, Inc. The model developed from pipes and node elevations from the City's GIS system, design drawings for pumps and tanks, and diurnal demand patterns from SCADA and historical use records. Comparing the model's performance with SCADA data validates the model. Fireflow simulations are performed under a maximum day demand scenario. These pressures may differ slightly than actual pressures measured in the field.

Warranty: The City of Aurora, Colorado makes no warrantees or guarantees, express or implied, as to the completeness, accuracy, or correctness of this data, nor shall the city incur any liability from any incorrect, incomplete or misleading information contained therein. The City makes no warrantee , either express or implied, of the value, design, condition, title, merchantability, or fitness for a particular purpose. The City shall not be liable for any direct, indirect, incidental, consequential, punitive, or special damages, whether foreseeable or unforeseeable, arising out of the authorized or unauthorized use of this data or the inability to use this data or out of any breach of warranty, whatsoever.

Provide a full size set of legible approved construction documents **PRINTED IN COLOR** for review by the Field Inspector.

Field Inspection consultation is available upon request; call (303) 739-7420 to schedule a consultation.

**COA Adopted Codes for this project:**
**ICC-2021 - NEC-2023**
**NFPA 13-2019 - NFPA 72-2019**
**COA Amendments 22 & 66**

Code violations that are found during the inspection are required to be corrected. Permit issuance does not grant approval of code violations.

## AHJ APPROVAL

**City of Aurora Building Division**
**Project:** *QTS DEN1 DC2 FSPK*
**Address:** *1140 N GUN CLUB RD*
**Occupancy Group:** *S-2*
**Construction Type:** *IIB SPK*
**RSN:** *1975523*
**Permit:** *2026 2513934-CM04*

**City of Aurora Building Division**
**Reviewed for Code Compliance**
**Approved as Noted:** *chorst*
**Date:** *May 28, 2026*
**2021 INTERNATIONAL CODES & 2023 NEC**

I certify to the best of my knowledge, information, and belief that the design of this system complies with all applicable provisions of NFPA standards and local fire codes.

*Dennis T. Scherr*
Dennis T. Scherr
NICET Level IV
Water-Based Systems Layout
Cert. # 113016 Exp. 3/1/2029

Stamp or Seal

MULTI-JURISDICTIONAL ID# 1002183508 EXP 9/1/26
LICENSE# 2001762-023-140
NV STATE FIRE MARSHAL REG. # G 583

*Eric Velasco*
Signature
ERIC VELASCO
NICET LEVEL II, #153055
WATER-BASED SYSTEMS LAYOUT
EXPIRATION DATE: 09/01/2026

SYMBOLS LEGEND:
= Hanger with rod length
= Trapeze Hanger Location
= Hydraulic Reference point
Abbreviations:
TOS = Top of Steel BOW = Bottom of Wood
BOS = Bottom of Steel BOC = Bottom of Concrete
BOP = Bottom of Purlin BOD = Bottom of Deck
TOW = Top of Wood
X" TOS = Centerline of pipe below top of steel
+X'-X" AFF = Centerline of pipe above finished floor

| No. | Date | By | Description |
|---|---|---|---|
| 1 | 11/12/25 | NC | ISSUED FOR APPROVAL |
| 2 | 02/12/26 | NC | AHJ COMMENTS |
| 3 | 04/08/26 | NC | AHJ COMMENTS - REV 2 |
| 4 | 05/06/26 | NC | ISSUED FOR APPROVAL |

Company
S&S SHAMBAUGH & SON, L.P.
CONTRACTORS · ENGINEERS
5460 DESERT POINT DR, LAS VEGAS, NV 89118
P. 702-832-4545 www.shambaugh.com
**FIRE PROTECTION - FIRE ALARM**

Date: 05/06/26
Designed: NC
Checked: EV/DS

QTS DEN1 - DC2

1140 N GUN CLUB RD
AURORA, COLORADO 80018

FIRE PROTECTION SYSTEMS

SITE PLAN / GENERAL NOTES

Project Number: 227317

Sheet Number: FP1.00

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Autodesk Docs://227317-QTS DEN1 DC2/227317 QTS DEN1 - DC2.rvt

Plotted: 5/6/2026 1:32:56 PM

## FIRE PROTECTION SYMBOLS

| SYMBOL | DESCRIPTION |
|---|---|
| | UP OR DOWN IN PIPING w/ TEE |
| | UP OR DOWN IN PIPING w/ ELBOW |
| | PIPE HANGER LOCATIONS |
| | TRAPEZE HANGER LOCATIONS |
| | GROOVED COUPLING LOCATION |
| | FIRE SPRINKLER SYSTEM RISER |
| | NEW PIPING |
| | EXISTING PIPING |
| | 2 WAY SWAY BRACE |
| | 4 WAY SWAY BRACE |
| | BRANCHLINE RESTRAINT |
| | SMOKE PARTITION |
| | FULL-HEIGHT MASONRY WALL |
| | FULL-HEIGHT GYP BOARD WALL |
| | 1-HOUR FIRE-RATED WALL |
| | 2-HOUR FIRE-RATED WALL |
| | 3-HOUR FIRE-RATED WALL |
| | FIRE DEPARTMENT CONNECTION (FDC) |
| | ELECTRIC BELL |

ABBREVIATION LEGEND:

BOH - BACK OF HOUSE
FOH - FRONT OF HOUSE
TOS - TOP OF STEEL
AFF - ABOVE FINISHED FLOOR
BOD - BOTTOM OF DECK

### Design Criteria for Light Hazard, Wet-Pipe, Horizontal Ceilings greater than 20'-0" high.

Area: OFFICE SPACES, LOBBIES, COORIDORS, RESTROOMS, ETC.
Sprinklers: Quick Response
C-factor used in calculations: 120 (Wet-pipe system, black steel pipe)
DENSITY USED IN CALCULATIONS: .10 GPM PER SQ. FT.
REMOTE AREA USED IN CALCULATIONS: 1500 SQ. FT.
Hose Stream Allowance: 100 GPM outside hose

### Light Hazard Storage Allowed:

None

### Design Criteria for Ord. Haz. Group 1, Preaction, Horizontal Ceilings.

Area: DATA HALLS
Sprinklers: Quick Response
C-factor used in calculations: 100 (Dry-pipe system, black steel pipe)
Density before any adjustments: .15 GPM per SQ. FT.
Remote Area before any adjustments: 1500 SQ. FT.
Remote Area increased by 30% for a dry-pipe or preaction system.
DENSITY USED IN CALCULATIONS: .15 GPM PER SQ. FT.
REMOTE AREA USED IN CALCULATIONS: 1950 SQ. FT.
Hose Stream Allowance: 250 GPM outside hose

### Ordinary Hazard Group 1 Storage Allowed:

Class 1 Commodities solid piled, palletized, bin box, shelf, single, double, multi-row rack, and back to back shelf storage to 12'-0" high.
Class 2 Commodities solid piled, palletized, bin box, shelf, single, double, multi-row rack, and back to back shelf storage to 10'-0" high.

### Ordinary Hazard Group 1 Design Criteria

System Type: Wet-Pipe
Area: MECHANICAL ROOMS, RISER ROOMS, MECHANICAL SUPPORT
Density used in calculations: 0.15 GPM/SQ. FT.
Remote Area used in calculations: 1950 SQ. FT.
Hose Stream Allowance: 250 GPM outside hose
Sprinklers: Quick Respnse, Standard Spray, 130 SQ. FT. max. spacing, K5.6, 200°F
C-factor used in calculations: 120 (Wet-Pipe system, black steel pipe)
Max. Ceiling Height: Any
Density before any adjustments: 0.15 GPM/SQ. FT.
Remote Area before any adjustments: 1500 SQ. FT.
Adjustments to remote area (adjustments are compounded):
☒ Remote Area increased 30% for roof or ceiling slope greater than 2:12
☐ Remote Area reduced for quick response sprinklers, wet-pipe system, Ordinary Hazard and ceiling height 20'-0" or less (max. reduction 40%):

### Ordinary Hazard Group 1 Storage Allowed:

Class 1 Commodities solid piled, palletized, bin box, shelf, single, double, multi-row rack, and back to back shelf storage to 12'-0" high.
Class 2 Commodities solid piled, palletized, bin box, shelf, single, double, multi-row rack, and back to back shelf storage to 10'-0" high.

### Design Criteria for Ord. Haz. Group 2, Preaction, Horizontal Ceilings.

Area: ELECTRICAL, IDF, GALLERIES
Sprinklers: Standard Response, Standard Spray, 130 SQFT. Max Spacing, k5.6, 212°
C-factor used in calculations: 100 (Dry-pipe system, black steel pipe)
Density before any adjustments: .20 GPM per SQ. FT.
Remote Area before any adjustments: 1500 SQ. FT.
Remote Area increased by 30% for a dry-pipe or preaction system.
DENSITY USED IN CALCULATIONS: .15 GPM PER SQ. FT.
REMOTE AREA USED IN CALCULATIONS: 1950 SQ. FT.
Hose Stream Allowance: 250 GPM outside hose

### Ordinary Hazard Group 2 Storage Allowed:

Class 1 Commodities solid piled, palletized, bin box, shelf, single, double, multi-row rack, and back to back shelf storage to 12'-0" high.
Class 2 Commodities solid piled, palletized, bin box, shelf, single, double, multi-row rack, and back to back shelf storage to 12'-0" high.
Class 3 Commodities solid piled, palletized, bin box, shelf, single, double, multi-row rack, and back to back shelf storage to 12'-0" high.
Class 4 Commodities single, double, multi-row rack, and back to back shelf storage to 10'-0" high.
Class 4 Commodities palletized, bin box, shelf, and solid piled storage to 12'-0" high, 32'-0" maximum ceiling height.
Group A Plastics Cartoned Unexpanded and Expanded solid piled, palletized, bin box, shelf, single, double, multi-row rack, and back to back shelf storage to 5'-0" high.
Group A Plastics Exposed Unexpanded and Expanded solid piled, palletized, bin box, shelf, single, double, multi-row rack, and back to back shelf storage to 5'-0" high.

Idle wood pallet storage allowed:
On floor, maximum 6'-0" high and each pile of no more than four stacks shall be separated from other wood pallet piles by at least 8'-0" of clear space or 25'-0" of commodity.

Idle plastic pallet storage allowed:
On floor, maximum 4'-0" high and each pile of no more than two stacks shall be separated from other plastic pallet piles by at least 8'-0" of clear space or 25'-0" of commodity. Roof sprinklers must be high temperature rated sprinklers.

### Design Criteria for Ord. Haz. Group 2, Wet-Pipe, Horizontal Ceilings greater than 20'-0" high.

Area: MISC.
Sprinklers: Standard Response
C-factor used in calculations: 120 (Wet-pipe system, black steel pipe)
DENSITY USED IN CALCULATIONS: .20 GPM PER SQ. FT.
REMOTE AREA USED IN CALCULATIONS: 1500 SQ. FT.
Hose Stream Allowance: 250 GPM outside hose

### Ordinary Hazard Group 2 Storage Allowed:

Class 1 Commodities solid piled, palletized, bin box, shelf, single, double, multi-row rack, and back to back shelf storage to 12'-0" high.
Class 2 Commodities solid piled, palletized, bin box, shelf, single, double, multi-row rack, and back to back shelf storage to 12'-0" high.
Class 3 Commodities solid piled, palletized, bin box, shelf, single, double, multi-row rack, and back to back shelf storage to 12'-0" high.
Class 4 Commodities solid piled, palletized, bin box, shelf, single, double, multi-row rack, and back to back shelf storage to 10'-0" high, 15'-0" maximum ceiling height.
Group A Plastics Cartoned Unexpanded and Expanded solid piled, palletized, bin box, shelf, single, double, multi-row rack, and back to back shelf storage to 10'-0" high, 20'-0" maximum ceiling height.
Group A Plastics Exposed Unexpanded and Expanded solid piled, palletized, bin box, shelf, single, double, multi-row rack, and back to back shelf storage to 12'-0" high, 17'-0" maximum ceiling height.
Group A Plastics Cartoned Unexpanded and Expanded solid piled, palletized, bin box, shelf, and back to back shelf storage to 12'-0" high, 32'-0" maximum ceiling height.
Group A Plastics Exposed Unexpanded and Expanded solid piled, palletized, bin box, shelf, single, double, multi-row rack, and back to back shelf storage to 5'-0" high.
Group A Plastics Exposed Unexpanded and Expanded solid piled, palletized, bin box, shelf, and back to back shelf storage to 8'-0" high, 28'-0" maximum ceiling height.
Group A Plastics Exposed Unexpanded and Expanded solid piled, palletized, bin box, shelf, single, double, multi-row rack, and back to back shelf storage to 10'-0" high, 15'-0" maximum ceiling height.
Group A Plastics Exposed Unexpanded solid piled, palletized, bin box, shelf, single, double, multi-row rack, and back to back shelf storage to 10'-0" high, 20'-0" maximum ceiling height.
Group A Plastics Exposed Unexpanded and Expanded solid piled, palletized, bin box, shelf, and back to back shelf storage to 12'-0" high, 17'-0" maximum ceiling height.
Group A Plastics Exposed Unexpanded and Expanded single, double, and multi-row rack to 12'-0" high, 17'-0" maximum ceiling height.

Idle wood pallet storage allowed:
On floor, maximum 6'-0" high and each pile of no more than four stacks shall be separated from other wood pallet piles by at least 8'-0" of clear space or 25'-0" of commodity.

Idle plastic pallet storage allowed:
On floor, maximum 4'-0" high and each pile of no more than two stacks shall be separated from other plastic pallet piles by at least 8'-0" of clear space or 25'-0" of commodity. Roof sprinklers must be high temperature rated sprinklers.

### Design Criteria for Extra Hazard Group 1, Horizontal Ceilings.

3

Area: LOADING DOCS & ASSOCIATED ADJACENT STORAGE ROOM
Sprinklers: Standard Response
C-factor used in calculations: 100 ( Preaction pipe system, black steel pipe)
Density before any adjustments: .30 GPM per SQ. FT.
Remote Area before any adjustments: 2500 SQ. FT.
Remote Area decreased by 25% (not less than 2000 sq. ft.) for use of 286° F sprinklers
DENSITY USED IN CALCULATIONS: .30 GPM PER SQ. FT.
REMOTE AREA USED IN CALCULATIONS: 3302 SQ. FT.
Hose Stream Allowance: 500 GPM outside hose

### Extra Hazard Group 1 Storage Allowed:

No storage allowed.

Code information:
- NFPA 855 (2020) 4.11.2.1

### Design Criteria for Extra Hazard Group 2, Preaction-Pipe, Horizontal Ceilings.

Area: MISC. STORAGE
Sprinklers: Standard Response
C-factor used in calculations: 100 ( Preaction -pipe system, black steel pipe)
Density before any adjustments: .40 GPM per SQ. FT.
Remote Area before any adjustments: 2500 SQ. FT.
Remote Area decreased by 25% (not less than 2000 sq. ft.) for use of 286° F sprinklers
DENSITY USED IN CALCULATIONS: .20 GPM PER SQ. FT.
REMOTE AREA USED IN CALCULATIONS: 1618 SQ. FT.
Hose Stream Allowance: 500 GPM outside hose

### Extra Hazard Group 2 Storage Allowed:

Class 1 Commodities solid piled, palletized, bin box, shelf, single, double, multi-row rack, and back to back shelf storage to 12'-0" high.
Class 2 Commodities solid piled, palletized, bin box, shelf, single, double, multi-row rack, and back to back shelf storage to 12'-0" high.
Class 3 Commodities solid piled, palletized, bin box, shelf, single, double, multi-row rack, and back to back shelf storage to 12'-0" high.
Class 4 Commodities solid piled, palletized, bin box, shelf, single, double, multi-row rack, and back to back shelf storage to 12'-0" high, 32'-0" maximum ceiling height.
Group A Plastics Cartoned Unexpanded and Expanded solid piled, palletized, bin box, shelf, single, double, multi-row rack, and back to back shelf storage to 10'-0" high, 20'-0" maximum ceiling height.
Group A Plastics Cartoned Unexpanded and Expanded solid piled, palletized, bin box, shelf, single, double, multi-row rack, and back to back shelf storage to 12'-0" high, 17'-0" maximum ceiling height.
Group A Plastics Cartoned Unexpanded and Expanded solid piled, palletized, bin box, shelf, and back to back shelf storage to 12'-0" high, 32'-0" maximum ceiling height.
Group A Plastics Exposed Unexpanded and Expanded solid piled, palletized, bin box, shelf, single, double, multi-row rack, and back to back shelf storage to 5'-0" high.
Group A Plastics Exposed Unexpanded and Expanded solid piled, palletized, bin box, shelf, and back to back shelf storage to 8'-0" high, 28'-0" maximum ceiling height.
Group A Plastics Exposed Unexpanded and Expanded solid piled, palletized, bin box, shelf, single, double, multi-row rack, and back to back shelf storage to 10'-0" high, 15'-0" maximum ceiling height.
Group A Plastics Exposed Unexpanded solid piled, palletized, bin box, shelf, single, double, multi-row rack, and back to back shelf storage to 10'-0" high, 20'-0" maximum ceiling height.
Group A Plastics Exposed Unexpanded and Expanded solid piled, palletized, bin box, shelf, and back to back shelf storage to 12'-0" high, 17'-0" maximum ceiling height.
Group A Plastics Exposed Unexpanded and Expanded single, double, and multi-row rack to 12'-0" high, 17'-0" maximum ceiling height.

Idle wood pallet storage allowed:
On floor, maximum 6'-0" high and each pile of no more than four stacks shall be separated from other wood pallet piles by at least 8'-0" of clear space or 25'-0" of commodity.

Idle plastic pallet storage allowed:
On floor, maximum 4'-0" high and each pile of no more than two stacks shall be separated from other plastic pallet piles by at least 8'-0" of clear space or 25'-0" of commodity. Roof sprinklers must be high temperature rated sprinklers.

### Wet-Pipe system installation and material notes

| Wet-Pipe Installation | |
|---|---|
| Line installation for drainage | Installed level |
| Main installation for drainage | Installed level |
| Trapped pipe 0-5 gallons | 3/4" plug or removal of (1) pendent sprinkler |
| Trapped pipe 5-50 gallons | 3/4" valve with plug |
| Trapped pipe 50+ gallons | 1" valve pipe to an accessible location |

| Piping and Fittings | |
|---|---|
| Crossmain and Feedmain installation - schedule 10 piping, grooved fittings, and welded outlets | |
| Grid - Gridlines installation - schedule 7 piping, grooved fittings, and welded outlets | |
| | |
| Armovers, Drops, and Sprigs - schedule 40 piping and threaded fittings | |
| Piping | BLACK steel ASTM A53, A135, A795 |
| Threaded Fittings | BLACK ductile iron class 300 |
| Grooved Fittings | Factory Painted Orange,<br>Victaulic "Firelock", "Standard", and Mech. Tee's |
| Grooved Couplings | Factory Painted Orange,<br>1-1/4" thru 4" Victaulic Style #109 (rigid)<br>6" and 8" Style #005H (rigid)<br>10" and 12" Style #77 (flexible), #009N (rigid) |
| Welded Outlets | BLACK steel, THREADED and/or GROOVED |

| General Materials | |
|---|---|
| Thread sealant | "Slic-tite" paste with teflon and "Permabond" anaerobic |
| Flange gaskets | 1/8" thick red rubber full face ASTM D2000 |
| Bolts | ZINC SAE J429-Grade 2 or ASTM A307-Grade A |
| Hex nuts | ZINC heavy hex grade 2 low carbon steel |
| Hanger structure attachments | Type and size varies, see hanger details |
| Hanger rods | ZINC plated all thread, size per NFPA 13 |
| Hanger rings | ZINC plated strap hanger, UL/FM |
| Hanger trapeze members | BLACK steel. |

Building Temperature:
Building temperature for wet-pipe sprinkler system(s) must be maintained at 40° F or warmer at all times. Heating system(s) are to be provided, installed, and maintained by others.

### HANGER SPACING IN ACCORDANCE WITH NFPA 13:

1" thru 1-1/4" steel piping = 12'-0" maximum spacing.
1-1/2" thru 8" steel piping = 15'-0" maximum spacing.

### UNSUPPORTED LENGTH BETWEEN THE END SPRINKLER AND THE LAST HANGER ON A LINE:

100 psi or less: 3'-0" max. length for 1" pipe. 4'-0" max. length for 1-1/4" pipe. 5'-0" max. length for 1-1/2" or larger piping.
101 psi or greater: 3'-0" max. length for 1" pipe. 4'-0" max. length for 1-1/4" pipe. 5'-0" max. length for 1-1/2" or larger piping.
101 psi or greater WHEN PENDENT SPRINKLER IN CEILING IS AT END OF BRANCHLINE: 1'-0" max. length for all pipe sizes.
The last hanger shall prevent upward pipe movement.
Where these limits are exceeded the pipe shall be extended beyond the end sprinkler and supported by an additional hanger.

### UNSUPPORTED LENGTH OF AN ARMOVER TO A SPRINKLER:

100 psi or less: 2'-0" max. length for all pipe sizes.
101 psi or greater: 2'-0" max. length for all pipe sizes.
101 psi or greater WHEN PENDENT SPRINKLER IN CEILING IS AT END OF ARMOVER: 1'-0" max. length for all pipe sizes.
The last hanger shall prevent upward pipe movement.
Where these limits are exceeded the pipe shall be extended beyond the end sprinkler and supported by an additional hanger.

### HANGER MATERIAL NOTES:

All pipe shall be supported from the building structure utilizing hangers, materials, and methods per NFPA 13. Piping supports shall be in accordance with NFPA 13.

BEAM CLAMPS:
Black malleable iron, UL/FM, manufactured to ANSI/ASTM A47-77 standards.

ALL THREAD ROD:
Zinc plated low carbon steel, manufactured to ASTM A193 B7 standards, and electro-zinc plated to ASTM B633 standards.

SWIVEL HANGER RINGS:
Zinc plated carbon steel, UL/FM, manufactured to ASTM A569, A366 standards, and electro-zinc plated to ASTM B633 standards.

TRAPEZE SUPPORTS:
Primarily Black piping, pipe trapeze member to be sized per NFPA 13, see hanger details on the drawings.
Some Black angle iron may be used, angle iron trapeze member to be sized per NFPA 13, see hanger details on the drawings.

HANGER ROD SIZES IN ACCORDANCE WITH NFPA 13:
1" thru 4" piping = 3/8" rod size.
6" thru 8" piping = 1/2" rod size.
10" thru 12" piping = 5/8" rod size.

EXPANSION SHIELDS IN CONCRETE INSTALLED IN THE VERTICAL POSITION:
1" thru 1-1/4" steel piping = 12'-0" maximum spacing.
1-1/2" thru 4" steel piping = 15'-0" maximum spacing.
6" thru 8" steel piping 15'-0" maximum spacing if alternated with hangers connected to structural members or 10'-0" maximum spacing if piping is supported with expansion shields only.

TOGGLE HANGERS:
Toggle hangers are permitted for support of 1" thru 1-1/2" piping under ceilings of hollow tile or metal lath and plaster.

HANGER SUPPORTS FOR SPRINKLER PIPING BELOW DUCTWORK, OVERHEAD DOORS, AND SIMILAR OBSTRUCTIONS:
Piping shall be supported from the building structure only.

Not less than 1 hanger for each section of pipe. Sprinklers less than 6'-0" apart may have hangers spaced up to 12'-0" apart. Starter lengths of pipe from a main may be up to 6'-0" long and not require a hanger.

A single section of pipe shall not require a hanger when the cumulative distance between hangers on the branch line does not exceed the spacing noted above.

CLEARANCE TO HANGERS:
Distance between hanger and centerline of upright sprinkler shall not be less than 0-3".

#01 HANGER
3/8" ROD ½" THRU 4" PIPE
1/2" ROD 6" AND 8" PIPE
BEAM CLAMP
A.T. ROD
HANGER RING

#03A HANGER
INSTALL: SAMMY X-PRESS IT TOOL
22 GA. MIN. METAL DECK
XP 20, LOOSE
A.T. ROD
HANGER RING (1"-4")

| | UL | FM |
|---|---|---|
| STEEL THICKNESS | .027"- .125" | .029"- .125" |
| MAX. RATING | 2½" PIPE | 2" PIPE |
| 3/8" ROD ½" THRU 2½" PIPE | | |

1" AUX. DRAIN GLOBE MODEL AD
NO SCALE
1" MAPT
"AUX" DRAIN" IDENTIFIED ON THE HANDLE
1" BRASS PLUG INCLUDED
6-5/8"

#25F PIPE STAND
FULL PIPE CLAMP WITH 1½" x 10" A.T. ROD AND 1½" NUT FOR ADJ.
1½" x 3'-0" THRD/PLAIN BLK. SCH. 40 PIPE
GALV COMPANION FLANGE
CONC. WEDGE EXP. ANC. (4) 1/2" x 3½"
1½" SUPPORT FOR (1½" - 12")
5" MIN
5" ADJ

#26B HANGER
CONC. DROP-IN ANCHOR FOR CONCRETE WALLS, LOOSE
NUTS AND FLAT WASHERS, LOOSE
A.T. ROD
NUTS AND FLAT WASHERS
PIPE CLAMP
1/2" ROD 2½" THRU 8" PIPE
5/8" ROD 10" AND 12" PIPE

#27B HANGER
CONC. DROP-IN ANCHOR FOR CONCRETE WALLS & FLOORS, LOOSE
NUT AND FENDER WASHER, LOOSE
A.T. ROD
SPLIT RING
1" THRU 2½" PIPE

#21C HANGER
UNI-STRUT PIPE STRAP, LOOSE
FAB LENGTH TO BE IN 2" INCREMENTS
1-5/8" GALV SLOTTED UNI-STRUT
3/8"x2½" CONC WEDGE EXP. ANCHOR, LOOSE
½" THRU 4" PIPE

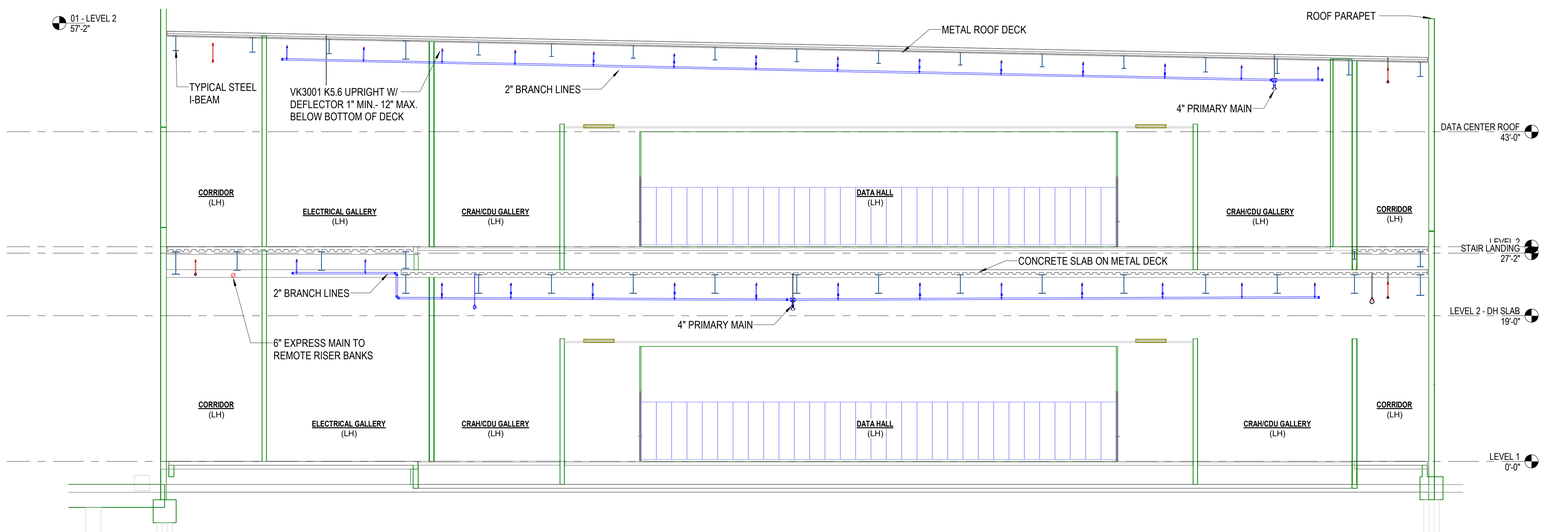
WET SPRINKLER DROP SWING - VICFLEX
NO SCALE
BRANCH PIPE
THREADED COUPLING
36" FLEXIBLE SPRINKLER PIPE
1" PIPE LENGTH VARIES NOTED ON PLANS AS DN 1 x X-X OR DROP X-X
AH2 HOSE ADJ BRKT
CEILING

PRE-ACTION/ DRY SPRINK DROP SWING - VICFLEX
NO SCALE
1" x 0'-2 NIPPLE
1" DROP LENGTH VARIES
1" PLUG
BULLHEAD TEE
72" FLEXIBLE SPRINKLER PIPE U.N.O.
1" TxT PIPE LENGTH VARIES
THREADED TEE
BRANCH PIPE
AH2-CC HOSE ADJ BRKT
CEILING

SPRINKLER LOCATION IN CEILING TILE
NO SCALE
2x2 CEILING TILE
2x2 LIGHT OR DIFFUSER
TYPICAL SPRINKLER
2x4 CEILING TILE
1'-0" 1'-0" 1'-0" 1'-0" 1'-0"
MAXIMUM TOLERANCE OF 1" IN ANY DIRECTION

### SPRINKLER SCHEDULE ALL HEADS

| | QTY | THRD | K-FACT. | TEMP. | FINISH | RESP. | MANUF. | MODEL | SIN | DESCRIPTION | WRENCH |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | | | | | | | | |
| ■ | 165 | 1/2" | 5.6 | 200 °F | Brass | Quick | Viking | 22961 | VK4621 | CONCEALED PENDENT | |
| ⧓ | 20 | 1 1/4" | 11.2 | 205 °F | Brass | Quick | Viking | ELO | VK544 | ELO DRY PENDENT | N/A |
| ■ | 3 | 1/2" | 5.6 | 200 °F | Chrome | Quick | Viking | Microfast | VK305 | HORIZONTAL SIDEWALL | |
| ■ | 15 | 1/2" | 5.6 | 200 °F | Chrome | Quick | Viking | XT1 | VK3021 | SEMI RECESS PENDENT | 23559MB |
| ◌ | 3984 | 1/2" | 5.6 | 200 °F | Brass | Quick | Viking | XT1 | VK3001 | UPRIGHT ON 1" SPRIG | 23559MB |
| ■ | 28 | 3/4" | 11.2 | 199 °F | | Quick | Viking | ELO | VK530 | UPRIGHT ON 1" SPRIG | |
| Total No. of Sprinklers: 4216 | | | | | | | | | | | |




9 BUILDING SECTION
1/8" = 1'-0"
2' 0' 4' 8'
SCALE 1/8" = 1'-0"

PIPE LEGEND
WET PIPE =
PREACTION PIPE =
DRY PIPE =
STANDPIPE /
EXPRESS MAIN =

Stamp or Seal
MULTI-JURISDICTIONAL ID# 1002183508 EXP 9/1/26
LICENSE# 2001762-023-140
NV STATE FIRE MARSHAL REG. # G 583

Eric Velasco
Signature
ERIC VELASCO
NICET LEVEL II, #153055
WATER-BASED SYSTEMS LAYOUT
EXPIRATION DATE: 09/01/2026

SYMBOLS LEGEND:
= Hanger with rod length
= Trapeze Hanger Location
= Hydraulic Reference point
Abbreviations:
TOS = Top of Steel BOW = Bottom of Wood
BOS = Bottom of Steel BOC = Bottom of Concrete
BOP = Bottom of Purlin BOD = Bottom of Deck
TOW = Top or Wood
X" TOS = Centerline of pipe below top of steel
+X'-X" AFF = Centerline of pipe above finished floor

| No. | Date | By | Description |
|---|---|---|---|
| 1 | 11/12/25 | NC | ISSUSED FOR APPROVAL |
| 2 | 02/12/26 | NC | AHJ COMMENTS |
| 3 | 04/08/26 | NC | AHJ COMMENTS - REV 2 |
| 4 | 05/06/26 | NC | ISSUED FOR APPROVAL |

Company
SHAMBAUGH & SON, L.P.
CONTRACTORS · ENGINEERS
5460 DESERT POINT DR, LAS VEGAS, NV 89118
P: 702-832-4545 www.shambaugh.com
FIRE PROTECTION - FIRE ALARM

Date 05/06/26
Designed NC
Checked EV/DS

QTS DEN1 - DC2
1140 N GUN CLUB RD
AURORA, COLORADO 80018

FIRE PROTECTION SYSTEMS

NOTES, DETAILS, & DESIGN CRITERIA

Project Number 227317
Sheet Number FP1.01

City of Aurora Building Division
Reviewed for Code Compliance
Approved as Noted: chorst
Date: May 28, 2026
2021 INTERNATIONAL CODES & 2023 NEC

I certify to the best of my knowledge, information, and belief that the design of this system complies with all applicable provisions of NFPA standards and local fire codes.
Dennis T. Scherr
Dennis T. Scherr
NICET Level IV
Water-Based Systems Layout
Cert. # 113016 Exp. 3/1/2029

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Autodesk Docs://227317-QTS DEN1 DC2/227317 QTS DEN1 - DC2.rvt

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## Ordinary Hazard Group 1 Design Criteria

| Area: Electric Fire Pump Room |
|---|
| Sprinklers: Standard Response, 286°F, K=5.6, 130 sq. ft. maximum spacing standard spray sprinklers |
| C-factor used in calculations: 120 (Wet-pipe system, black steel pipe) |
| Density before any adjustments: .15 GPM / SQ. FT. |
| Remote Area before any adjustments: 1500 SQ. FT. |
| DENSITY USED IN CALCULATIONS: .15 GPM / SQ. FT. |
| REMOTE AREA USED IN CALCULATIONS: 1500 SQ. FT. |
| Hose Stream Allowance: 250 GPM outside hose |

### BUILDING FIRE ALARM SYSTEM CONNECTIONS

This information is provided for coordination purposes. Devices are provided and installed by fire protection contractor. Wiring of the devices is BY OTHERS, unless noted otherwise.
N.O. = Normally Open Control Valve N.C. = Normally Closed Valve

| | | SUPERVISORY | ALARM |
|---|---|---|---|
| ELECTRIC FIRE PUMP LOCATION: PUMP ROOM | Controller, Fire Pump Running<br>May be either Supervisory or Alarm, determined by others | | X |
| | Controller, Loss of Phase | X | |
| | Controller, Phase Reversal | X | |
| | Fire Pump Suction control valve tamper (N.O.) | X | |
| | Fire Pump Discharge control valve tamper (N.O.) | X | |
| | Fire Pump Test Header control valve tamper (N.C.) | X | |
| | By-pass Control Valve before check tamper (N.O.) | X | |
| | By-pass Control Valve after check tamper (N.O.) | X | |
| | Jockey Pump suction control valve tamper (N.O.) | X | |
| | Jockey Pump discharge control valve tamper (N.O.) | X | |

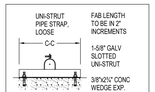
### POWER SUPPLY REQUIREMENTS FOR FIRE PROTECTION EQUIPMENT

This information is for coordination purposes. Equipment is provided by fire protection contractor. Exterior audible alarm is mounted and wired BY OTHERS. Other equipment is mounted by the fire protection contractor, wiring of the equipment is BY OTHERS, unless noted otherwise.

| | |
|---|---|
| ELECTRIC FIRE PUMP LOCATION: PUMP ROOM | Electric Fire Pump Controller and Motor<br>Dedicated Power: see "P1" and "PC" in electric fire pump data.<br>Note: Power supply direct from transformer, no disconnect allowed, route exterior and/or underground |
| | Electric Jockey Pump<br>Dedicated circuit: see "P2" and "JC" in electric fire pump data. |

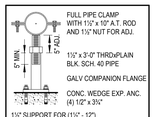
### Fire Pump Material Notes

| | |
|---|---|
| Schedule 10 piping with grooves and/or welded flanges | |
| Schedule 40 piping with threads | |
| Piping | BLACK steel ASTM A53, A135, A795 |
| Threaded Fittings | BLACK ductile iron class 300 |
| Grooved Fittings | Factory Painted Orange,<br>Victaulic "Firelock" and "Standard" |
| Grooved Couplings | Factory Painted Orange,<br>1-1/4" thru 4" Victaulic Style #009N (rigid)<br>6" and 8" Style #005H (rigid)<br>10" and 12" Style #77 (flexible), #07 (rigid)<br>Gaskets are Grade "E" EPDM rubber compound |
| Welded Outlets | BLACK steel, THREADED and/or GROOVED |
| Flange Fittings | Ductile iron class 125, rated to 250 PSI, ASTM A536, ASME B16.1<br>Cast Iron class 125, rated to 200 PSI, ASTM A126, ASME B16.1 |
| Flange Gaskets | Full-faced class 125 red rubber, 1/8" thick |



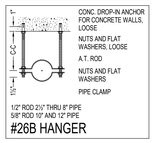

½" THRU 4" PIPE (SENSING, JOCKEY PUMP, DRIP)

#21C HANGER ASSEMBLY



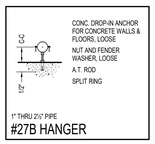

1¼" SUPPORT FOR (1½" - 12")

#25F PIPE STAND




1/2" ROD 2½" THRU 8" PIPE
5/8" ROD 10" AND 12" PIPE

#26B HANGER




1" THRU 2½" PIPE

#27B HANGER

## ELECTRIC FIRE PUMP DATA

### ELECTRIC MOTOR DRIVEN FIRE PUMP

(P1) FIRE PUMP UL/FM

| | |
|---|---|
| FIRE PUMP RATING: | 1000 GPM @ 90 PSI |
| MANUFACTURER: | AURORA |
| MODEL: | HORIZONTAL SPLITCASE 5-481-15 |
| SUCTION FLANGE: | 6" CLASS 125 |
| DISCHARGE FLANGE: | 5" CLASS 125 |
| RPM: | 1770 |

ELECTRIC MOTOR

| | |
|---|---|
| FRAME: | 404TS |
| RPM: | 1800 |
| HORSEPOWER: | 100 HP |
| POWER SUPPLY: | 3-60-460 VOLT |

### ELECTRIC FIRE PUMP CONTROLLER

(PC) TYPE: SOFT START W/ A.T.S.
MANUFACTURER: TORNATECH
MODEL: GPS+GPU
ENCLOSURE RATING: NEMA 2
POWER SUPPLY: 3-60-460 VOLT

### ELECTRIC JOCKEY PUMP

(P2) JOCKEY PUMP RATING: 12.5 GPM @ 100 PSI
MANUFACTURER: AURORA
MODEL: PVM3-9
SUCTION: 1¼" F-NPT
DISCHARGE: 1¼" F-NPT
HORSEPOWER: 1.5 HP
POWER SUPPLY: 3-60-460 VOLT

### ELECTRIC JOCKEY PUMP CONTROLLER

(PC) MANUFACTURER: TORNATECH
MODEL: JPLT
ENCLOSURE RATING: NEMA 2
POWER SUPPLY: 3-60-460 VOLT

### FIRE PUMP FACTORY CURVE



| FLOW (GPM) | NET PRESSURE (PSI) |
|---|---|
| 0 | 103 |
| 500 | 103.5 |
| 1000 | 90 |
| 1167 | 81 |
| 1334 | 69.9 |
| 1500 | 58.5 |

## FIRE PUMP COMPONENTS

| NO. | |
|---|---|
| FDC | FIRE DEPARTMENT CONNECTIONS |
| FF1 | VICTAULIC FIRELOCK #001 90 ELL |
| FF2 | VICTAULIC FIRELOCK #002 TEE |
| J2 | VICTAULIC #728 THREADED BALL VALVE W/ TAMPER SWITCH |
| J4 | THREADED BRASS CHECK VALVE |
| MH1 | #25F PIPE STAND |
| MP1 | TEST HEADER (SEE DETAIL ON THIS SHEET) |
| VC1 | VICTAULIC #717 FIRELOCK SWING CHECK VALVE |
| VG2 | VICTAULIC #771H GxG OS&Y GATE VALVE W/ TAMPER SWITCH |
| VG3 | VICTAULIC #705 BUTTERFLY VALVE W/ TAMPER SWITCH |
| VG4 | VICTAULIC #707C (N.C.) BUTTERFLY VALVE W/ TAMPER SWITCH |
| VR1 | VIKING E-1/F-1 EASY RISER SWING CHECK VALVE W/ TRIM: DRAIN VALVE, (2) 0-400psi PRESSURE GAUGES |
| VT1 | BALL VALVE (NORMALLY CLOSED) |

### Electric Fire Pump Notes

All work and materials shall conform with NFPA 13 and 20.

Fire pump rooms shall be free from storage, equipment, and penetrations not essential to the operation of the fire pump and related components. Equipment related to domestic water distribution shall be permitted to be located within the same room as the fire pump equipment.

Temperature within the fire pump room shall be maintained above 40° F by others.

Artifical light shall be provided in the fire pump room by others. Emergency lighting shall be provided by fixed or portable battery operated lights, including flashlights. Emergency lights shall NOT be connected to an engine-starting battery.

Ventilation of the fire pump room shall be by others.

Floor shall be pitched for adequate drainage of escaping water away from critical equipment such as the pump, driver, controller, etc. The fire pump room shall be provided with a floor drain that will discharge to a frost-free location.

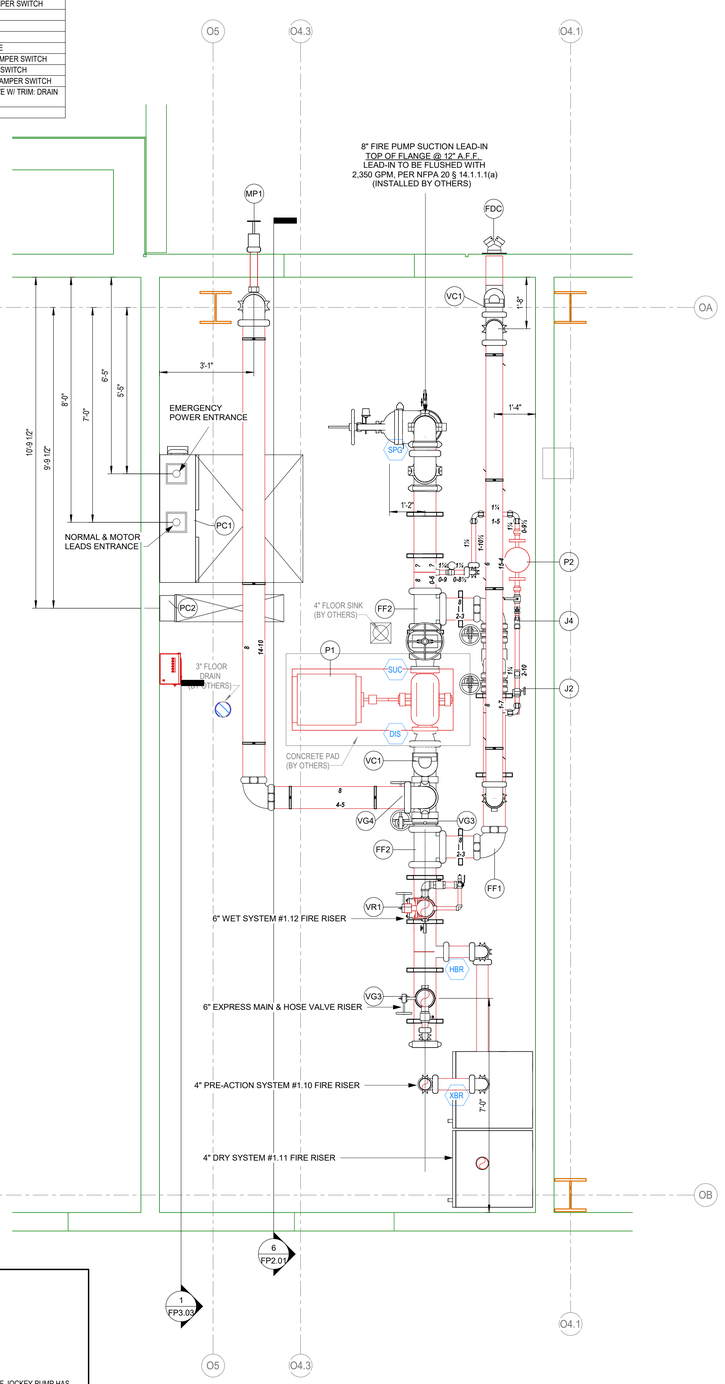
All electrical work to supply power to the fire controller/pump and jockey controller/pump shall be by others.

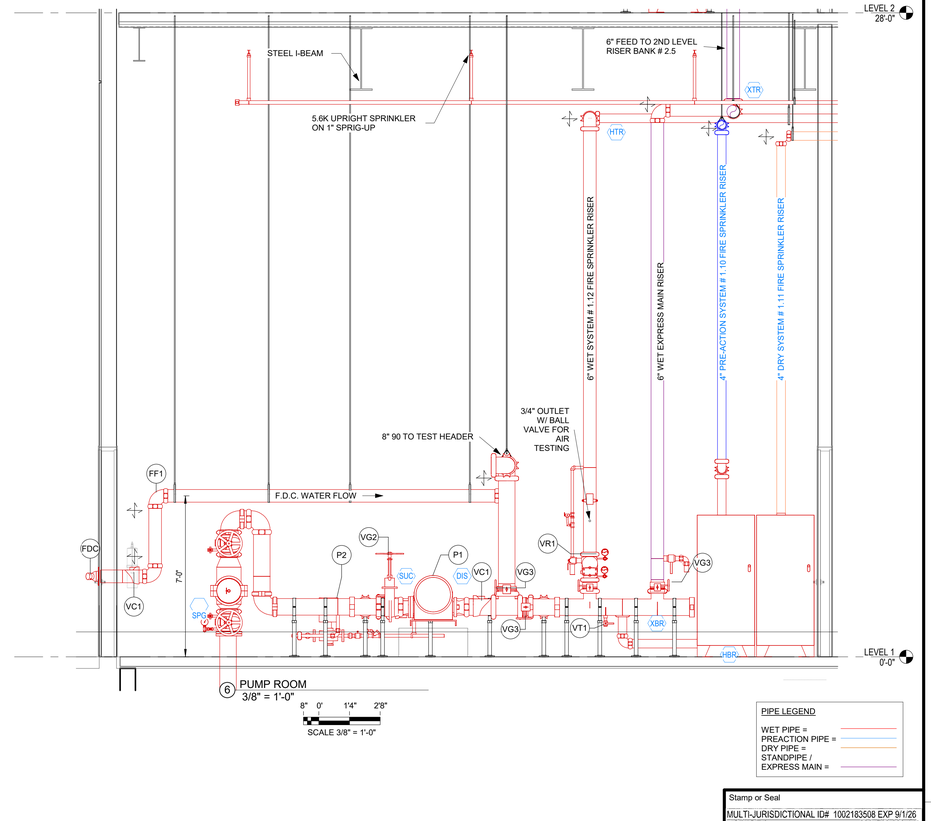
Conductors feeding fire pump(s) shall be dedicated and protected to resist possible damage by fire, structural failure, or operational accident.

Conduit entry into a fire pump controller and jockey pump controller shall be through the bottom of the cabinet. NO SIDE OR TOP ENTRY IS ALLOWED unless a specific location is allowed by the manufacturer.

The supply conductors shall directly connect the power source to a listed fire pump controller, no disconnects ahead of the fire pump controller per NFPA 70.

Concrete pad below fire pump and grouting of the fire pump base is to be by others.



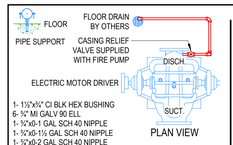




6 PUMP ROOM
3/8" = 1'-0"

8" 0' 1'4" 2'8"
SCALE 3/8" = 1'-0"

PIPE LEGEND

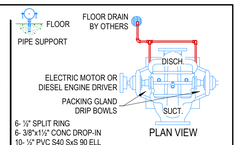
WET PIPE =
PREACTION PIPE =
DRY PIPE =
STANDPIPE / EXPRESS MAIN =




PLAN VIEW

1- 1½"x¾" CI BLK HEX BUSHING
6- ¾" MI GALV 90 ELL
1- ¾"x0-1 GAL SCH 40 NIPPLE
1- ¾"x0-1½ GAL SCH 40 NIPPLE
1- ¾"x0-2 GAL SCH 40 NIPPLE
1- ¾"x0-2½ GAL SCH 40 NIPPLE
1- ¾"x0-3 GAL SCH 40 NIPPLE
6- 3/8"x1½" CONC DROP-IN
21- ½" GALV SCH 40 PIPE

CASING RELIEF DISCHARGE



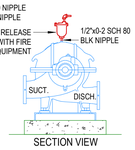

PLAN VIEW

6- ½" SPLIT RING
6- 3/8"x1½" CONC DROP-IN
10- ½" PVC S40 SxS 90 ELL
1- ½" PVC S40 SxSxS TEE
2- ½" PVC S40 SxM ADAPTER
10'- 3/8" ZINC ALL THREAD ROD
20'- ½" PVC PIPE

PUMP BOWL

AIR RELEASE KIT

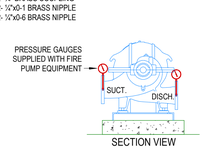
1- ¾"x½" BLK HEX BUSHING
2- ½" MI GALV 90 ELL
2- ½"x0-2 GALV SCH 40 NIPPLE
1- ½"x0-2 BLK SCH 80 NIPPLE




SECTION VIEW

PRESSURE GAUGES

2- ¼" BRASS 90 ELL
2- ¼" BRASS COUPLING
2- ¼"x0-1 BRASS NIPPLE
2- ¼"x0-6 BRASS NIPPLE




SECTION VIEW

SS Fire-Jockey Pumps
FIRE PUMP MOUNTING 0.75in KIT

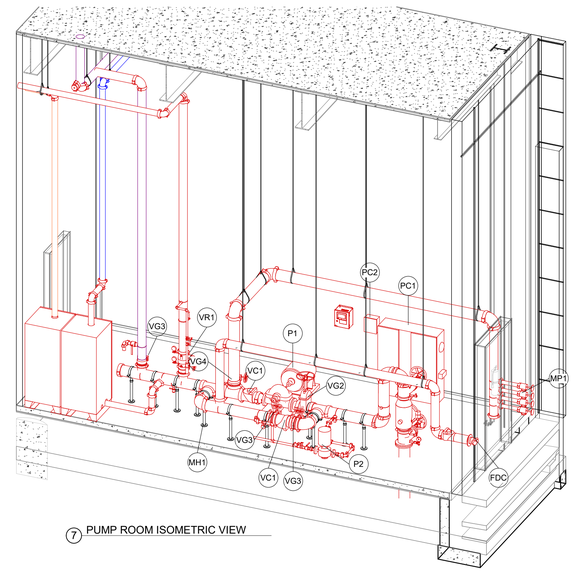
10- ¾" ZINC ALL THREAD ROD
12- ¾"-10 ZINC HD HEX NUT
12- ¾" ZINC FLAT WASHER
6- 5/8"x4½" CONC WEDGE ANCHOR
3- 4" C-CHANNEL FOR SKI FAB
6- ¾" FIRE PUMP SKI
¾" ALL THREAD ROD
DOUBLE NUT AND FLAT WASHERS
5/8"x4½" CONC WEDGE ANCHOR
½" ROD CPLG., WELDED ONTO C-CHANNEL
11/16" HOLE
FIRE PUMP SKI, SEE DETAIL
FIRE PUMP SKI
4"x11½" C-CHANNEL

3/4" FIRE PUMP MOUNTING

SS Fire-Jockey Pumps
GOL TEST HEADER 4-WAY

1- 6" WELD CAP (TEST HDR FAB)
2- 6" SCH 10 PIPE (TEST HDR FAB)
4- 2½" GRV-O-LET
4- 2½" GALV CPLG 009N
4- 2½" ANG HOSE VL GRVxMNST
4- 2½" NST CAP-CHAIN
1- 6" CI SOLID WALL PLATE GALV
1- 6" CHROME SPLIT WALL PLATE
6" CI GALV WALL PLATE
6" WELD CAP
6" CHROME SPLIT WALL PLATE
SHOP PAINT TEST HEADER "SAFETY RED"
6"
WALL

4-WAY TEST HEADER
1000 GPM FIRE PUMP

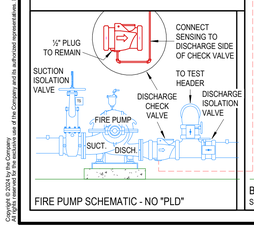



7 PUMP ROOM ISOMETRIC VIEW

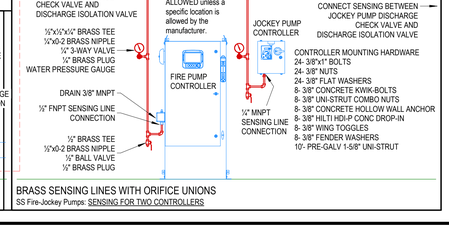
4- ½" BRASS UNION 3/32" ORIFICE
16- ½" BRASS 90 ELL
2- ½" BRASS TEE
2- ½"x¼" BRASS TEE
2- ½" BRASS COUPLING
2- ½"x¼" BRASS REDUCER
2- ½" BRASS PLUG
2- ½" BRASS PLUG
4- ¼"x0-4 BRASS NIPPLE
6- ½"x0-2 BRASS NIPPLE
4- ½"x0-4 BRASS NIPPLE
4- ½"x0-6 BRASS NIPPLE

2- ½" BALL VALVE
2- ¼" 3-WAY VALVE
2- 0-300 PSI WATER GAUGE
8- ½" PREGALV HGR RING
8- ½" SPLIT RING
8- 3/8" BLK BEAM CLAMP
8- 3/8" HOLLOW-SET DROP-IN
8- 3/8"-16 ZINC HD HEX NUT
8- 3/8" ZINC FENDER WASHER
84'- ½" BRASS SCH 40 PIPE
40'- 3/8" ZINC ALL THREAD ROD

½" GROUND FACE BRASS UNIONS WITH NON-CORROSIVE DIAPHRAGM DRILLED WITH 3/32" ORIFICE AND PAINTED YELLOW (TYP.)
INSTALL IN HORIZONTAL PIPE



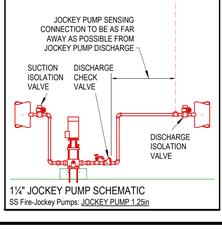

FIRE PUMP SCHEMATIC - NO "PLD"




BRASS SENSING LINES WITH ORIFICE UNIONS
SS Fire-Jockey Pumps: SENSING FOR TWO CONTROLLERS

1- ½" DI BLK 90 ELL
12- 1¼" DI BLK 90 ELL
2- 1¼"x1¼"x¼" DI BLK TEE
2- 1¼" MI BLK UNION
1- ½"x0-2 BLK SCH 40 NIPPLE
11- 1¼"x0-3 BLK SCH 40 NIPPLE
2- 1¼" THRD VIC #728 BALL VALVE
1- 1¼" THRD CHECK VALVE
1- ½" PRESS RELIEF VA 205#
4- 1¼" PREGALV HGR RING
4- 1¼" SPLIT RING
4- 3/8" BLK BEAM CLAMP
4- 3/8"x1½" CONC DROP-IN
8- 3/8"-16 ZINC HD HEX NUT
8- 3/8" ZINC FLAT WASHER
42'- 1½" BLK SCH 40 PIPE
20'- 3/8" ZINC ALL THRD ROD
1- 1"x0-3 BLK SCH 40 NIPPLE
1- 1½"x1" BLK REDUCER

IF JOCKEY PUMP HAS FLANGE CONNECTIONS, SEND THREADED COMPANION FLANGES, RED RUBBER GASKETS, BOLTS, AND NUTS AS LOOSE MATERIALS




1¼" JOCKEY PUMP SCHEMATIC
SS Fire-Jockey Pumps: JOCKEY PUMP 1.25in

8 PUMP ROOM PLAN VIEW
1/2" = 1'-0"

NORTH

6" 0' 1' 2'
SCALE 1/2" = 1'-0"

SYMBOLS LEGEND:

= Hanger with rod length
= Trapeze Hanger Location
= Hydraulic Reference point

Abbreviations:
TOS = Top of Steel
BOS = Bottom of Steel
BOP = Bottom of Purlin
TOW = Top or Wood
BOW = Bottom of Wood
BOC = Bottom of Concrete
BOD = Bottom of Deck

X" TOS = Centerline of pipe below top of steel
+X'-X" AFF = Centerline of pipe above finished floor

| No. | Date | By | Description |
|---|---|---|---|
| 1 | 11/12/25 | NC | ISSUED FOR APPROVAL |
| 2 | 02/12/26 | NC | AHJ COMMENTS |
| 3 | 04/08/26 | NC | AHJ COMMENTS - REV 2 |
| 4 | 05/06/26 | NC | ISSUED FOR APPROVAL |

Stamp or Seal

MULTI-JURISDICTIONAL ID# 1002183508 EXP 9/1/26
LICENSE# 2001762-023-140
NV STATE FIRE MARSHAL REG. # G 583

Eric Velasco
Signature

ERIC VELASCO
NICET LEVEL II, #153055
WATER-BASED SYSTEMS LAYOUT
EXPIRATION DATE: 09/01/2026

Company

SHAMBAUGH & SON, L.P.
CONTRACTORS · ENGINEERS
5460 DESERT POINT DR, LAS VEGAS, NV 89118
P. 702-832-4545 www.shambaugh.com
FIRE PROTECTION - FIRE ALARM

Date 05/06/26
Designed NC
Checked EV/DS

QTS DEN1 - DC2

1140 N GUN CLUB RD
AURORA, COLORADO 80018

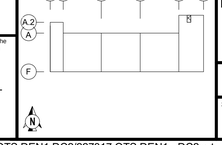
City of Aurora Building Division
Reviewed for Code Compliance
Approved as Noted: chorst
Date: May 28, 2026
2021 INTERNATIONAL CODES & 2023 NEC

I certify to the best of my knowledge, information, and belief that the design of this system complies with all applicable provisions of NFPA standards and local fire codes.

Dennis T. Scherr

Dennis T. Scherr
NICET Level IV
Water-Based Systems Layout
Cert. # 113016 Exp. 3/1/2029

Building Key Plan



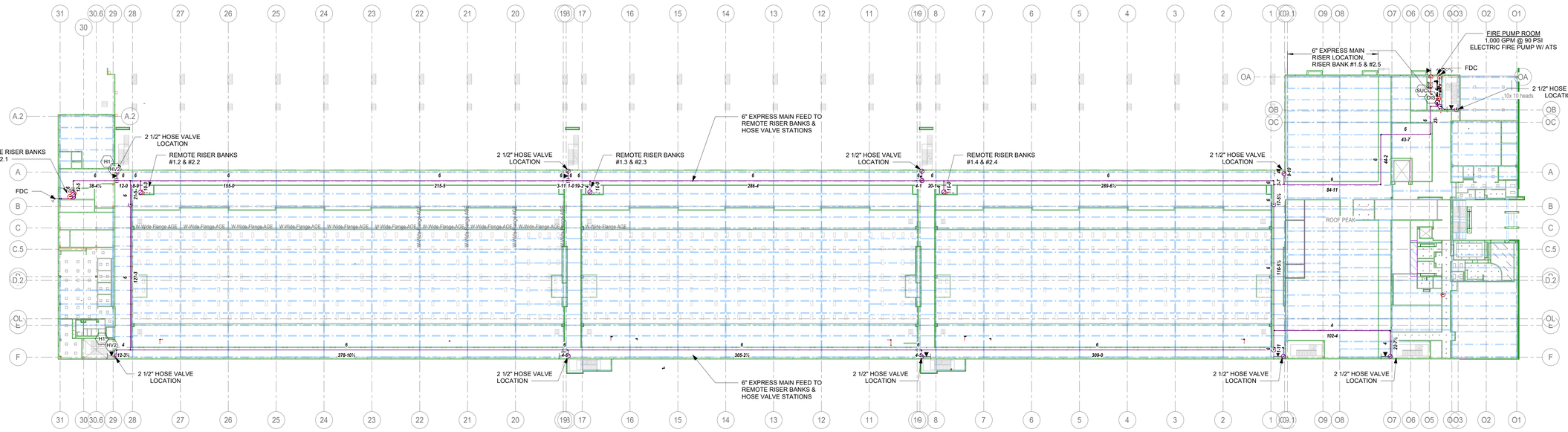

FIRE PROTECTION SYSTEMS

FIRE PUMP GERNAL NOTES, PIPING PLAN & DETAILS

Project Number 227317

Sheet Number FP2.01

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1 STANDPIPE DISTRIBUTION PLAN
1" = 40'-0"

NORTH

10' 0' 20' 40'
SCALE 1" = 40'-0"

I certify to the best of my knowledge, information, and belief that the design of this system complies with all applicable provisions of NFPA standards and local fire codes.

*Dennis T. Scherr*

Dennis T. Scherr
NICET Level IV
Water-Based Systems Layout
Cert. # 113016 Exp. 3/1/2029

Stamp or Seal

MULTI-JURISDICTIONAL ID# 1002183508 EXP 9/1/26
LICENSE# 2001762-023-140
NV STATE FIRE MARSHAL REG. # G 583

*Eric Velasco*

Signature

ERIC VELASCO
NICET LEVEL II, #153055
WATER-BASED SYSTEMS LAYOUT
EXPIRATION DATE: 09/01/2026

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Company

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P: 702-832-4545 www.shambaugh.com
FIRE PROTECTION - FIRE ALARM

Date: 05/06/26
Designed: NC
Checked: EV/DS

City of Aurora Building Division
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Date: May 28, 2026
2021 INTERNATIONAL CODES & 2023 NEC

QTS DEN1 - DC2

1140 N GUN CLUB RD
AURORA, COLORADO 80018

Building Key Plan

FIRE PROTECTION SYSTEMS

# STANDPIPE DISTRIBUTION PLAN

Project Number 227317

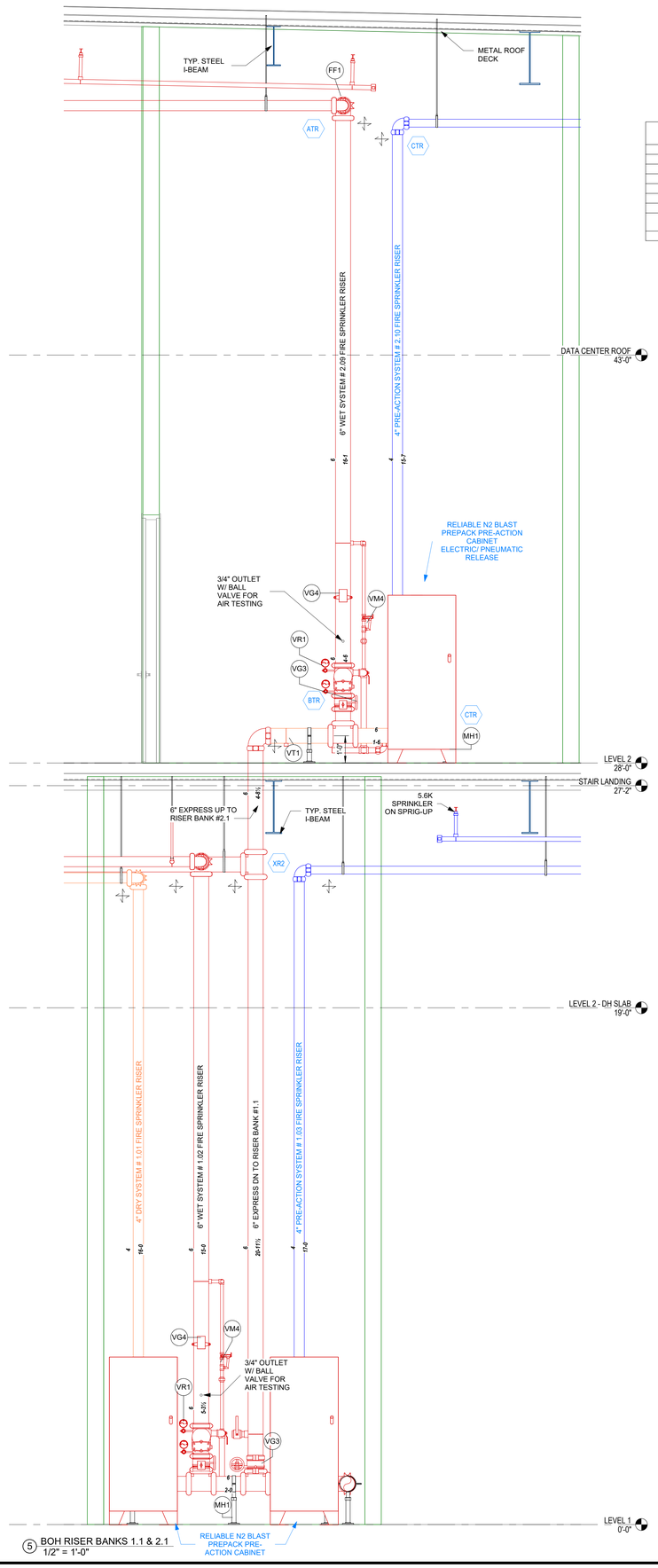
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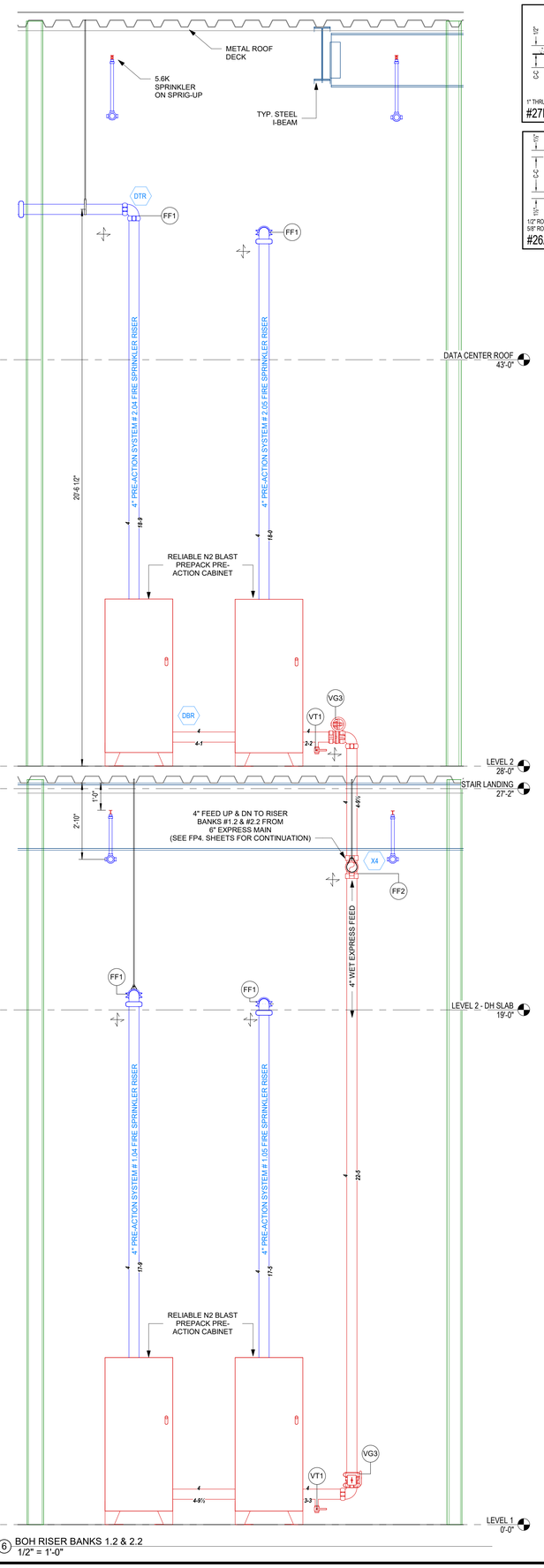
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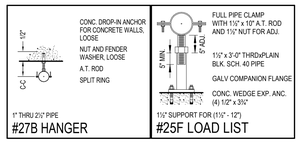


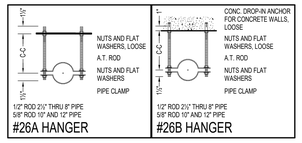

5 BOH RISER BANKS 1.1 & 2.1
1/2" = 1'-0"

| KEY NOTE LEGEND | |
|---|---|
| NO. | DESCRIPTION |
| FF1 | VICTAULIC FIRELOCK #001 90 ELL |
| FF2 | VICTAULIC FIRELOCK #002 TEE |
| MH1 | #25F PIPE STAND |
| VG3 | VICTAULIC #705 BUTTERFLY VALVE W/ TAMPER SWITCH |
| VG4 | VICTAULIC #707C (N.C.) BUTTERFLY VALVE W/ TAMPER SWITCH |
| VM4 | AGF #3011A INSPECTOR'S TEST VALVE w/ PSI RELIEF |
| VR1 | VIKING E-1/F-1 EASY RISER SWING CHECK VALVE W/ TRIM. DRAIN VALVE, (2) 0-400psi PRESSURE GAUGES |
| VT1 | BALL VALVE (NORMALLY CLOSED) |




6 BOH RISER BANKS 1.2 & 2.2
1/2" = 1'-0"




## FIRE PROTECTION SYMBOLS

| SYMBOL | DESCRIPTION |
|---|---|
| | UP OR DOWN IN PIPING w/ TEE |
| | UP OR DOWN IN PIPING w/ ELBOW |
| | PIPE HANGER LOCATIONS |
| | TRAPEZE HANGER LOCATIONS |
| | GROOVED COUPLING LOCATION |
| | FIRE SPRINKLER SYSTEM RISER |
| | NEW PIPING |
| | EXISTING PIPING |
| | 2 WAY SWAY BRACE |
| | 4 WAY SWAY BRACE |
| | BRANCHLINE RESTRAINT |
| | SMOKE PARTITION |
| | FULL-HEIGHT MASONRY WALL |
| | FULL-HEIGHT GYP BOARD WALL |
| | 1-HOUR FIRE-RATED WALL |
| | 2-HOUR FIRE-RATED WALL |
| | 3-HOUR FIRE-RATED WALL |
| | FIRE DEPARTMENT CONNECTION (FDC) |
| | ELECTRIC BELL |

PIPE LEGEND

WET PIPE
PREACTION PIPE
DRY PIPE

I certify to the best of my knowledge, information, and belief that the design of this system complies with all applicable provisions of NFPA standards and local fire codes.

*Dennis T. Scherr*

Dennis T. Scherr
NICET Level IV
Water-Based Systems Layout
Cert. # 113016 Exp. 3/1/2029

Stamp or Seal

MULTI-JURISDICTIONAL ID# 1002183508 EXP 9/1/26
LICENSE# 2001762-023-140
NV STATE FIRE MARSHAL REG. # G 583

*Eric Velasco*
Signature

ERIC VELASCO
NICET LEVEL II, #153055
WATER-BASED SYSTEMS LAYOUT
EXPIRATION DATE: 09/01/2026

SYMBOLS LEGEND:

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= Trapeze Hanger Location
= Hydraulic Reference point

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BOS = Bottom of Steel
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FIRE PROTECTION - FIRE ALARM

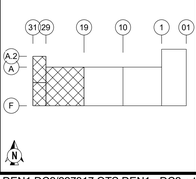
Date: 05/06/26
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Checked: EV/DS

City of Aurora Building Division
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Approved as Noted:*chorst*
Date:*May 28, 2026*
2021 INTERNATIONAL CODES & 2023 NEC

QTS DEN1 - DC2

1140 N GUN CLUB RD
AURORA, COLORADO 80018

Building Key Plan




FIRE PROTECTION SYSTEMS

# FIRE SPRINKLER BOH RISER BANKS #1.1, #2.1, & DATA HALL BANKS #1.2, #2.2 ELEVATIONS

Project Number: 227317

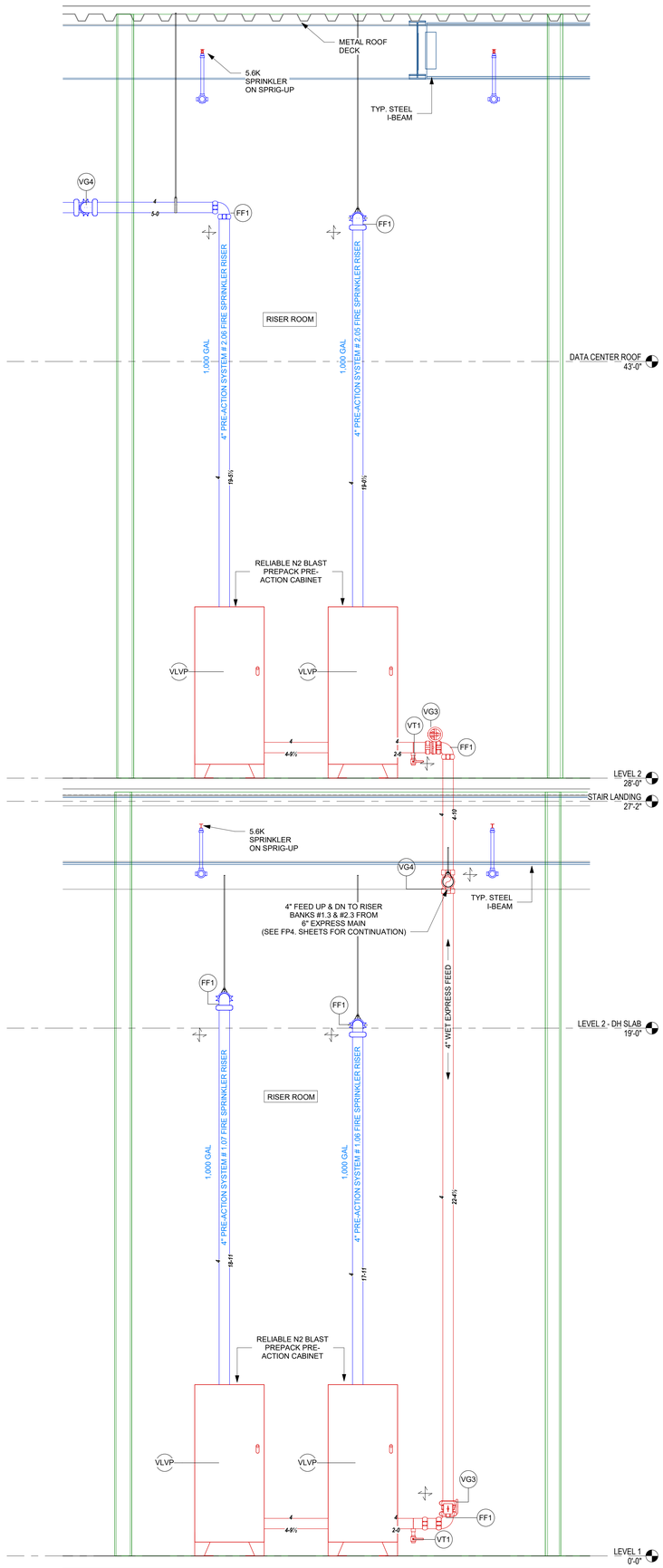
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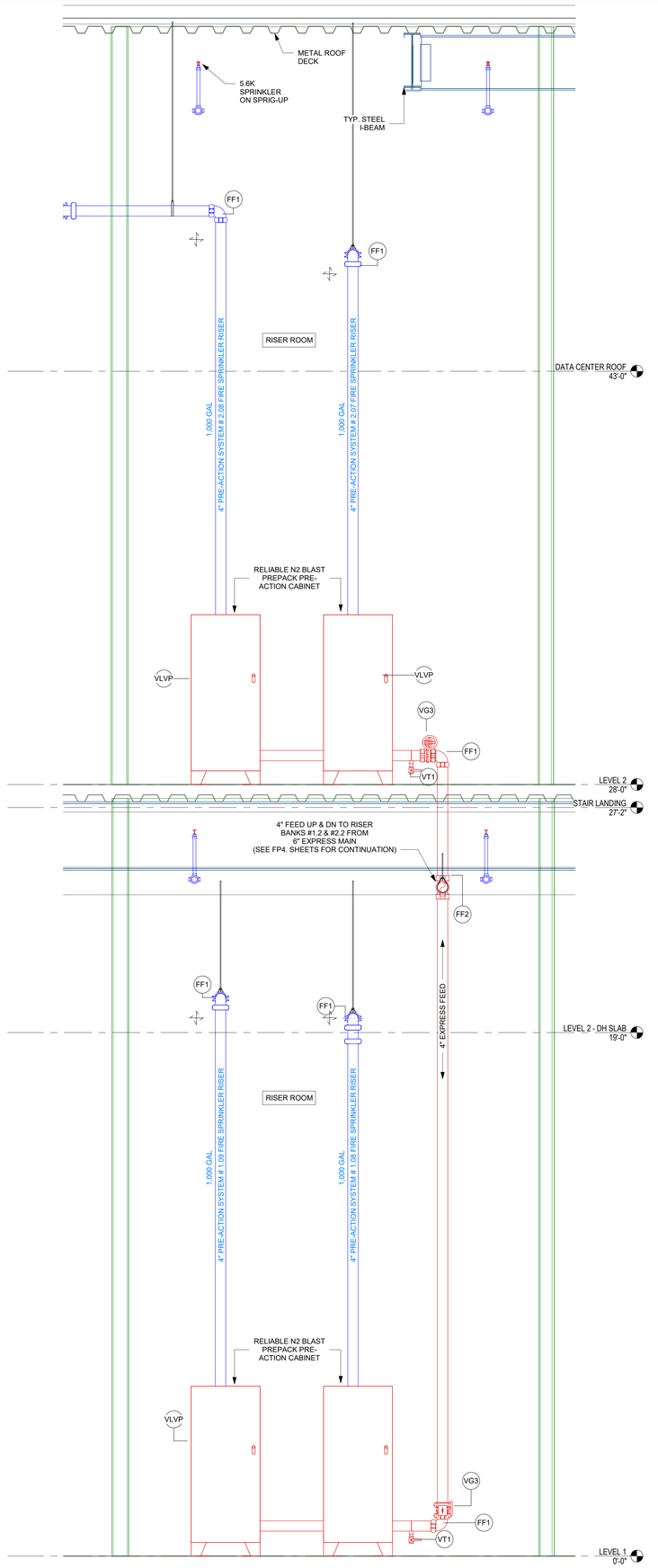


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8 BOH RISER BANKS 1.3 & 2.3
1/2" = 1'-0"

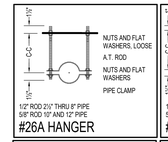



9 BOH RISER BANKS 1.4 & 2.4
1/2" = 1'-0"

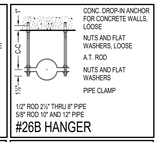
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| FF2 | VICTAULIC FIRELOCK #002 TEE |
| VG3 | VICTAULIC #705 BUTTERFLY VALVE W/ TAMPER SWITCH |
| VG4 | VICTAULIC #707C (N.C.) BUTTERFLY VALVE W/ TAMPER SWITCH |
| VLVP | VALVES - DRY/PRE-ACTION |
| VT1 | BALL VALVE (NORMALLY CLOSED) |

## FIRE PROTECTION SYMBOLS

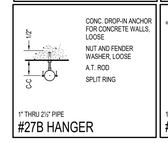
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| | PIPE HANGER LOCATIONS |
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| | FIRE SPRINKLER SYSTEM RISER |
| | NEW PIPING |
| | EXISTING PIPING |
| | 2 WAY SWAY BRACE |
| | 4 WAY SWAY BRACE |
| | BRANCHLINE RESTRAINT |
| | SMOKE PARTITION |
| | FULL-HEIGHT MASONRY WALL |
| | FULL-HEIGHT GYP BOARD WALL |
| | 1-HOUR FIRE-RATED WALL |
| | 2-HOUR FIRE-RATED WALL |
| | 3-HOUR FIRE-RATED WALL |
| | FIRE DEPARTMENT CONNECTION (FDC) |
| | ELECTRIC BELL |



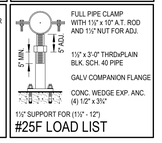

#26A HANGER




#26B HANGER




#27B HANGER




#25F LOAD LIST

PIPE LEGEND

WET PIPE
PREACTION PIPE
DRY PIPE

Stamp or Seal

MULTI-JURISDICTIONAL ID# 1002183508 EXP 9/1/26
LICENSE# 2001762-023-140
NV STATE FIRE MARSHAL REG. # G 583

Eric Velasco
Signature

ERIC VELASCO
NICET LEVEL II, #153055
WATER-BASED SYSTEMS LAYOUT
EXPIRATION DATE: 09/01/2026

SYMBOLS LEGEND:
= Hanger with rod length
= Trapeze Hanger Location
= Hydraulic Reference point
Abbreviations:
TOS = Top of Steel BOW = Bottom of Wood
BOS = Bottom of Steel BOC = Bottom of Concrete
BOP = Bottom of Purlin BOD = Bottom of Deck
TOW = Top or Wood
X" TOS = Centerline of pipe below top of steel
+X"-X" AFF = Centerline of pipe above finished floor

| No. | Date | By | Description |
|---|---|---|---|
| 1 | 11/12/25 | NC | ISSUED FOR APPROVAL |
| 2 | 02/12/26 | NC | AHJ COMMENTS |
| 3 | 04/08/26 | NC | AHJ COMMENTS - REV 2 |
| 4 | 05/06/26 | NC | ISSUED FOR APPROVAL |

Company

S&S SHAMBAUGH & SON, L.P.
CONTRACTORS · ENGINEERS
5460 DESERT POINT DR, LAS VEGAS, NV 89118
P. 702-832-4545 www.shambaugh.com

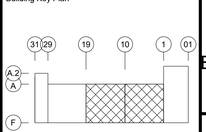
**FIRE PROTECTION - FIRE ALARM**

City of Aurora Building Division
Reviewed for Code Compliance
Approved as Noted: chorst
Date: May 28, 2026
2021 INTERNATIONAL CODES & 2023 NEC

I certify to the best of my knowledge, information, and belief that the design of this system complies with all applicable provisions of NFPA standards and local fire codes.

Dennis T. Scherr
Dennis T. Scherr
NICET Level IV
Water-Based Systems Layout
Cert. # 113016 Exp. 3/1/2029

Building Key Plan




Date: 05/06/26
Designed: NC
Checked: EV/DS

QTS DEN1 - DC2

1140 N GUN CLUB RD
AURORA, COLORADO 80018

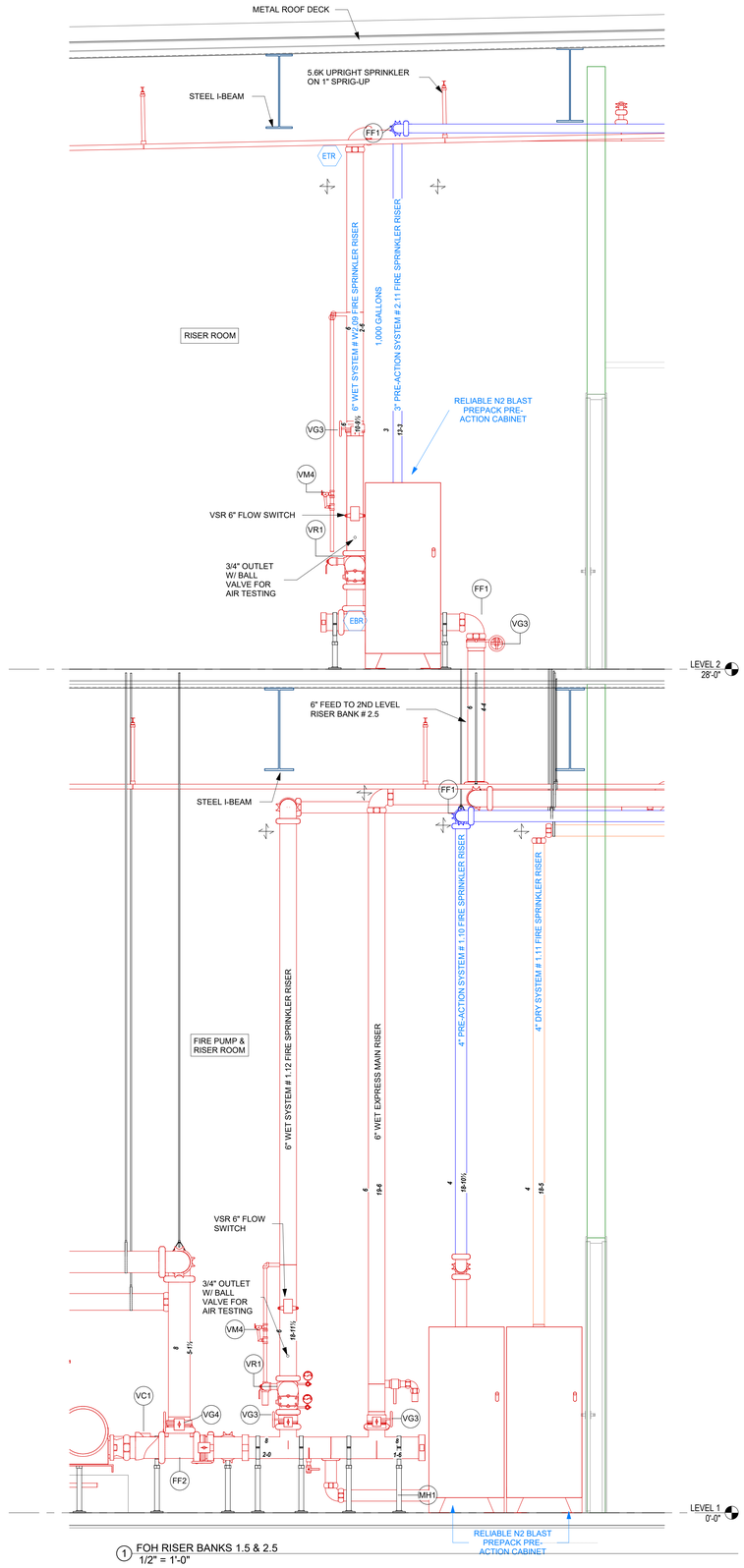
FIRE PROTECTION SYSTEMS

# FIRE SPRINKLER DATA HALL RISER BANKS #1.3, #2.3, #1.4 & #2.4 ELEVATIONS

Project Number 227317

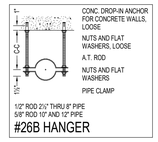
Sheet Number FP3.02

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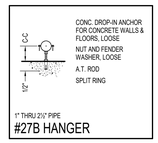



1 FOH RISER BANKS 1.5 & 2.5
1/2" = 1'-0"

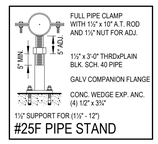
| KEY NOTE LEGEND | |
|---|---|
| NO. | DESCRIPTION |
| FF1 | VICTAULIC FIRELOCK #001 90 ELL |
| FF2 | VICTAULIC FIRELOCK #002 TEE |
| MH1 | #25F PIPE STAND |
| VC1 | VICTAULIC #717 FIRELOCK SWING CHECK VALVE |
| VG3 | VICTAULIC #705 BUTTERFLY VALVE W/ TAMPER SWITCH |
| VG4 | VICTAULIC #707C (N.C.) BUTTERFLY VALVE W/ TAMPER SWITCH |
| VM4 | AGF #3011A INSPECTOR'S TEST VALVE w/ PSI RELIEF |
| VR1 | VIKING E-1/F-1 EASY RISER SWING CHECK VALVE W/ TRIM: DRAIN VALVE, (2) 0-400psi PRESSURE GAUGES |




#26B HANGER




#27B HANGER




#25F PIPE STAND

## FIRE PROTECTION SYMBOLS

| SYMBOL | DESCRIPTION |
|---|---|
| | UP OR DOWN IN PIPING w/ TEE |
| | UP OR DOWN IN PIPING w/ ELBOW |
| | PIPE HANGER LOCATIONS |
| | TRAPEZE HANGER LOCATIONS |
| | GROOVED COUPLING LOCATION |
| | FIRE SPRINKLER SYSTEM RISER |
| | NEW PIPING |
| | EXISTING PIPING |
| | 2 WAY SWAY BRACE |
| | 4 WAY SWAY BRACE |
| | BRANCHLINE RESTRAINT |
| | SMOKE PARTITION |
| | FULL-HEIGHT MASONRY WALL |
| | FULL-HEIGHT GYP BOARD WALL |
| | 1-HOUR FIRE-RATED WALL |
| | 2-HOUR FIRE-RATED WALL |
| | 3-HOUR FIRE-RATED WALL |
| | FIRE DEPARTMENT CONNECTION (FDC) |
| | ELECTRIC BELL |

## PIPE LEGEND

WET PIPE
PREACTION PIPE
DRY PIPE

I certify to the best of my knowledge, information, and belief that the design of this system complies with all applicable provisions of NFPA standards and local fire codes.

*Dennis T. Scherr*

Dennis T. Scherr
NICET Level IV
Water-Based Systems Layout
Cert. # 113016 Exp. 3/1/2029

Stamp or Seal

MULTI-JURISDICTIONAL ID# 1002183508 EXP 9/1/26
LICENSE# 2001762-023-140
NV STATE FIRE MARSHAL REG. # G 583

*Eric Velasco*

Signature

ERIC VELASCO
NICET LEVEL II, #153055
WATER-BASED SYSTEMS LAYOUT
EXPIRATION DATE: 09/01/2026

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FIRE PROTECTION - FIRE ALARM

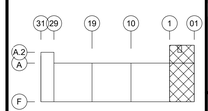
Date: 05/06/26
Designed: NC
Checked: EV/DS

City of Aurora Building Division
Reviewed for Code Compliance
Approved as Noted: chorst
Date: May 28, 2026
2021 INTERNATIONAL CODES & 2023 NEC

QTS DEN1 - DC2

1140 N GUN CLUB RD
AURORA, COLORADO 80018

Building Key Plan




FIRE PROTECTION SYSTEMS

FIRE SPRINKLER FOH RISER BANKS #1.5 & #2.5 ELEVATIONS

Project Number: 227317

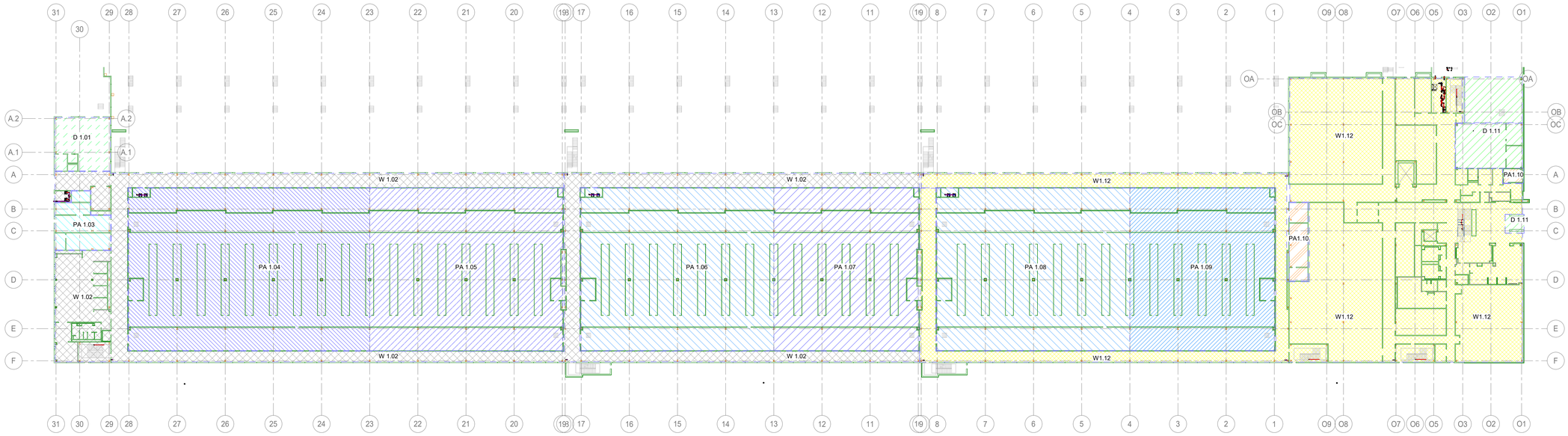
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Plotted: 5/6/2026 1:33:11 PM




1 LEVEL 1 ZONING PLAN
1" = 40'-0"

I certify to the best of my knowledge, information, and belief that the design of this system complies with all applicable provisions of NFPA standards and local fire codes.

*Dennis T. Scherr*

Dennis T. Scherr
NICET Level IV
Water-Based Systems Layout
Cert. # 113016 Exp. 3/1/2029

Stamp or Seal

MULTI-JURISDICTIONAL ID# 1002183508 EXP 9/1/26
LICENSE# 2001762-023-140
NV STATE FIRE MARSHAL REG. # G 583

*Eric Velasco*

Signature

ERIC VELASCO
NICET LEVEL II, #153055
WATER-BASED SYSTEMS LAYOUT
EXPIRATION DATE: 09/01/2026

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P. 702-832-4545 www.shambaugh.com

**FIRE PROTECTION - FIRE ALARM**

Date 05/06/26

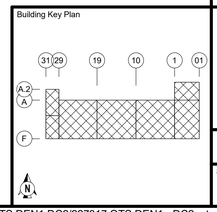
Designed NC

Checked EV/DS

QTS DEN1 - DC2

1140 N GUN CLUB RD
AURORA, COLORADO 80018

Building Key Plan



FIRE PROTECTION SYSTEMS

LEVEL 1 - OVERALL ZONING PLAN

Project Number 227317

Sheet Number FP4.00

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Plotted: 5/6/2026 1:33:13 PM

## SPRINKLER SCHEDULE

| | QTY | THRD | K-FACT. | TEMP. | FINISH | RESP. | MANUF. | MODEL | SIN | DESCRIPTION | WRENCH |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | | | | | | | | |
| ■ | 10 | 1/2" | 5.6 | 200 °F | Brass | Quick | Viking | 22961 | VK4621 | CONCEALED PENDENT | |
| ⧓ | 20 | 1 1/4" | 11.2 | 205 °F | Brass | Quick | Viking | ELO | VK544 | ELO DRY PENDENT | N/A |
| ○ | 170 | 1/2" | 5.6 | 200 °F | Brass | Quick | Viking | XT1 | VK3001 | UPRIGHT ON 1" SPRIG | 23559MB |
| ■ | 28 | 3/4" | 11.2 | 199 °F | | Quick | Viking | ELO | VK530 | UPRIGHT ON 1" SPRIG | |
| Total No. of Sprinklers: 229 | | | | | | | | | | | |

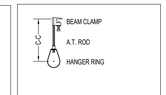
PIPE LEGEND

WET PIPE =
PREACTION PIPE =
DRY PIPE =
STANDPIPE /
EXPRESS MAIN =



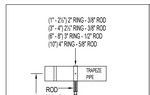

1" AUX. DRAIN GLOBE MODEL AD

NO SCALE

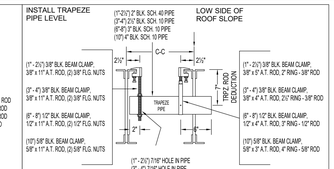



3/8" ROD ½" THRU 4" PIPE
1/2" ROD 8" AND 8" PIPE

#01 HANGER



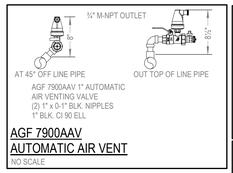

#R3R HANGER




#19A HANGER, UP TO 1/4:12 ROOF SLOPE

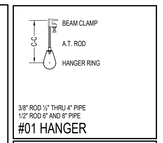
NOTES:
1. ALL PIPING IN PREACTION/DRY SYSTEMS SHALL BE SLOPED PER NFPA
2. ALL PENDENTS SHALL BE CONNECTED VIA FLEX DROPS UNLESS NOTED OTHERWISE.
3. OBSTRUCTED CONSTRUCTION DEFLECTOR DISTANCE APPLIED PER NFPA 13 (2019) 10.2.6.1.2
4. HANGERS ARE TOP BEAM CLAMPS WHERE BEAMS PRESENT AND HILTI HUS-EZ CONCRETE ANCHORS WHERE BEAMS ARE NOT PRESENT
5. LEVEL 1 WET AND PREACTION PIPE SIZING BASED ON LEVEL 2 CALCULATIONS

GENERAL PIPING NOTES:
1. OVERHEAD PIPE SHALL BE ROLL-GROOVED, AS APPLICABLE, UNLESS NOTED OTHERWISE.
2. MAINS SHALL BE SCH. 10, 2½" BRANCHLINES SHALL BE EDDY FLOW, 1" DROPS SHALL BE SCH. 40.
3. REFER TO DETAILS ON THIS SHEET FOR TYPICAL HANGER ATTACHMENTS.
4. REFER TO SHEETS FP1.0 & FP1.1 FOR ADDITIONAL SPECIFIC FIRE SPRINKLER NOTES & DETAILS.
5. TYPICAL HANGERS ARE #01 TOP BEAM CLAMPS. WHERE JOISTS/BEAMS ARE NOT ACCESSIBLE, #19A TRAPEZE HANGERS SHALL BE USED.



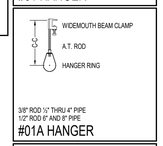

AGF 7900AAV AUTOMATIC AIR VENT

NO SCALE



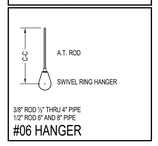

3/8" ROD ½" THRU 4" PIPE
1/2" ROD 8" AND 8" PIPE

#01 HANGER



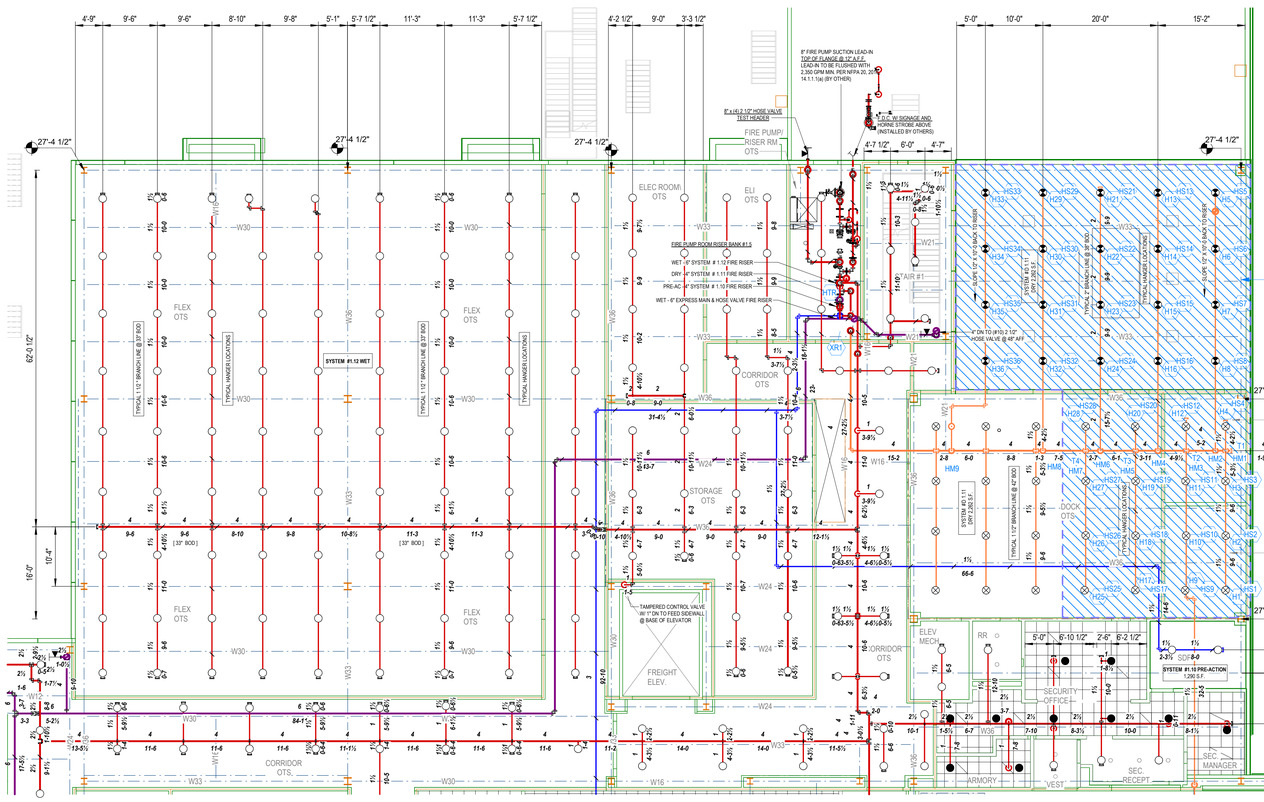

3/8" ROD ½" THRU 4" PIPE
1/2" ROD 8" AND 8" PIPE

#01A HANGER




3/8" ROD ½" THRU 4" PIPE
1/2" ROD 8" AND 8" PIPE

#06 HANGER




HYD. REMOTE AREA #9 -
DRY SYSTEM 1.11, "LOADING DOCK"
NFPA 13 - EXTRA HAZARD GRP-1
.30 GPM/SF OVER 3,302 SF (3,250 SF MIN.)

HYDRAULIC DESIGN INFORMATION:
PROJECT: QTS DEN1
ADDRESS: 1140 N GUN CLUB RD
CONTRACT: 227317
AS SHOWN ON PRINT NO. FP4.01 DATED 04/27/26
SYSTEM NO. #1.11
IS DESIGNED FOR 36 SPRINKLERS TO DISCHARGE
AT A DENSITY OF .3 G.P.M. PER SQUARE FOOT
OVER A MAXIMUM FLOOR AREA OF 3,302 SQ. FT.
WHEN SUPPLIED WITH WATER AT A RATE OF 1,729 G.P.M.
AT A PRESSURE OF 37 P.S.I.
AT BASE OF RISER HOSE ALLOWANCE: 500 G.P.M.
K-FACTOR: 11.2K ORIFICE: 3/4" TEMPERATURE: 200°F
OCCUPANCY CLASS: EXTRA HAZARD GRP-1
SAFETY MARGIN: 24.62 P.S.I.
NOTES: CALCULATION NODE "H"
HYDRAULIC CALCULATION FILE NAME:
227317 QTS DC2 - CALC9 - SYS D 1.11

NORTH

⑤ LEVEL 1 - FOH SEGMENT A
3/32" = 1'-0"

2'8" 0' 5'4" 10'8"
SCALE 3/32" = 1'-0"

City of Aurora Building Division
Reviewed for Code Compliance
Approved as Noted: *cthorst*
Date: *May 28, 2026*
2021 INTERNATIONAL CODES & 2023 NEC

I certify to the best of my knowledge, information, and belief that the design of this system complies with all applicable provisions of NFPA standards and local fire codes.

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Stamp or Seal

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Company

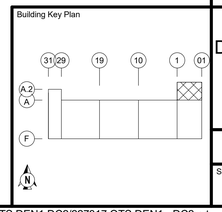
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FIRE PROTECTION - FIRE ALARM

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Designed: NC
Checked: EV/DS

QTS DEN1 - DC2

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AURORA, COLORADO 80018

Building Key Plan




FIRE PROTECTION SYSTEMS

PRE-ACT SYS#1.10, DRY SYS#1.11 & WET SYS#1.12 LEVEL 1 - FRONT OF HOUSE SEGMENT A

Project Number: 227317

Sheet Number: FP4.01

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Plotted: 5/6/2026 1:33:15 PM

## SPRINKLER SCHEDULE

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|---|---|---|---|---|---|---|---|---|---|---|---|
| ■ | 60 | 1/2" | 5.6 | 200 °F | Brass | Quick | Viking | 22961 | VK4621 | CONCEALED PENDENT | |
| ■ | 10 | 1/2" | 5.6 | 200 °F | Chrome | Quick | Viking | XT1 | VK3021 | SEMI RECESS PENDENT | 23559MB |
| ○ | 224 | 1/2" | 5.6 | 200 °F | Brass | Quick | Viking | XT1 | VK3001 | UPRIGHT ON 1" SPRIG | 23559MB |
| Total No. of Sprinklers: 294 | | | | | | | | | | | |

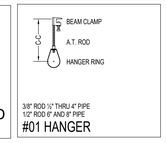
PIPE LEGEND

WET PIPE =
PREACTION PIPE =
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STANDPIPE /
EXPRESS MAIN =

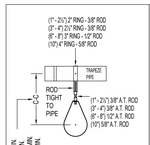



1" AUX. DRAIN GLOBE MODEL AD

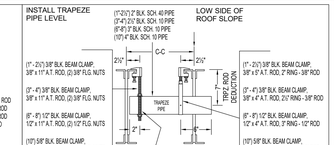
NO SCALE




#01 HANGER



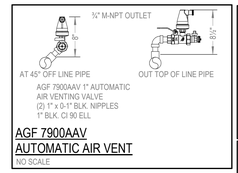

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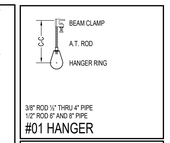
NOTES:
1. ALL PIPING IN PREACTION/DRY SYSTEMS SHALL BE SLOPED PER NFPA
2. ALL PENDENTS SHALL BE CONNECTED VIA FLEX DROPS UNLESS NOTED OTHERWISE
3. OBSTRUCTED CONSTRUCTION DEFLECTOR DISTANCE APPLIED PER NFPA 13 (2019) 10.2.6.1.2
4. HANGERS ARE TOP BEAM CLAMPS WHERE BEAMS PRESENT AND HILTI HUS-EZ CONCRETE ANCHORS WHERE BEAMS ARE NOT PRESENT
5. LEVEL 1 WET AND PREACTION PIPE SIZING BASED ON LEVEL 2 CALCULATIONS

GENERAL PIPING NOTES:
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2. MAINS SHALL BE SCH. 10, 2½" BRANCHLINES SHALL BE EDDY FLOW, 1" DROPS SHALL BE SCH. 40.
3. REFER TO DETAILS ON THIS SHEET FOR TYPICAL HANGER ATTACHMENTS.
4. REFER TO SHEETS FP1.0 & FP1.1 FOR ADDITIONAL SPECIFIC FIRE SPRINKLER NOTES & DETAILS.
5. TYPICAL HANGERS ARE #01 TOP BEAM CLAMPS. WHERE JOISTS/BEAMS ARE NOT ACCESSIBLE, #19A TRAPEZE HANGERS SHALL BE USED.

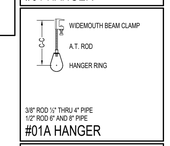



AGF 7900AAV AUTOMATIC AIR VENT

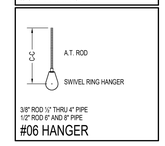
NO SCALE



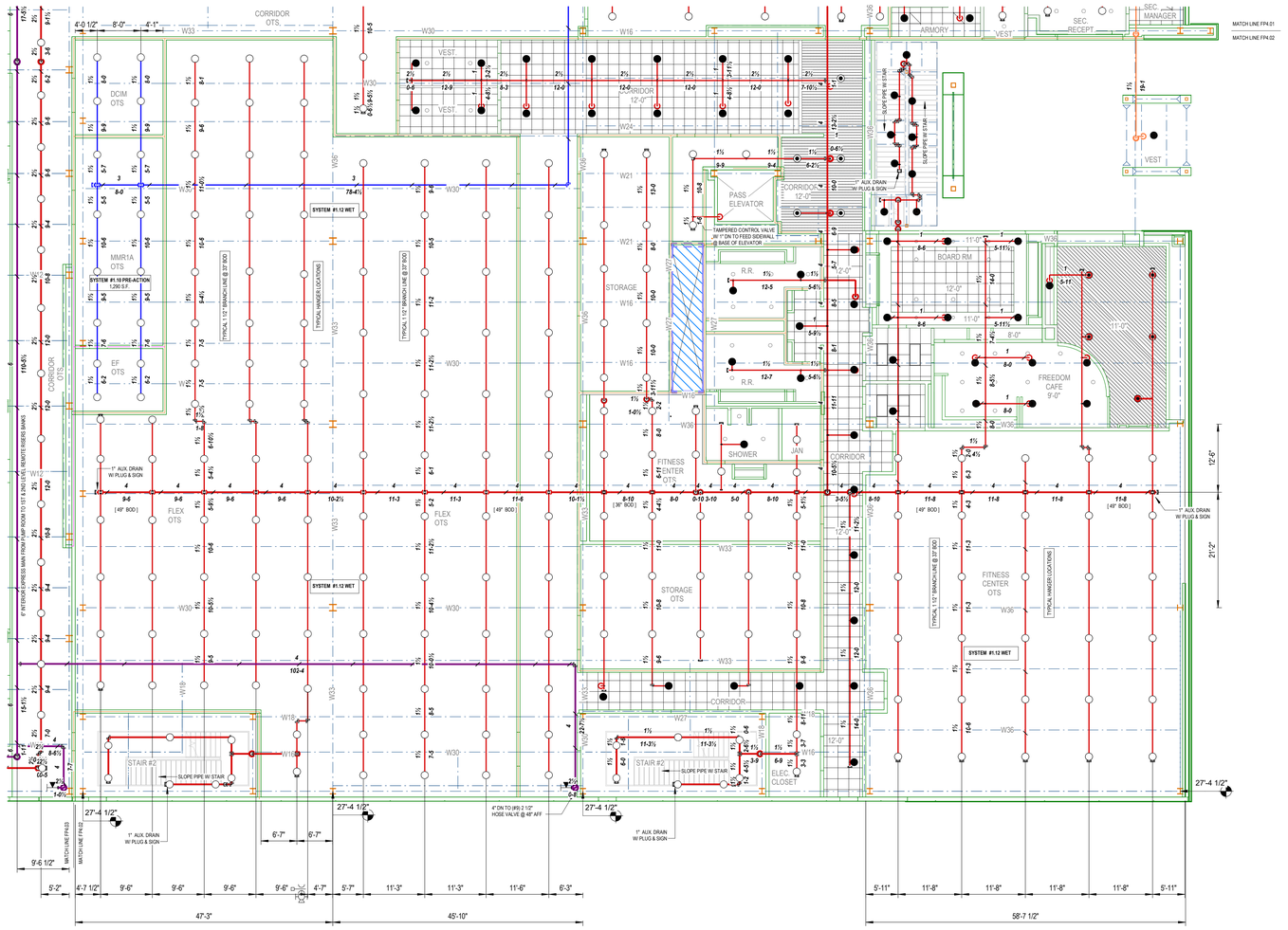

#01 HANGER




#01A HANGER




#06 HANGER




5 LEVEL 1 - FOH SEGMENT B
3/32" = 1'-0"

SCALE 3/32" = 1'-0"

NORTH

I certify to the best of my knowledge, information, and belief that the design of this system complies with all applicable provisions of NFPA standards and local fire codes.

*Dennis T. Scherr*

Dennis T. Scherr
NICET Level IV
Water-Based Systems Layout
Cert. # 113016 Exp. 3/1/2029

Stamp or Seal

MULTI-JURISDICTIONAL ID# 1002183508 EXP 9/1/26
LICENSE# 2001762-023-140
NV STATE FIRE MARSHAL REG. # G 583

*Eric Velasco*

Signature

ERIC VELASCO
NICET LEVEL II, #153055
WATER-BASED SYSTEMS LAYOUT
EXPIRATION DATE: 09/01/2026

SYMBOLS LEGEND:

= Hanger with rod length
= Trapeze Hanger Location
= Hydraulic Reference point

Abbreviations:
TOS = Top of Steel
BOS = Bottom of Steel
BOP = Bottom of Purlin
TOW = Top of Wood
BOW = Bottom of Wood
BOC = Bottom of Concrete
BOD = Bottom of Deck

X" TOS = Centerline of pipe below top of steel
+X'-X" AFF = Centerline of pipe above finished floor

| No. | Date | By | Description |
|---|---|---|---|
| 1 | 11/12/25 | NC | ISSUSED FOR APPROVAL |
| 2 | 02/12/26 | NC | AHJ COMMENTS |
| 3 | 04/08/26 | NC | AHJ COMMENTS - REV 2 |
| 4 | 05/06/26 | NC | ISSUED FOR APPROVAL |

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CONTRACTORS · ENGINEERS
5460 DESERT POINT DR. LAS VEGAS, NV 89118
P. 702-832-4545 www.shambaugh.com
FIRE PROTECTION - FIRE ALARM

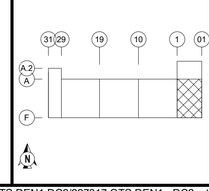
Date: 05/06/26
Designed: NC
Checked: EV/DS

City of Aurora Building Division
Reviewed for Code Compliance
Approved as Noted: chorst
Date: May 28, 2026
2021 INTERNATIONAL CODES & 2023 NEC

QTS DEN1 - DC2

1140 N GUN CLUB RD
AURORA, COLORADO 80018

Building Key Plan




FIRE PROTECTION SYSTEMS

PRE-ACT SYS#1.10, WET SYS#1.11 LEVEL 1 - FRONT OF HOUSE SEGMENT B

Project Number: 227317

Sheet Number: FP4.02

Plotted: 5/6/2026 1:33:17 PM

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## SPRINKLER SCHEDULE

| | QTY | THRD | K-FACT. | TEMP. | FINISH | RESP. | MANUF. | MODEL | SIN | DESCRIPTION | WRENCH |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ◌ | 467 | 1/2" | 5.6 | 200 °F | Brass | Quick | Viking | XT1 | VK3001 | UPRIGHT ON 1" SPRIG | 23559MB |
| Total No. of Sprinklers: 467 | | | | | | | | | | | |

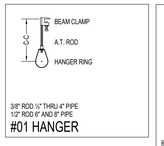
PIPE LEGEND

WET PIPE =
PREACTION PIPE =
DRY PIPE =
STANDPIPE /
EXPRESS MAIN =



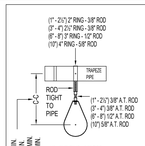

1" AUX. DRAIN GLOBE MODEL AD

NO SCALE

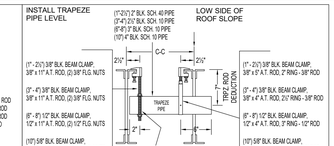



3/8" ROD ½" THRU 4" PIPE
1/2" ROD 6" AND 8" PIPE

#01 HANGER



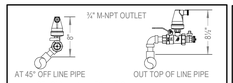

#R3R HANGER




#19A HANGER, UP TO 1/4:12 ROOF SLOPE

NOTES:
1. ALL PIPING IN PREACTION/DRY SYSTEMS SHALL BE SLOPED PER NFPA
2. ALL PENDENTS SHALL BE CONNECTED VIA FLEX DROPS UNLESS NOTED OTHERWISE
3. OBSTRUCTED CONSTRUCTION DEFLECTOR DISTANCE APPLIED PER NFPA 13 (2019) 10.2.6.1.2
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5. LEVEL 1 WET AND PREACTION PIPE SIZING BASED ON LEVEL 2 CALCULATIONS

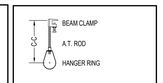
GENERAL PIPING NOTES:
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5. TYPICAL HANGERS ARE #01 TOP BEAM CLAMPS. WHERE JOISTS/BEAMS ARE NOT ACCESSIBLE, #19A TRAPEZE HANGERS SHALL BE USED.




AGF 7900AAV 1" AUTOMATIC AIR VENTING VALVE
(2) 1" x 0-1" BLK. NIPPLES
1" BLK. CI 90 ELL

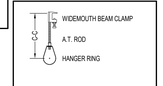
AGF 7900AAV
AUTOMATIC AIR VENT

NO SCALE



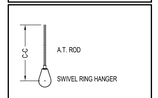

3/8" ROD ½" THRU 4" PIPE
1/2" ROD 6" AND 8" PIPE

#01 HANGER



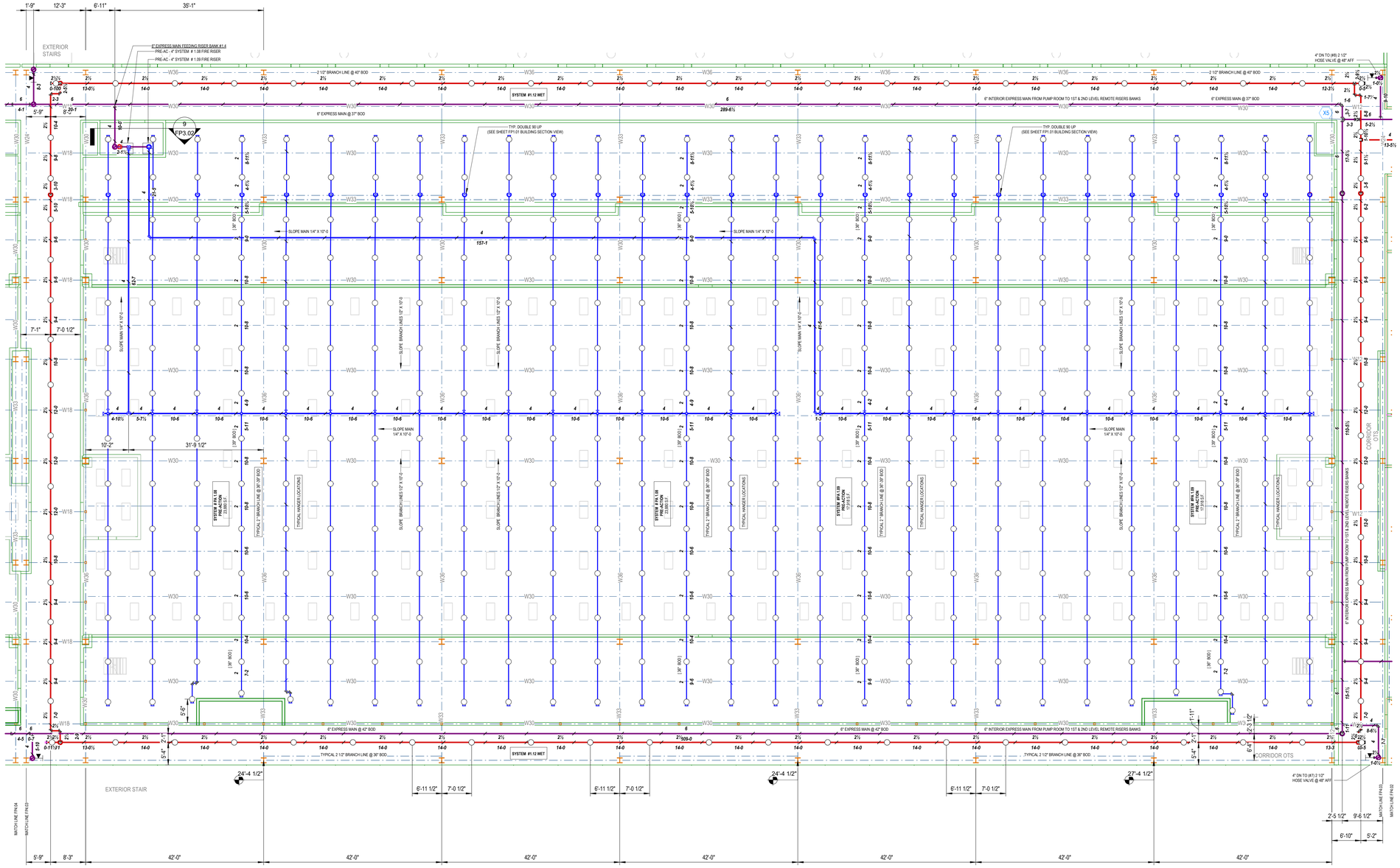

3/8" ROD ½" THRU 4" PIPE
1/2" ROD 6" AND 8" PIPE

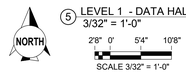
#01A HANGER




3/8" ROD ½" THRU 4" PIPE
1/2" ROD 6" AND 8" PIPE

#06 HANGER




5 LEVEL 1 - DATA HALL 1000
3/32" = 1'-0"

2'8" 0' 5'4" 10'8"
SCALE 3/32" = 1'-0"

I certify to the best of my knowledge, information, and belief that the design of this system complies with all applicable provisions of NFPA standards and local fire codes.

*Dennis T. Scherr*

Dennis T. Scherr
NICET Level IV
Water-Based Systems Layout
Cert. # 113016 Exp. 3/1/2029

Stamp or Seal

MULTI-JURISDICTIONAL ID# 1002183508 EXP 9/1/26
LICENSE# 2001762-023-140
NV STATE FIRE MARSHAL REG. # G 583

*Eric Velasco*
Signature

ERIC VELASCO
NICET LEVEL II, #153055
WATER-BASED SYSTEMS LAYOUT
EXPIRATION DATE: 09/01/2026

SYMBOLS LEGEND:
= Hanger with rod length
= Trapeze Hanger Location
= Hydraulic Reference point

Abbreviations:
TOS = Top of Steel BOW = Bottom of Wood
BOS = Bottom of Steel BOC = Bottom of Concrete
BOP = Bottom of Purlin BOD = Bottom of Deck
TOW = Top or Wood

X" TOS = Centerline of pipe below top of steel
+X-X" AFF = Centerline of pipe above finished floor

| No. | Date | By | Description |
|---|---|---|---|
| 1 | 11/12/25 | NC | ISSUED FOR APPROVAL |
| 2 | 02/12/26 | NC | AHJ COMMENTS |
| 3 | 04/08/26 | NC | AHJ COMMENTS - REV 2 |
| 4 | 05/06/26 | NC | ISSUED FOR APPROVAL |

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CONTRACTORS · ENGINEERS
5460 DESERT POINT DR, LAS VEGAS, NV 89118
P. 702-832-4545 www.shambaugh.com

FIRE PROTECTION - FIRE ALARM

Date 05/06/26

Designed NC

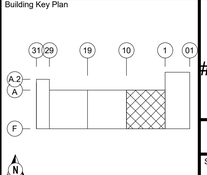
Checked EV/DS

City of Aurora Building Division
Reviewed for Code Compliance
Approved as Noted:chorst
Date:May 28, 2026
2021 INTERNATIONAL CODES & 2023 NEC

QTS DEN1 - DC2

1140 N GUN CLUB RD
AURORA, COLORADO 80018

Building Key Plan




FIRE PROTECTION SYSTEMS

PRE-ACT SYS #1.08, #1.09 & WET SYS #1.12, LEVEL 1 - DATA HALL 1100

Project Number 227317

Sheet Number FP4.03

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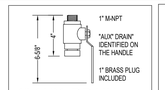
PERMIT #2026 2513934 | CM 04 | RSN:1975523

## SPRINKLER SCHEDULE

| | QTY | THRD | K-FACT. | TEMP. | FINISH | RESP. | MANUF. | MODEL | SIN | DESCRIPTION | WRENCH |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | 451 | 1/2" | 5.6 | 200 °F | Brass | Quick | Viking | XT1 | VK3001 | UPRIGHT ON 1" SPRIG | 23559MB |
| Total No. of Sprinklers: 451 | | | | | | | | | | | |

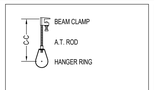
PIPE LEGEND

WET PIPE =
PREACTION PIPE =
DRY PIPE =
STANDPIPE /
EXPRESS MAIN =

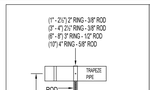



1" AUX. DRAIN GLOBE MODEL AD

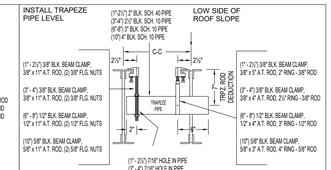
NO SCALE




#01 HANGER



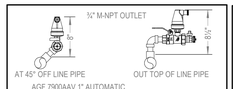

#R3R HANGER




#19A HANGER, UP TO 1/4:12 ROOF SLOPE

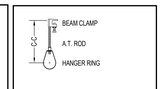
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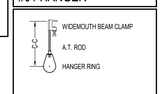



AGF 7900AAV AUTOMATIC AIR VENT

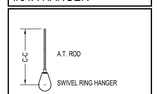
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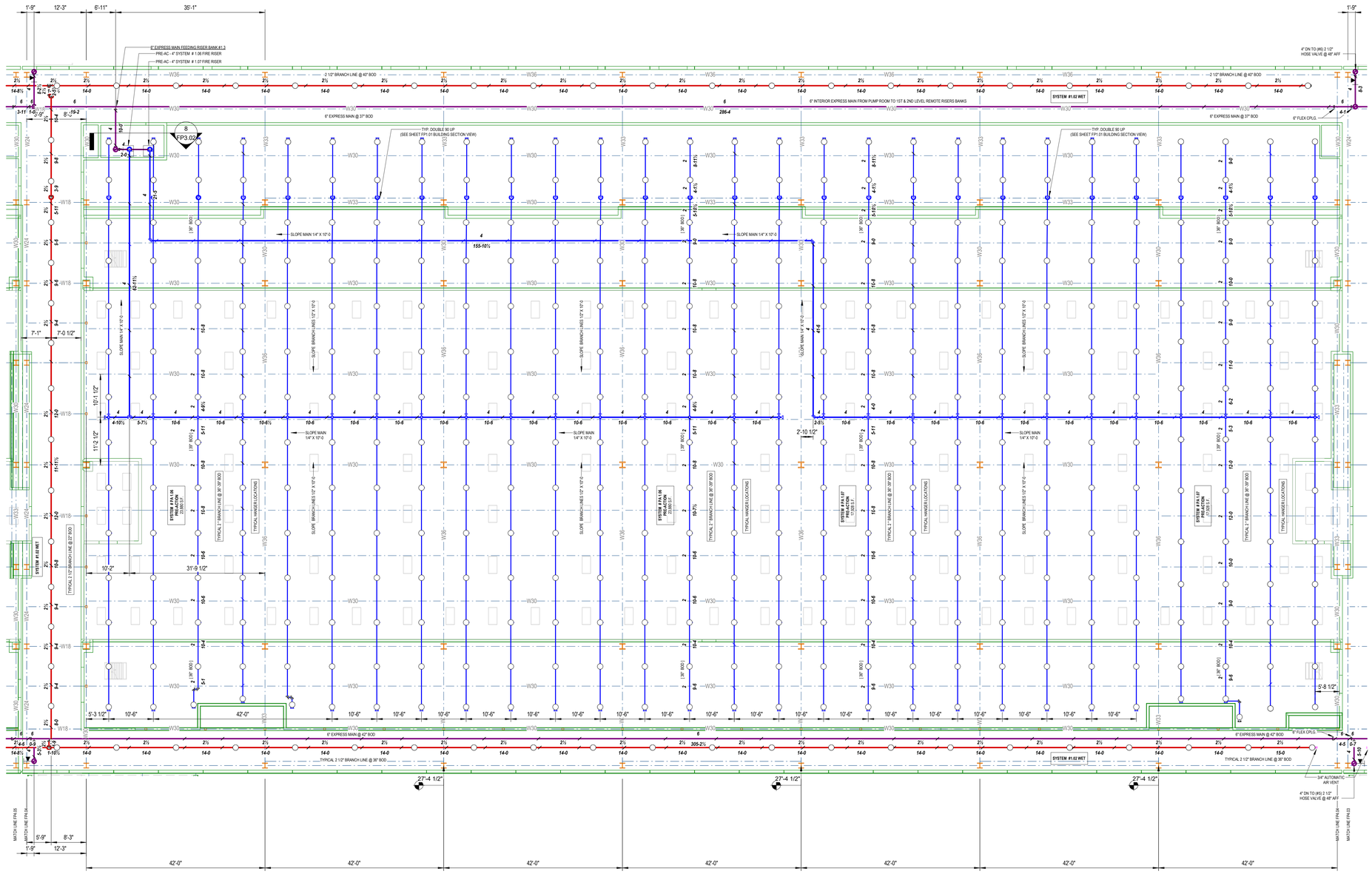

#01 HANGER




#01A HANGER




#06 HANGER







5 LEVEL 1 - DATA HALL 1200
3/32" = 1'-0"

2'8" 0' 5'4" 10'8"

SCALE 3/32" = 1'-0"

I certify to the best of my knowledge, information, and belief that the design of this system complies with all applicable provisions of NFPA standards and local fire codes.

*Dennis T. Scherr*

Dennis T. Scherr
NICET Level IV
Water-Based Systems Layout
Cert. # 113016 Exp. 3/1/2029

Stamp or Seal

MULTI-JURISDICTIONAL ID# 1002183508 EXP 9/1/26
LICENSE # 2001762-025,140
NV STATE FIRE MARSHAL REG. # G 583

*Eric Velasco*

Signature

ERIC VELASCO
NICET LEVEL II, #153055
WATER-BASED SYSTEMS LAYOUT
EXPIRATION DATE: 09/01/2026

SYMBOLS LEGEND:

= Hanger with rod length
= Trapeze Hanger Location
= Hydraulic Reference point

Abbreviations:
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BOS = Bottom of Steel BOC = Bottom of Concrete
BOP = Bottom of Purlin BOD = Bottom of Deck
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X" TOS = Centerline of pipe below top of steel
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| No. | Date | By | Description |
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| 3 | 04/08/26 | NC | AHJ COMMENTS - REV 2 |
| 4 | 05/06/26 | NC | ISSUED FOR APPROVAL |

Company

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FIRE PROTECTION - FIRE ALARM

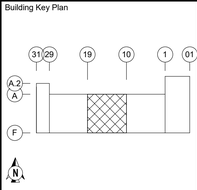
Date: 05/06/26
Designed: NC
Checked: EV/DS

City of Aurora Building Division
Reviewed for Code Compliance
Approved as Noted:chorst
Date:May 28, 2026
2021 INTERNATIONAL CODES & 2023 NEC

QTS DEN1 - DC2

1140 N GUN CLUB RD
AURORA, COLORADO 80018

Building Key Plan




FIRE PROTECTION SYSTEMS

WET SYS #1.02, PRE-ACT SYS #1.06 &#1.07 LEVEL 1 - DATA HALL 1200

Project Number: 227317

Sheet Number: FP4.04

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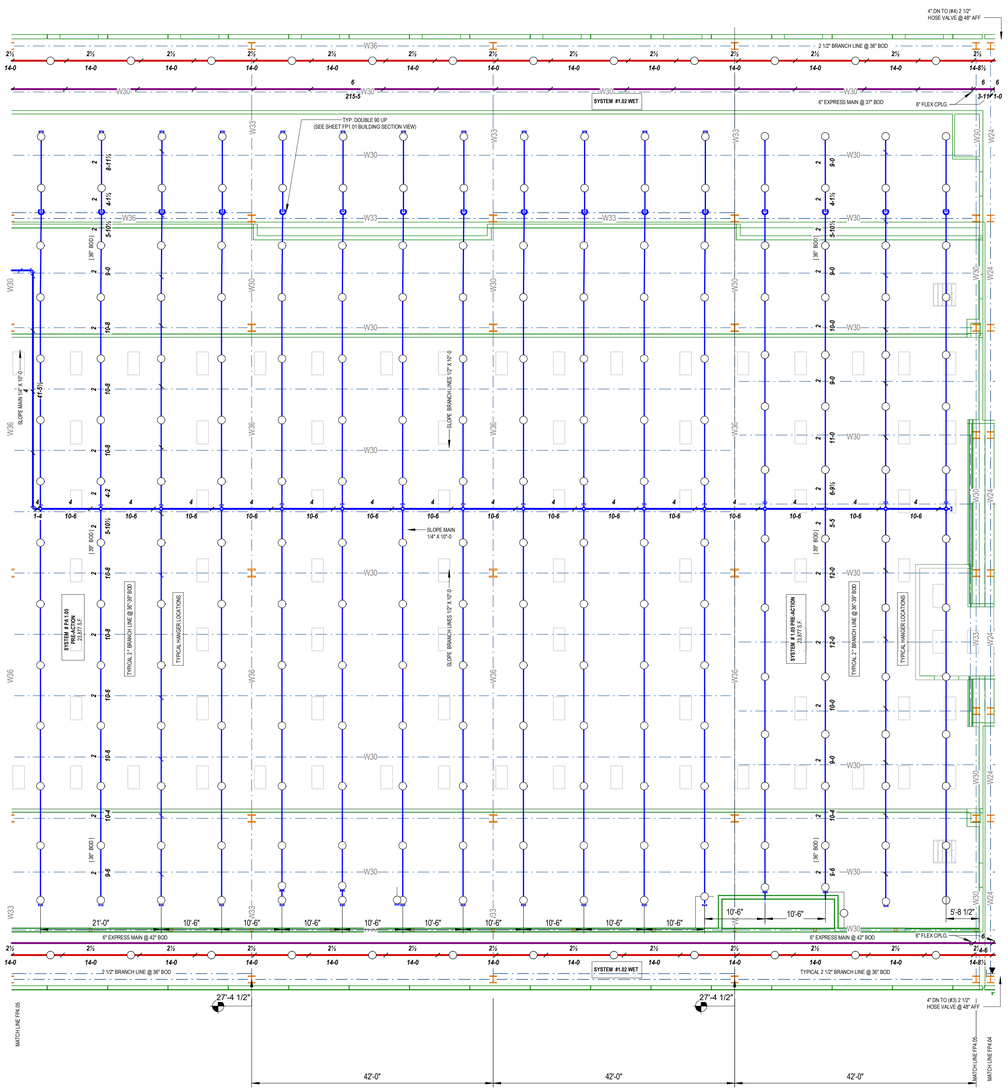
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## SPRINKLER SCHEDULE

| | QTY | THRD | K-FACT. | TEMP. | FINISH | RESP. | MANUF. | MODEL | SIN | DESCRIPTION | WRENCH |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ◌ | 252 | 1/2" | 5.6 | 200 °F | Brass | Quick | Viking | XT1 | VK3001 | UPRIGHT ON 1" SPRIG | 23559MB |
| Total No. of Sprinklers: 252 | | | | | | | | | | | |

PIPE LEGEND

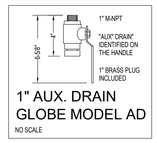
WET PIPE =
PREACTION PIPE =
DRY PIPE =
STANDPIPE /
EXPRESS MAIN =



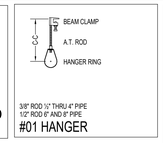

5 LEVEL 1 - DATA HALL 1300.1
3/32" = 1'-0"

NORTH

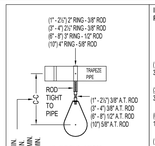
2'8" 0' 5'4" 10'8"
SCALE 3/32" = 1'-0"



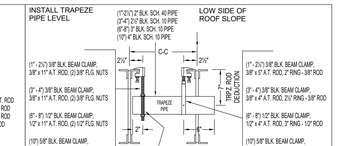

1" AUX. DRAIN GLOBE MODEL AD
NO SCALE




3/8" ROD ½" THRU 4" PIPE
1/2" ROD 8" AND 8" PIPE
#01 HANGER



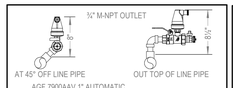

#R3R HANGER



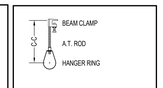

#19A HANGER, UP TO 1/4:12 ROOF SLOPE

NOTES:
1. ALL PIPING IN PREACTION/DRY SYSTEMS SHALL BE SLOPED PER NFPA
2. ALL PENDENTS SHALL BE CONNECTED VIA FLEX DROPS UNLESS NOTED OTHERWISE
3. OBSTRUCTED CONSTRUCTION DEFLECTOR DISTANCE APPLIED PER NFPA 13 (2019) 10.2.6.1.2
4. HANGERS ARE TOP BEAM CLAMPS WHERE BEAMS PRESENT AND HILTI HUS-EZ CONCRETE ANCHORS WHERE BEAMS ARE NOT PRESENT
5. LEVEL 1 WET AND PREACTION PIPE SIZING BASED ON LEVEL 2 CALCULATIONS

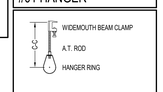
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3. REFER TO DETAILS ON THIS SHEET FOR TYPICAL HANGER ATTACHMENTS.
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5. TYPICAL HANGERS ARE #01 TOP BEAM CLAMPS. WHERE JOISTS/BEAMS ARE NOT ACCESSIBLE, #19A TRAPEZE HANGERS SHALL BE USED.



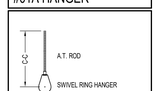

AGF 7900AAV
AUTOMATIC AIR VENT
NO SCALE




3/8" ROD ½" THRU 4" PIPE
1/2" ROD 8" AND 8" PIPE
#01 HANGER




3/8" ROD ½" THRU 4" PIPE
1/2" ROD 8" AND 8" PIPE
#01A HANGER




3/8" ROD ½" THRU 4" PIPE
1/2" ROD 8" AND 8" PIPE
#06 HANGER

I certify to the best of my knowledge, information, and belief that the design of this system complies with all applicable provisions of NFPA standards and local fire codes.

*Dennis T. Scherr*

Dennis T. Scherr
NICET Level IV
Water-Based Systems Layout
Cert. # 113016 Exp. 3/1/2029

Stamp or Seal

MULTI-JURISDICTIONAL ID# 1002183508 EXP 9/1/26
LICENSE# 2001762-023-140
NV STATE FIRE MARSHAL REG. # G 583

*Eric Velasco*
Signature

ERIC VELASCO
NICET LEVEL II, #153055
WATER-BASED SYSTEMS LAYOUT
EXPIRATION DATE: 09/01/2026

SYMBOLS LEGEND:
= Hanger with rod length
= Trapeze Hanger Location
= Hydraulic Reference point
Abbreviations:
TOS = Top of Steel BOW = Bottom of Wood
BOS = Bottom of Steel BOC = Bottom of Concrete
BOP = Bottom of Purlin BOD = Bottom of Deck
TOW = Top or Wood
X" TOS = Centerline of pipe below top of steel
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| No. | Date | By | Description |
|---|---|---|---|
| 1 | 11/12/25 | NC | ISSUED FOR APPROVAL |
| 2 | 02/12/26 | NC | AHJ COMMENTS |
| 3 | 04/08/26 | NC | AHJ COMMENTS - REV 2 |
| 4 | 05/06/26 | NC | ISSUED FOR APPROVAL |

Company

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CONTRACTORS · ENGINEERS
5460 DESERT POINT DR, LAS VEGAS, NV 89118
P: 702-832-4545 www.shambaugh.com
FIRE PROTECTION - FIRE ALARM

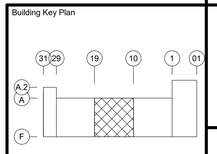
Date 04/27/26
Designed NC
Checked EV

City of Aurora Building Division
Reviewed for Code Compliance
Approved as Noted: *chorst*
Date: *May 28, 2026*
2021 INTERNATIONAL CODES & 2023 NEC

QTS DEN1 - DC2

1140 N GUN CLUB RD
AURORA, COLORADO 80018

Building Key Plan




FIRE PROTECTION SYSTEMS

WET SYS #1.02 & PRE-ACTION SYS # 1.05 LEVEL 1 - DATA HALL 1300

Project Number 227317

Sheet Number FP4.05

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Plotted: 5/6/2026 1:33:26 PM

PERMIT #2026 2513934 | CM 04 | RSN:1975523

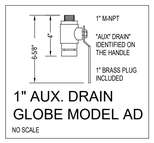
## SPRINKLER SCHEDULE

| | QTY | THRD | K-FACT. | TEMP. | FINISH | RESP. | MANUF. | MODEL | SIN | DESCRIPTION | WRENCH |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ◌ | 311 | 1/2" | 5.6 | 200 °F | Brass | Quick | Viking | XT1 | VK3001 | UPRIGHT ON 1" SPRIG | 23559MB |

Total No. of Sprinklers: 311

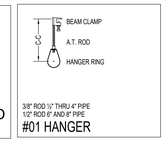
PIPE LEGEND

WET PIPE =
PREACTION PIPE =
DRY PIPE =
STANDPIPE /
EXPRESS MAIN =



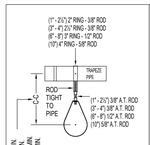

1" AUX. DRAIN GLOBE MODEL AD

NO SCALE

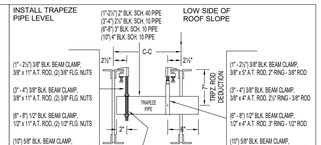



3/8" ROD ½" THRU 4" PIPE
1/2" ROD 6" AND 8" PIPE

#01 HANGER



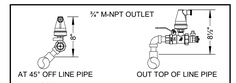

#R3R HANGER




#19A HANGER, UP TO 1/4:12 ROOF SLOPE

NOTES:
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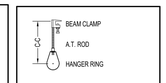
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AGF 7900AAV 1" AUTOMATIC AIR VENTING VALVE
(2) 1" x 0-1" BLK. NIPPLES
1" BLK. CI 90 ELL

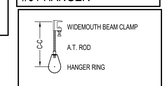
AGF 7900AAV
AUTOMATIC AIR VENT

NO SCALE



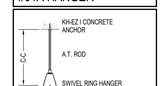

3/8" ROD ½" THRU 4" PIPE
1/2" ROD 6" AND 8" PIPE

#01 HANGER



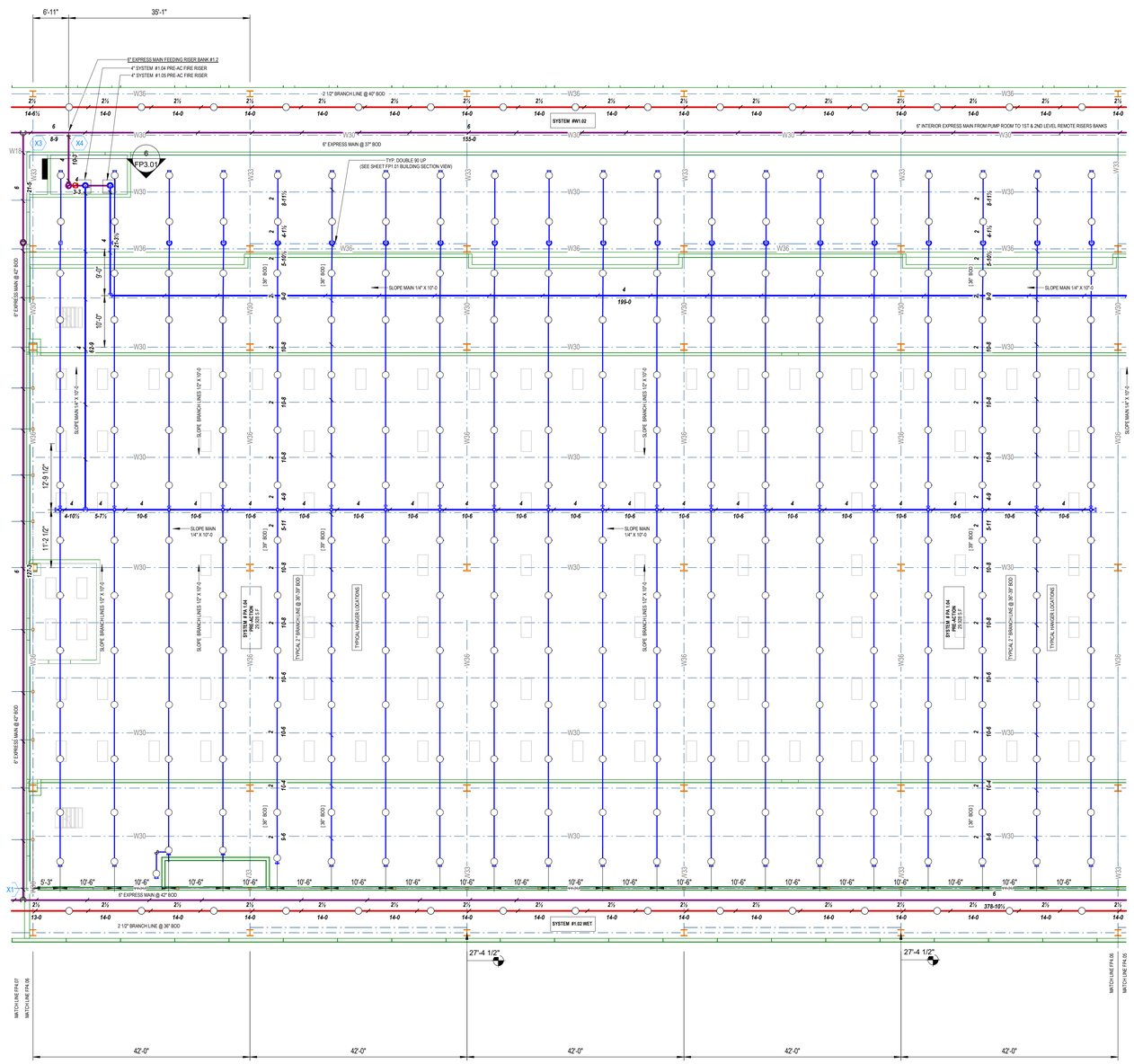

3/8" ROD ½" THRU 4" PIPE
1/2" ROD 6" AND 8" PIPE

#01A HANGER




3/8" ROD ½" THRU 4" PIPE
1/2" ROD 6" AND 8" PIPE

#06 HANGER




1 LEVEL 1 - DATA HALL 1300.2
3/32" = 1'-0"

2'8" 0' 5'4" 10'8"
SCALE 3/32" = 1'-0"

NORTH

I certify to the best of my knowledge, information, and belief that the design of this system complies with all applicable provisions of NFPA standards and local fire codes.

*Dennis T. Scherr*

Dennis T. Scherr
NICET Level IV
Water-Based Systems Layout
Cert. # 113016 Exp. 3/1/2029

Stamp or Seal

MULTI-JURISDICTIONAL ID# 1002183508 EXP 9/1/26
LICENSE# 2001762-023-140
NV STATE FIRE MARSHAL REG. # G 583

*Eric Velasco*

Signature

ERIC VELASCO
NICET LEVEL II, #153055
WATER-BASED SYSTEMS LAYOUT
EXPIRATION DATE: 09/01/2026

SYMBOLS LEGEND:

= Hanger with rod length
= Trapeze Hanger Location
= Hydraulic Reference point

Abbreviations:
TOS = Top of Steel
BOC = Bottom of Concrete
BOP = Bottom of Purlin
BOD = Bottom of Deck
TOW = Top of Wood
BOW = Bottom of Wood

X" TOS = Centerline of pipe below top of steel
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| No. | Date | By | Description |
|---|---|---|---|
| 1 | 11/12/25 | NC | ISSUSED FOR APPROVAL |
| 2 | 02/12/26 | NC | AHJ COMMENTS |
| 3 | 04/08/26 | NC | AHJ COMMENTS - REV 2 |
| 4 | 05/06/26 | NC | ISSUED FOR APPROVAL |

Company

SHAMBAUGH & SON, L.P.
CONTRACTORS · ENGINEERS
5460 DESERT POINT DR. LAS VEGAS, NV 89118
P. 702-832-4545 www.shambaugh.com

FIRE PROTECTION - FIRE ALARM

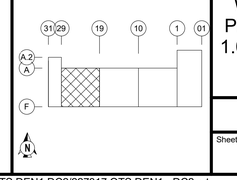
Date: 05/06/26
Designed: NC
Checked: EV/DS

City of Aurora Building Division
Reviewed for Code Compliance
Approved as Noted: *chorst*
Date: *May 28, 2026*
2021 INTERNATIONAL CODES & 2023 NEC

QTS DEN1 - DC2

1140 N GUN CLUB RD
AURORA, COLORADO 80018

Building Key Plan




FIRE PROTECTION SYSTEMS

WET SYS #1.02 & PRE-ACTION SYS # 1.04 LEVEL 1 - DATA HALL 1300

Project Number: 227317

Sheet Number: FP4.06

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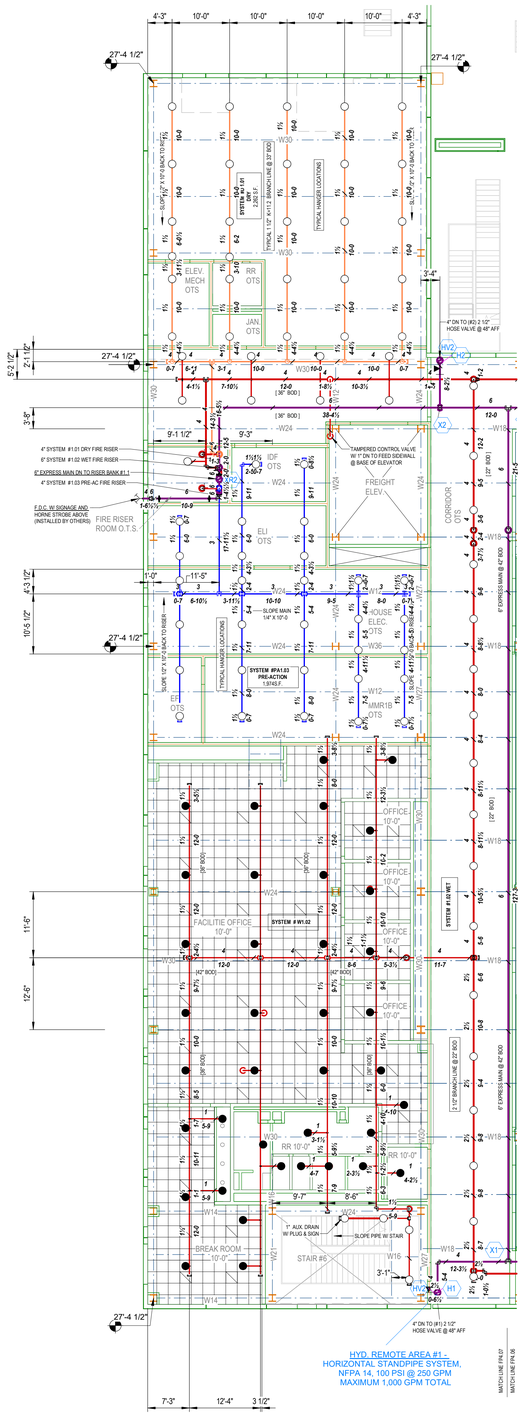


Autodesk Docs://227317-QTS DEN1 DC2/227317 QTS DEN1 - DC2.rvt

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## SPRINKLER SCHEDULE

| | QTY | THRD | K-FACT. | TEMP. | FINISH | RESP. | MANUF. | MODEL | SIN | DESCRIPTION | WRENCH |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ■ | 38 | 1/2" | 5.6 | 200 °F | Brass | Quick | Viking | 22961 | VK4621 | CONCEALED PENDENT | |
| ○ | 87 | 1/2" | 5.6 | 200 °F | Brass | Quick | Viking | XT1 | VK3001 | UPRIGHT ON 1" SPRIG | 23559MB |
| Total No. of Sprinklers: 125 | | | | | | | | | | | |




HYD. REMOTE AREA #1 -
HORIZONTAL STANDPIPE SYSTEM,
NFPA 14, 100 PSI @ 250 GPM
MAXIMUM 1,000 GPM TOTAL

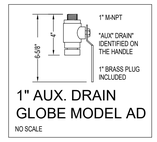
5 LEVEL 1 - BOH SEGMENT K
3/32" = 1'-0"

NORTH

2'8" 0' 5'4" 10'8"
SCALE 3/32" = 1'-0"

PIPE LEGEND

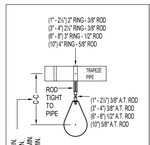
WET PIPE =
PREACTION PIPE =
DRY PIPE =
STANDPIPE /
EXPRESS MAIN =



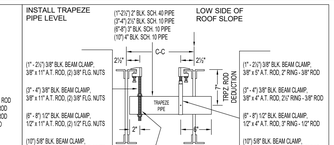

1" AUX. DRAIN GLOBE MODEL AD
NO SCALE




3/8" ROD ½" THRU 4" PIPE
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#01 HANGER



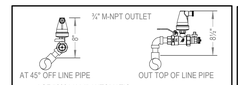

#R3R HANGER



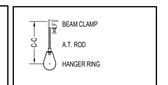

#19A HANGER, UP TO 1/4:12 ROOF SLOPE

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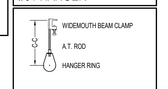
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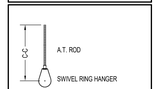

AGF 7900AAV
AUTOMATIC AIR VENT
NO SCALE




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1/2" ROD 8" AND 8" PIPE
#01 HANGER




3/8" ROD ½" THRU 4" PIPE
1/2" ROD 8" AND 8" PIPE
#01A HANGER




3/8" ROD ½" THRU 4" PIPE
1/2" ROD 8" AND 8" PIPE
#06 HANGER

HYDRAULIC DESIGN INFROMATION:
PROJECT: QTS DEN1
ADDRESS: 1140 N GUN CLUB RD
CONTRACT: 227317
AS SHOWN ON PRINT NO.: FP4.01 DATE:10/10/2025
SYSTEM NO. : STANDPIPE
IS DESIGNED FOR (4) 2-1/2" HOSE VALVE TO
DISCHARGE 250 GPM PER HOSE VALVE WHEN
SUPPLIED WITH 100 PSI AT EACH HOSE VALVE
TOTAL WATER DISCHARGE RATE OF 1,000 GPM
OCCUPANCY CLASS: CLASS 1 STANDPIPE
SAFETY MARGIN: 1 PSI
HYDRAULIC CALCULATION FILE NAME: CALC1 S.P.

I certify to the best of my knowledge, information, and belief that the design of this system complies with all applicable provisions of NFPA standards and local fire codes.

*Dennis T. Scherr*

Dennis T. Scherr
NICET Level IV
Water-Based Systems Layout
Cert. # 113016 Exp. 3/1/2029

Stamp or Seal

MULTI-JURISDICTIONAL ID# 1002183508 EXP 9/1/26
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*Eric Velasco*
Signature

ERIC VELASCO
NICET LEVEL II, #153055
WATER-BASED SYSTEMS LAYOUT
EXPIRATION DATE: 09/01/2026

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P: 702-832-4545 www.shambaugh.com
FIRE PROTECTION - FIRE ALARM

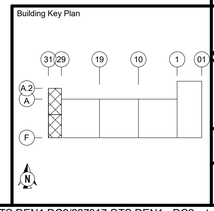
Date 05/06/26
Designed NC
Checked EV/DS

City of Aurora Building Division
Reviewed for Code Compliance
Approved as Noted: *chorst*
Date: *May 28, 2026*
2021 INTERNATIONAL CODES & 2023 NEC

QTS DEN1 - DC2

1140 N GUN CLUB RD
AURORA, COLORADO 80018

Building Key Plan




FIRE PROTECTION SYSTEMS

DRY SYS #1.01, WET SYS # 1.02 & PRE-ACT 1.03 LEVEL 1 - BACK OF HOUSE

Project Number 227317

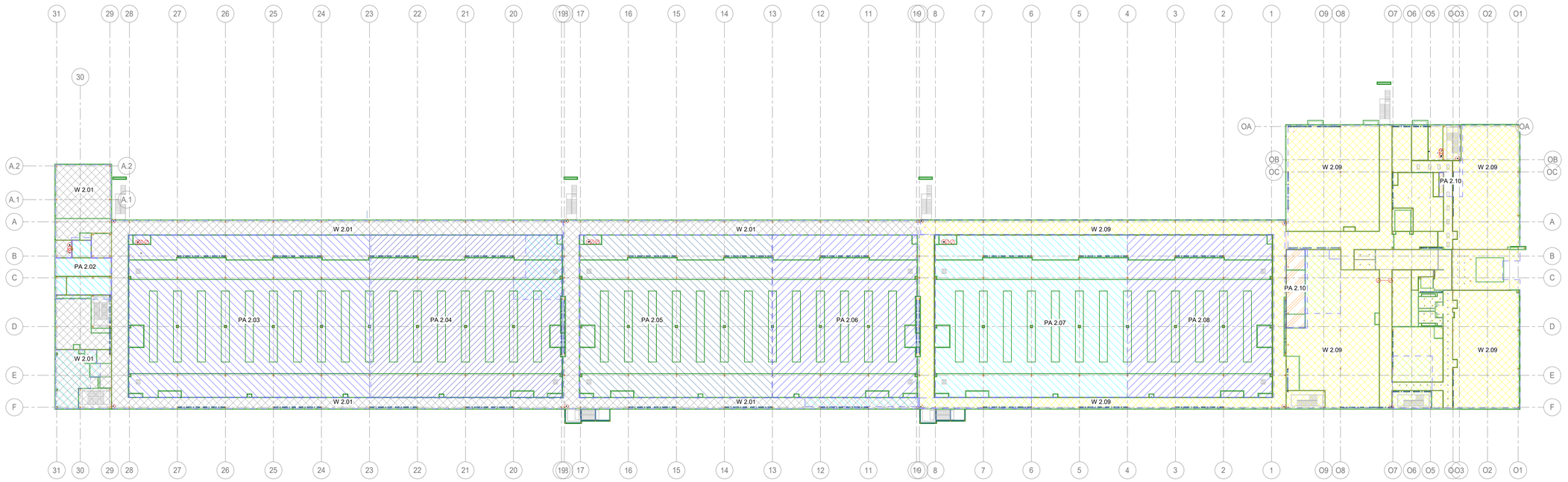
Sheet Number FP4.07

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Plotted: 5/6/2026 1:33:30 PM




1 LEVEL 2 ZONING PLAN
1" = 40'-0"

I certify to the best of my knowledge, information, and belief that the design of this system complies with all applicable provisions of NFPA standards and local fire codes.

Dennis T. Scherr

Dennis T. Scherr
NICET Level IV
Water-Based Systems Layout
Cert. # 113016 Exp. 3/1/2029

Stamp or Seal

MULTI-JURISDICTIONAL ID# 1002183508 EXP 9/1/26
LICENSE# 2001762-023-140
NV STATE FIRE MARSHAL REG. # G 583

Eric Velasco
Signature

ERIC VELASCO
NICET LEVEL II, #153055
WATER-BASED SYSTEMS LAYOUT
EXPIRATION DATE: 09/01/2026

SYMBOLS LEGEND:
= Hanger with rod length
= Trapeze Hanger Location
= Hydraulic Reference point
Abbreviations:
TOS = Top of Steel
BOS = Bottom of Steel
BOP = Bottom of Purlin
TOW = Top of Wood
BOW = Bottom of Wood
BOC = Bottom of Concrete
BOD = Bottom of Deck
X" TOS = Centerline of pipe below top of steel
+X-X" AFF = Centerline of pipe above finished floor

| No. | Date | By | Description |
|---|---|---|---|
| 1 | 11/12/25 | NC | ISSUSED FOR APPROVAL |
| 2 | 02/12/26 | NC | AHJ COMMENTS |
| 3 | 04/08/26 | NC | AHJ COMMENTS - REV 2 |
| 4 | 05/06/26 | NC | ISSUED FOR APPROVAL |

Company

SHAMBAUGH & SON, L.P.
CONTRACTORS · ENGINEERS
5460 DESERT POINT DR. LAS VEGAS, NV 89118
P. 702-832-4545 www.shambaugh.com
FIRE PROTECTION - FIRE ALARM

Date 05/06/26

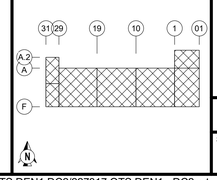
Designed NC

Checked EV/DS

QTS DEN1 - DC2

1140 N GUN CLUB RD
AURORA, COLORADO 80018

Building Key Plan



FIRE PROTECTION SYSTEMS

LEVEL 2 - OVERALL ZONING PLAN

Project Number 227317

Sheet Number FP4.08

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Plotted: 5/6/2026 1:33:31 PM

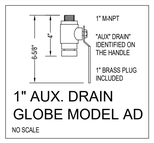
## SPRINKLER SCHEDULE

| | QTY | THRD | K-FACT. | TEMP. | FINISH | RESP. | MANUF. | MODEL | SIN | DESCRIPTION | WRENCH |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ■ | 22 | 1/2" | 5.6 | 200 °F | Brass | Quick | Viking | 22961 | VK4621 | CONCEALED PENDENT | |
| ○ | 207 | 1/2" | 5.6 | 200 °F | Brass | Quick | Viking | XT1 | VK3001 | UPRIGHT ON 1" SPRIG | 23559MB |

Total No. of Sprinklers: 229

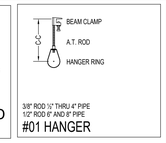
PIPE LEGEND

WET PIPE =
PREACTION PIPE =
DRY PIPE =
STANDPIPE /
EXPRESS MAIN =

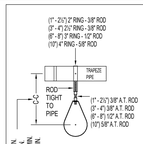



1" AUX. DRAIN GLOBE MODEL AD

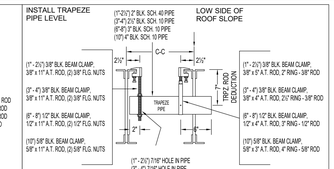
NO SCALE




#01 HANGER



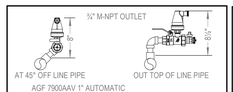

#R3R HANGER




#19A HANGER, UP TO 1/4:12 ROOF SLOPE

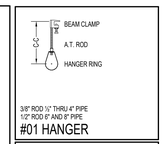
NOTES:
1. ALL PIPING IN PREACTION/DRY SYSTEMS SHALL BE SLOPED PER NFPA
2. ALL PENDENTS SHALL BE CONNECTED VIA FLEX DROPS UNLESS NOTED OTHERWISE
3. OBSTRUCTED CONSTRUCTION DEFLECTOR DISTANCE APPLIED PER NFPA 13 (2019) 10.2.6.1.2
4. HANGERS ARE TOP BEAM CLAMPS WHERE BEAMS PRESENT AND HILTI HUS-EZ CONCRETE ANCHORS WHERE BEAMS ARE NOT PRESENT
5. LEVEL 1 WET AND PREACTION PIPE SIZING BASED ON LEVEL 2 CALCULATIONS

GENERAL PIPING NOTES:
1. OVERHEAD PIPE SHALL BE ROLL-GROOVED, AS APPLICABLE, UNLESS NOTED OTHERWISE.
2. MAINS SHALL BE SCH. 10, 2½" BRANCHLINES SHALL BE EDDY FLOW, 1" DROPS SHALL BE SCH. 40.
3. REFER TO DETAILS ON THIS SHEET FOR TYPICAL HANGER ATTACHMENTS.
4. REFER TO SHEETS FP1.0 & FP1.1 FOR ADDITIONAL SPECIFIC FIRE SPRINKLER NOTES & DETAILS.
5. TYPICAL HANGERS ARE #01 TOP BEAM CLAMPS. WHERE JOISTS/BEAMS ARE NOT ACCESSIBLE, #19A TRAPEZE HANGERS SHALL BE USED.

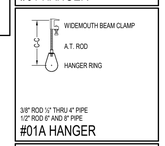



AGF 7900AAV AUTOMATIC AIR VENT

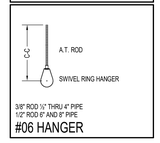
NO SCALE



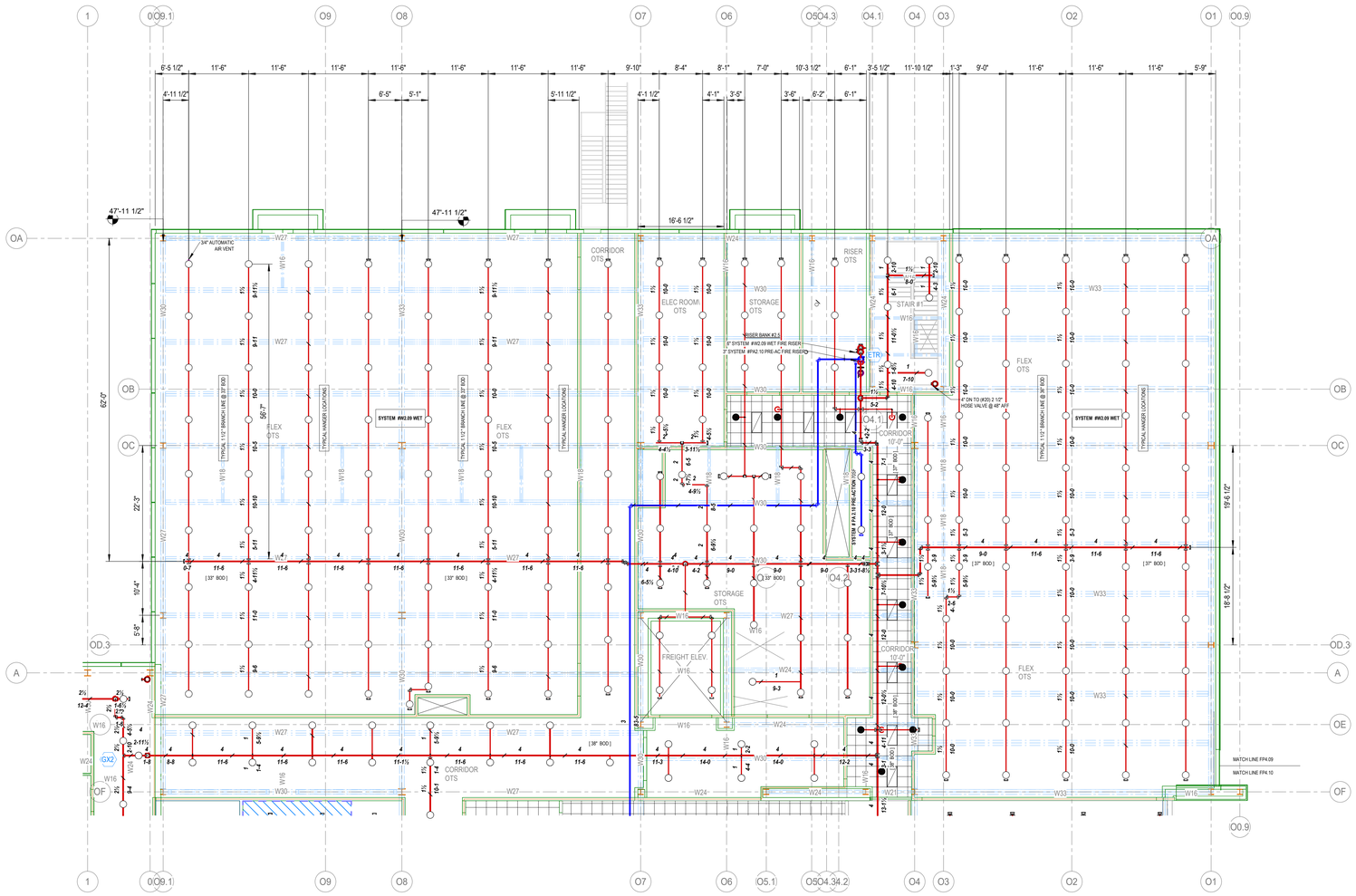

#01 HANGER




#01A HANGER




#06 HANGER




5 LEVEL 2 - FOH SEGMENT A
3/32" = 1'-0"

NORTH

2'8" 0' 5'4" 10'8"

SCALE 3/32" = 1'-0"

I certify to the best of my knowledge, information, and belief that the design of this system complies with all applicable provisions of NFPA standards and local fire codes.

*Dennis T. Scherr*

Dennis T. Scherr
NICET Level IV
Water-Based Systems Layout
Cert. # 113016 Exp. 3/1/2029

Stamp or Seal

MULTI-JURISDICTIONAL ID# 1002183508 EXP 9/1/26
LICENSE# 2001762-023-140
NV STATE FIRE MARSHAL REG. # G 583

*Eric Velasco*

Signature

ERIC VELASCO
NICET LEVEL II, #153055
WATER-BASED SYSTEMS LAYOUT
EXPIRATION DATE: 09/01/2026

SYMBOLS LEGEND:

= Hanger with rod length
= Trapeze Hanger Location
= Hydraulic Reference point

Abbreviations:
TOS = Top of Steel BOW = Bottom of Wood
BOS = Bottom of Steel BOC = Bottom of Concrete
BOP = Bottom of Purlin BOD = Bottom of Deck
TOW = Top of Wood

X" TOS = Centerline of pipe below top of steel
+X'-X" AFF = Centerline of pipe above finished floor

| No. | Date | By | Description |
|---|---|---|---|
| 1 | 11/12/25 | NC | ISSUED FOR APPROVAL |
| 2 | 02/12/26 | NC | AHJ COMMENTS |
| 3 | 04/08/26 | NC | AHJ COMMENTS - REV 2 |
| 4 | 05/06/26 | NC | ISSUED FOR APPROVAL |

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CONTRACTORS · ENGINEERS
5460 DESERT POINT DR, LAS VEGAS, NV 89118
P. 702-832-4545 www.shambaugh.com

FIRE PROTECTION - FIRE ALARM

Date: 05/06/26

Designed: NC

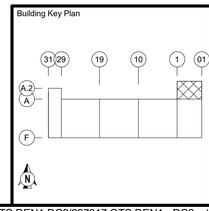
Checked: EV/DS

City of Aurora Building Division
Reviewed for Code Compliance
Approved as Noted: *chorst*
Date: *May 28, 2026*
2021 INTERNATIONAL CODES & 2023 NEC

QTS DEN1 - DC2

1140 N GUN CLUB RD
AURORA, COLORADO 80018

Building Key Plan




FIRE PROTECTION SYSTEMS

WET SYS #2.09
LEVEL 2 - FRONT OF HOUSE SEGMENT A

Project Number: 227317

Sheet Number: FP4.09

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Plotted: 5/6/2026 1:33:33 PM

## SPRINKLER SCHEDULE

| | QTY | THRD | K-FACT. | TEMP. | FINISH | RESP. | MANUF. | MODEL | SIN | DESCRIPTION | WRENCH |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ■ | 48 | 1/2" | 5.6 | 200 °F | Brass | Quick | Viking | 22961 | VK4621 | CONCEALED PENDENT | |
| ■ | 5 | 1/2" | 5.6 | 200 °F | Chrome | Quick | Viking | XT1 | VK3021 | SEMI RECESS PENDENT | 23559MB |
| ◌ | 236 | 1/2" | 5.6 | 200 °F | Brass | Quick | Viking | XT1 | VK3001 | UPRIGHT ON 1" SPRIG | 23559MB |
| Total No. of Sprinklers: 289 | | | | | | | | | | | |

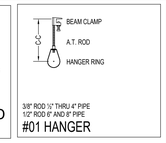
### HYDRAULIC DESIGN INFORMATION:

PROJECT: QTS DEN1
ADDRESS: 1140 N GUN CLUB RD
CONTRACT: 227317
AS SHOWN ON PRINT NO. FP4.10 DATED 4/27/26
SYSTEM NO. W2-09
IS DESIGNED FOR 17 SPRINKLERS TO DISCHARGE
AT A DENSITY OF .2 G.P.M. PER SQUARE FOOT
OVER A MAXIMUM FLOOR AREA OF 1,618 SQ. FT.
WHEN SUPPLIED WITH WATER AT A RATE OF 746 G.P.M.
AT A PRESSURE OF 15 P.S.I.
AT BASE OF RISER HOSE ALLOWANCE: 250 G.P.M.
K-FACTOR: 5.6K ORIFICE: 1/2" TEMPERATURE: 200°F
OCCUPANCY CLASS: ORDINARY HAZARD GRP-2
SAFETY MARGIN: 47.83 P.S.I.
NOTES: CALCULATION NODE "E"
HYDRAULIC CALCULATION FILE NAME:
CALC 6 W 2-09

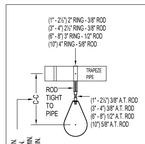
PIPE LEGEND
WET PIPE =
PREACTION PIPE =
DRY PIPE =
STANDPIPE /
EXPRESS MAIN =



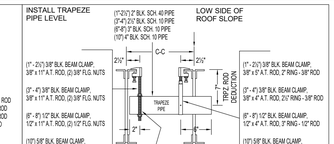

1" AUX. DRAIN GLOBE MODEL AD
NO SCALE




3/8" ROD ½" THRU 4" PIPE
1/2" ROD 8" AND 8" PIPE
#01 HANGER



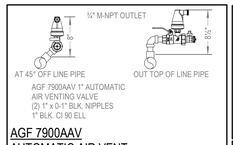

#R3R HANGER



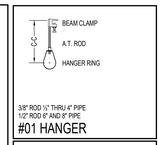

#19A HANGER, UP TO 1/4:12 ROOF SLOPE

NOTES:
1. ALL PIPING IN PREACTION/DRY SYSTEMS SHALL BE SLOPED PER NFPA
2. ALL PENDENTS SHALL BE CONNECTED VIA FLEX DROPS UNLESS NOTED OTHERWISE
3. OBSTRUCTED CONSTRUCTION DEFLECTOR DISTANCE APPLIED PER NFPA 13 (2019) 10.2.6.1.2
4. HANGERS ARE TOP BEAM CLAMPS WHERE BEAMS PRESENT AND HILTI HUS-EZ CONCRETE ANCHORS WHERE BEAMS ARE NOT PRESENT
5. LEVEL 1 WET AND PREACTION PIPE SIZING BASED ON LEVEL 2 CALCULATIONS

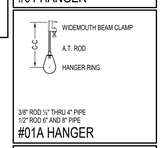
GENERAL PIPING NOTES:
1. OVERHEAD PIPE SHALL BE ROLL-GROOVED, AS APPLICABLE, UNLESS NOTED OTHERWISE.
2. MAINS SHALL BE SCH. 10, 2½" BRANCHLINES SHALL BE EDDY FLOW, 1" DROPS SHALL BE SCH. 40.
3. REFER TO DETAILS ON THIS SHEET FOR TYPICAL HANGER ATTACHMENTS.
4. REFER TO SHEETS FP1.0 & FP1.1 FOR ADDITIONAL SPECIFIC FIRE SPRINKLER NOTES & DETAILS.
5. TYPICAL HANGERS ARE #01 TOP BEAM CLAMPS. WHERE JOISTS/BEAMS ARE NOT ACCESSIBLE, #19A TRAPEZE HANGERS SHALL BE USED.




AGF 7900AAV
AUTOMATIC AIR VENT
NO SCALE



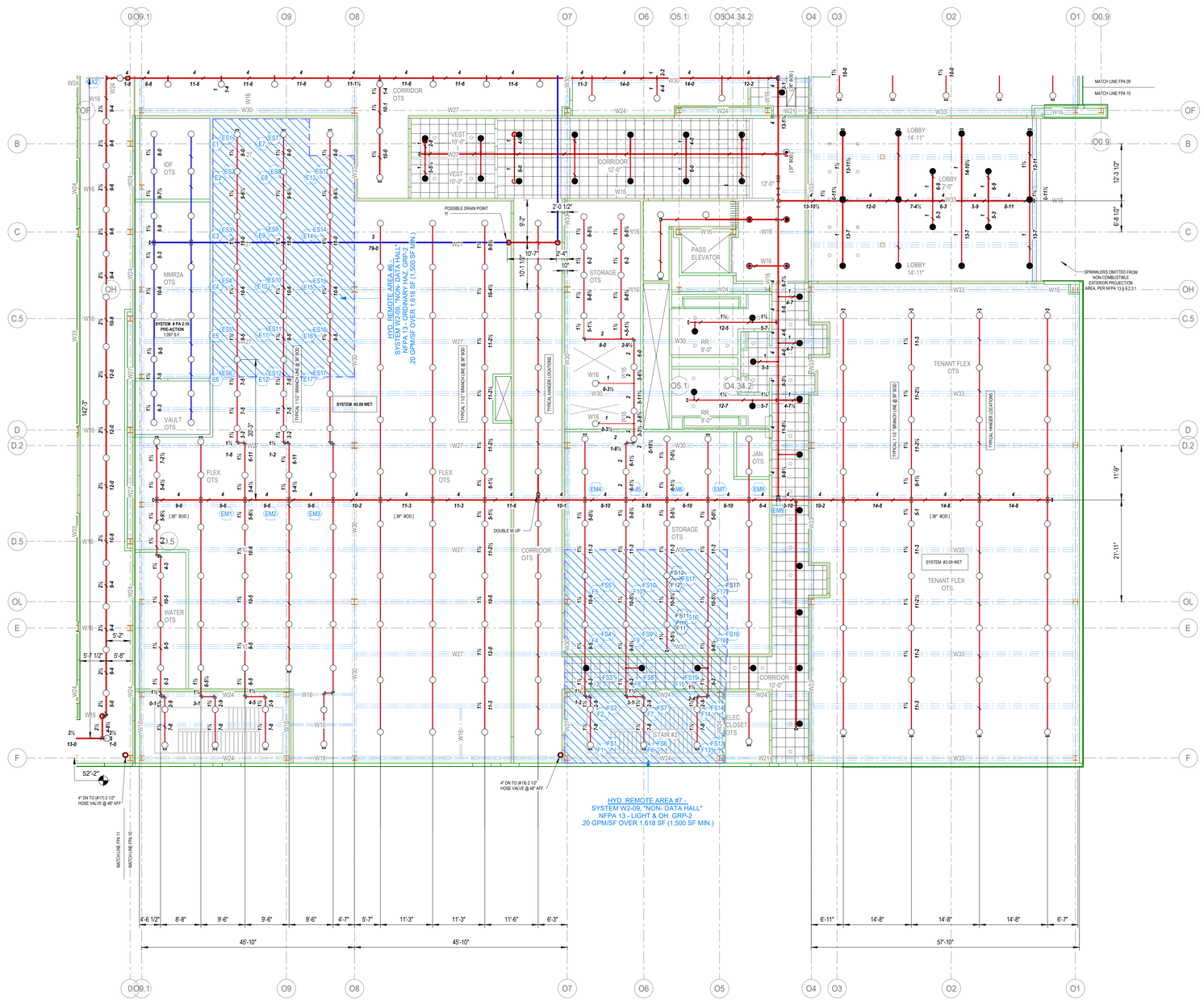

3/8" ROD ½" THRU 4" PIPE
1/2" ROD 8" AND 8" PIPE
#01 HANGER




3/8" ROD ½" THRU 4" PIPE
1/2" ROD 8" AND 8" PIPE
#01A HANGER




3/8" ROD ½" THRU 4" PIPE
1/2" ROD 8" AND 8" PIPE
#06 HANGER




5 LEVEL 2 - FOH SEGMENT B
3/32" = 1'-0"
SCALE 3/32" = 1'-0"

### HYDRAULIC DESIGN INFORMATION:

PROJECT: QTS DEN1
ADDRESS: 1140 N GUN CLUB RD
CONTRACT: 227317
AS SHOWN ON PRINT NO. FP4.01 DATED 10/10/2025
SYSTEM NO. W2-09
IS DESIGNED FOR 15 SPRINKLERS TO DISCHARGE
AT A DENSITY OF .2 G.P.M. PER SQUARE FOOT
OVER A MAXIMUM FLOOR AREA OF 1,599 SQ. FT.
WHEN SUPPLIED WITH WATER AT A RATE OF 727 G.P.M.
AT A PRESSURE OF .10 P.S.I.
AT BASE OF RISER HOSE ALLOWANCE: 250 G.P.M.
K-FACTOR: 5.6K ORIFICE: 1/2" TEMPERATURE: 200°F
OCCUPANCY CLASS: ORDINARY HAZARD GRP-2
SAFETY MARGIN: 73.94 P.S.I.
NOTES: CALCULATION NODE "F"
HYDRAULIC CALCULATION FILE NAME:
CALC 7 W 2-09

SYMBOLS LEGEND:
= Hanger with rod length
= Trapeze Hanger Location
= Hydraulic Reference point
Abbreviations:
TOS = Top of Steel BOW = Bottom of W-rod
BOS = Bottom of Steel BOC = Bottom of Concrete
BOP = Bottom of Purlin BOD = Bottom of Deck
TOW = Top or Wood
X" TOS = Centerline of pipe below top of steel
+X-X" AFF = Centerline of pipe above finished floor

| No. | Date | By | Description |
|---|---|---|---|
| 1 | 11/12/25 | NC | ISSUED FOR APPROVAL |
| 2 | 02/12/26 | NC | AHJ COMMENTS |
| 3 | 04/08/26 | NC | AHJ COMMENTS - REV 2 |
| 4 | 05/06/26 | NC | ISSUED FOR APPROVAL |

I certify to the best of my knowledge, information, and belief that the design of this system complies with all applicable provisions of NFPA standards and local fire codes.

*Dennis T. Scherr*
Dennis T. Scherr
NICET Level IV
Water-Based Systems Layout
Cert. # 113016 Exp. 3/1/2029

Stamp or Seal

MULTI-JURISDICTIONAL ID# 1002183508 EXP 9/1/26
LICENSE# 2001762-023-140
NV STATE FIRE MARSHAL REG. # G 583

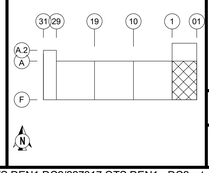
*Eric Velasco*
Signature
ERIC VELASCO
NICET LEVEL II, #153055
WATER-BASED SYSTEMS LAYOUT
EXPIRATION DATE: 09/01/2026

Company
SHAMBAUGH & SON, L.P.
CONTRACTORS · ENGINEERS
8460 DESERT POINT DR. LAS VEGAS, NV 89118
P: 702-832-4545 www.shambaugh.com
FIRE PROTECTION - FIRE ALARM

Date 05/06/26
Designed NC
Checked EV/DS

City of Aurora Building Division
Reviewed for Code Compliance
Approved as Noted:*chorst*
Date:*May 28, 2026*
2021 INTERNATIONAL CODES & 2023 NEC

Building Key Plan




QTS DEN1 - DC2
1140 N GUN CLUB RD
AURORA, COLORADO 80018

FIRE PROTECTION SYSTEMS

WET SYS #2.09 & PRE-AC SYS #2.10 LEVEL 2 - FRONT OF HOUSE SEGMENT B

Project Number 227317

Sheet Number FP4.10

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Plotted: 5/6/2026 1:33:35 PM

## SPRINKLER SCHEDULE

| | QTY | THRD | K-FACT. | TEMP. | FINISH | RESP. | MANUF. | MODEL | SIN | DESCRIPTION | WRENCH |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ◌ | 470 | 1/2" | 5.6 | 200 °F | Brass | Quick | Viking | XT1 | VK3001 | UPRIGHT ON 1" SPRIG | 23559MB |
| Total No. of Sprinklers: 470 | | | | | | | | | | | |

NOTES:
1. ALL PIPING IN PREACTION/DRY SYSTEMS SHALL BE SLOPED PER NFPA
2. ALL PENDENTS SHALL BE CONNECTED VIA FLEX DROPS UNLESS NOTED OTHERWISE
3. OBSTRUCTED CONSTRUCTION DEFLECTOR DISTANCE APPLIED PER NFPA 13 (2019) 10.2.6.1.2
4. HANGERS ARE TOP BEAM CLAMPS WHERE BEAMS PRESENT AND HILTI HUS-EZ CONCRETE ANCHORS WHERE BEAMS ARE NOT PRESENT
5. LEVEL 1 WET AND PREACTION PIPE SIZING BASED ON LEVEL 2 CALCULATIONS

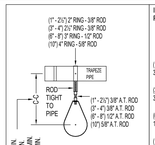
PIPE LEGEND
WET PIPE =
PREACTION PIPE =
DRY PIPE =
STANDPIPE /
EXPRESS MAIN =



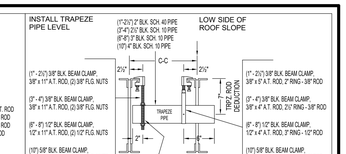
1" AUX. DRAIN GLOBE MODEL AD
NO SCALE



3/8" ROD ½" THRU 4" PIPE
1/2" ROD 6" AND 8" PIPE
#01 HANGER

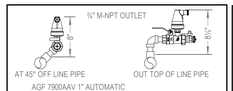


#R3R HANGER

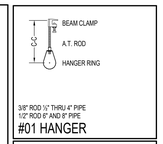


#19A HANGER, UP TO 1/4:12 ROOF SLOPE

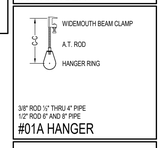
GENERAL PIPING NOTES:
1. OVERHEAD PIPE SHALL BE ROLL-GROOVED, AS APPLICABLE, UNLESS NOTED OTHERWISE.
2. MAINS SHALL BE SCH. 10, 2½" BRANCHLINES SHALL BE EDDY FLOW. 1" DROPS SHALL BE SCH. 40.
3. REFER TO DETAILS ON THIS SHEET FOR TYPICAL HANGER ATTACHMENTS.
4. REFER TO SHEETS FP1.0 & FP1.1 FOR ADDITIONAL SPECIFIC FIRE SPRINKLER NOTES & DETAILS.
5. TYPICAL HANGERS ARE #01 TOP BEAM CLAMPS. WHERE JOISTS/BEAMS ARE NOT ACCESSIBLE, #19A TRAPEZE HANGERS SHALL BE USED.



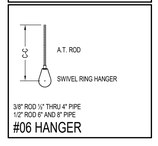
AGF 7900AAV
AUTOMATIC AIR VENT
NO SCALE



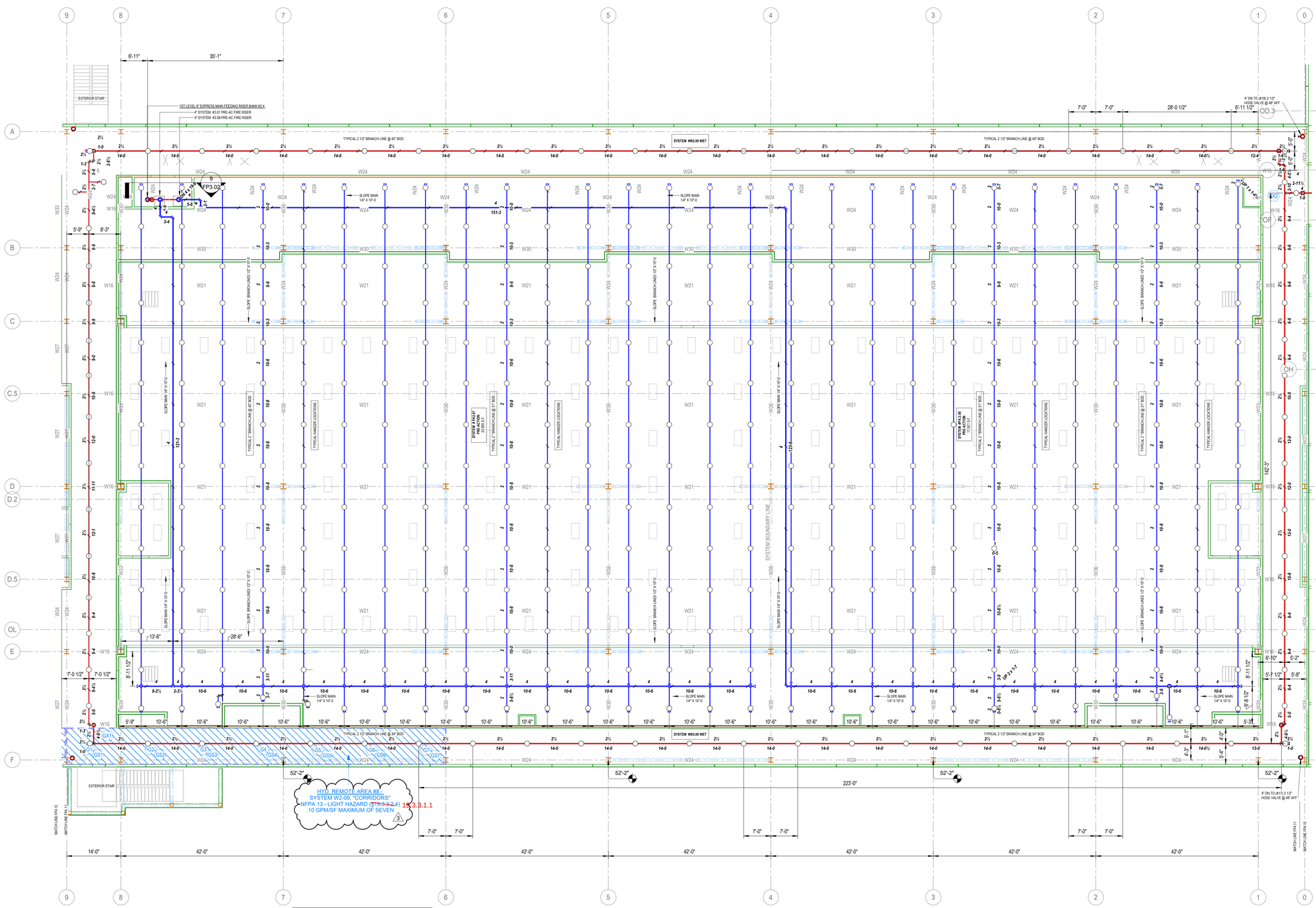
3/8" ROD ½" THRU 4" PIPE
1/2" ROD 6" AND 8" PIPE
#01 HANGER



3/8" ROD ½" THRU 4" PIPE
1/2" ROD 6" AND 8" PIPE
#01A HANGER



3/8" ROD ½" THRU 4" PIPE
1/2" ROD 6" AND 8" PIPE
#06 HANGER




HYDRAULIC DESIGN INFORMATION:
PROJECT: QTS DEN1
ADDRESS: 1140 N GUN CLUB RD
CONTRACT: 227317
AS SHOWN ON PRINT NO. FP4.11 DATED 10/15/2025
SYSTEM NO. W 2-09
IS DESIGNED FOR 7 SPRINKLERS TO DISCHARGE
AT A DENSITY OF .1 G.P.M. PER SQUARE FOOT
OVER A MAXIMUM FLOOR AREA OF 7 SPK SQ. FT.
WHEN SUPPLIED WITH WATER AT A RATE OF 277 G.P.M.
AT A PRESSURE OF 24 P.S.I.
AT BASE OF RISER HOSE ALLOWANCE: 100 G.P.M.
K-FACTOR: 5.6K ORIFICE: 1/2" TEMPERATURE: 200°F
OCCUPANCY CLASS: LIGHT HAZARD
SAFETY MARGIN: 88.51 P.S.I.
NOTES: CALCULATION NODE "G"
HYDRAULIC CALCULATION FILE NAME:
CALC 8 W 2-09

NORTH

5 LEVEL 2 - DATA HALL 2100
3/32" = 1'-0"
2'8" 0' 5'4" 10'8"
SCALE 3/32" = 1'-0"

I certify to the best of my knowledge, information, and belief that the design of this system complies with all applicable provisions of NFPA standards and local fire codes.

*Dennis T. Scherr*

Dennis T. Scherr
NICET Level IV
Water-Based Systems Layout
Cert. # 113016 Exp. 3/1/2029

Stamp or Seal

MULTI-JURISDICTIONAL ID# 1002183508 EXP 9/1/26
LICENSE# 2001762-023-140
NV STATE FIRE MARSHAL REG. # G 583

*Eric Velasco*
Signature

ERIC VELASCO
NICET LEVEL II, #153055
WATER-BASED SYSTEMS LAYOUT
EXPIRATION DATE: 09/01/2026

SYMBOLS LEGEND:
= Hanger with rod length
= Trapeze Hanger Location
= Hydraulic Reference point
Abbreviations:
TOS = Top of Steel BOW = Bottom of Wood
BOS = Bottom of Steel BOC = Bottom of Concrete
BOP = Bottom of Purlin BOD = Bottom of Deck
TOW = Top or Wood
X" TOS = Centerline of pipe below top of steel
+X.X" AFF = Centerline of pipe above finished floor

| No. | Date | By | Description |
|---|---|---|---|
| 1 | 11/12/25 | NC | ISSUED FOR APPROVAL |
| 2 | 02/12/26 | NC | AHJ COMMENTS |
| 3 | 04/08/26 | NC | AHJ COMMENTS - REV 2 |
| 4 | 05/06/26 | NC | ISSUED FOR APPROVAL |

Company
SHAMBAUGH & SON, L.P.
CONTRACTORS · ENGINEERS
5460 DESERT POINT DR, LAS VEGAS, NV 89118
P. 702-832-4545 www.shambaugh.com
FIRE PROTECTION - FIRE ALARM

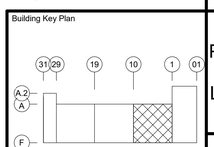
Date 05/06/26
Designed NC
Checked EV/DS

City of Aurora Building Division
Reviewed for Code Compliance
Approved as Noted: *cherst*
Date: *May 28, 2026*
2021 INTERNATIONAL CODES & 2023 NEC

QTS DEN1 - DC2

1140 N GUN CLUB RD
AURORA, COLORADO 80018

Building Key Plan




FIRE PROTECTION SYSTEMS
PRE-ACT SYS# 2.07, PRE-ACT SYS# 2.08 & WET SYS #2.09
LEVEL 2 - DATA HALL 2100

Project Number 227317

Sheet Number FP4.11

Plotted: 5/6/2026 1:33:38 PM

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## SPRINKLER SCHEDULE

| | QTY | THRD | K-FACT. | TEMP. | FINISH | RESP. | MANUF. | MODEL | SIN | DESCRIPTION | WRENCH |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ◌ | 455 | 1/2" | 5.6 | 200 °F | Brass | Quick | Viking | XT1 | VK3001 | UPRIGHT ON 1" SPRIG | 23559MB |

Total No. of Sprinklers: 455

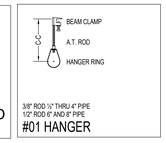
PIPE LEGEND

WET PIPE =
PREACTION PIPE =
DRY PIPE =
STANDPIPE /
EXPRESS MAIN =

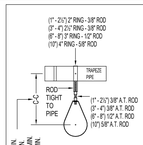



1" AUX. DRAIN GLOBE MODEL AD

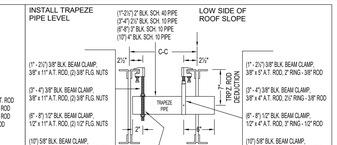
NO SCALE




#01 HANGER



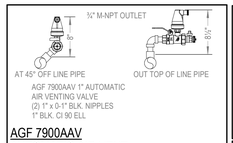

#R3R HANGER




#19A HANGER, UP TO 1/4:12 ROOF SLOPE

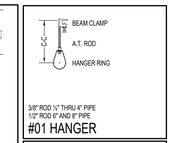
NOTES:
1. ALL PIPING IN PREACTION/DRY SYSTEMS SHALL BE SLOPED PER NFPA
2. ALL PENDENTS SHALL BE CONNECTED VIA FLEX DROPS UNLESS NOTED OTHERWISE
3. OBSTRUCTED CONSTRUCTION DEFLECTOR DISTANCE APPLIED PER NFPA 13 (2019) 10.2.6.1.2
4. HANGERS ARE TOP BEAM CLAMPS WHERE BEAMS PRESENT AND HILTI HUS-EZ CONCRETE ANCHORS WHERE BEAMS ARE NOT PRESENT
5. LEVEL 1 WET AND PREACTION PIPE SIZING BASED ON LEVEL 2 CALCULATIONS

GENERAL PIPING NOTES:
1. OVERHEAD PIPE SHALL BE ROLL-GROOVED, AS APPLICABLE, UNLESS NOTED OTHERWISE.
2. MAINS SHALL BE SCH. 10, 2½" BRANCHLINES SHALL BE EDDY FLOW, 1" DROPS SHALL BE SCH. 40.
3. REFER TO DETAILS ON THIS SHEET FOR TYPICAL HANGER ATTACHMENTS.
4. REFER TO SHEETS FP1.0 & FP1.1 FOR ADDITIONAL SPECIFIC FIRE SPRINKLER NOTES & DETAILS.
5. TYPICAL HANGERS ARE #01 TOP BEAM CLAMPS. WHERE JOISTS/BEAMS ARE NOT ACCESSIBLE, #19A TRAPEZE HANGERS SHALL BE USED.

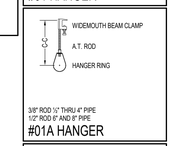



AGF 7900AAV AUTOMATIC AIR VENT

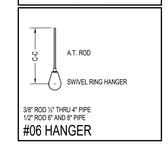
NO SCALE



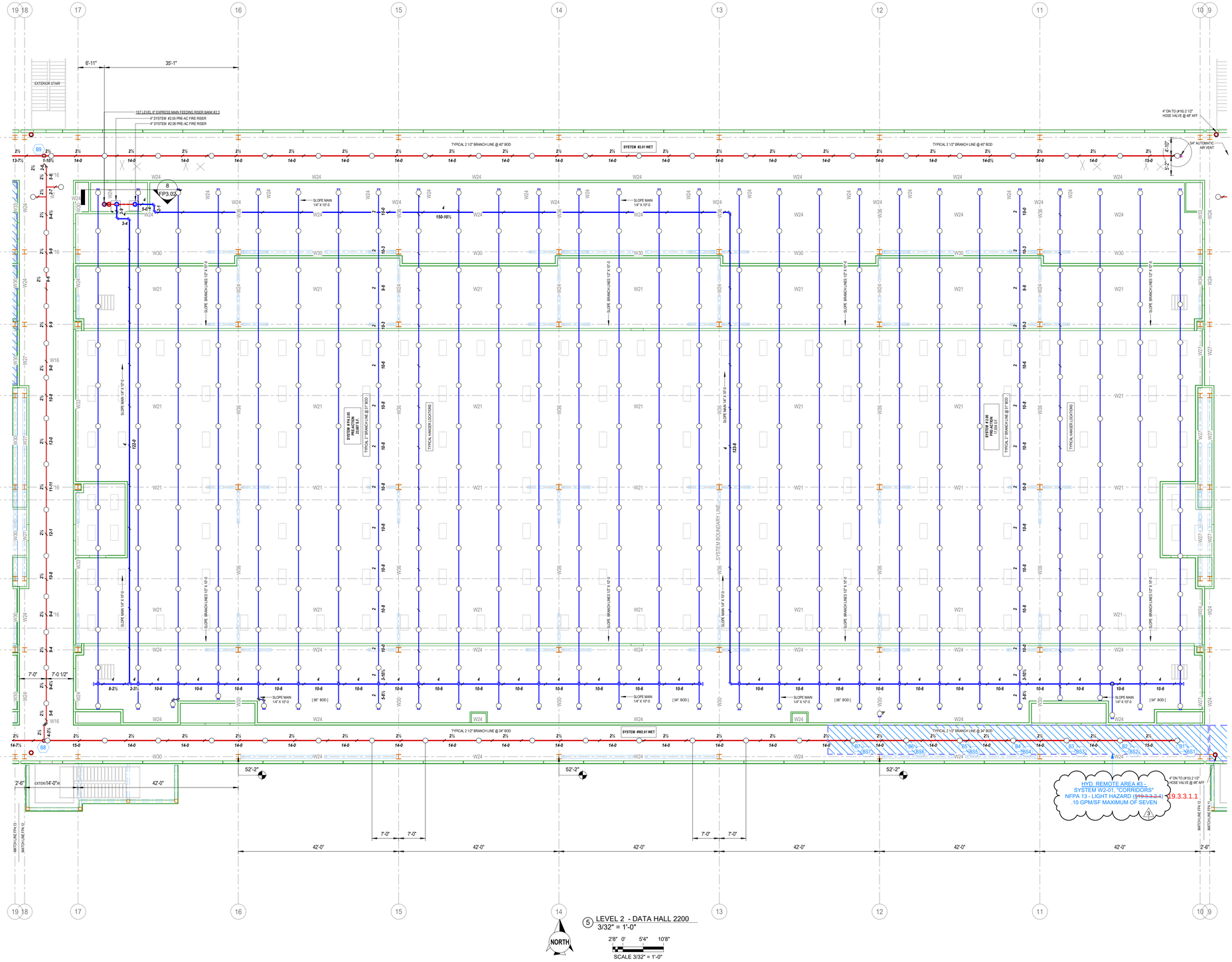

#01 HANGER




#01A HANGER



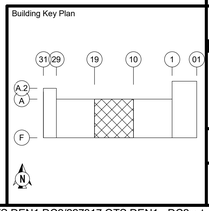

#06 HANGER




HYDRAULIC DESIGN INFORMATION:
PROJECT: QTS DEN1
ADDRESS: 1140 N GUN CLUB RD
CONTRACT: 227317
AS SHOWN ON PRINT NO. FP4.01 DATED 10/15/2025
SYSTEM NO. WZ-01
IS DESIGNED FOR 7 SPRINKLERS TO DISCHARGE
AT A DENSITY OF .1 G.P.M. PER SQUARE FOOT
OVER A MAXIMUM FLOOR AREA OF 7 HDS SQ. FT.
WHEN SUPPLIED WITH WATER AT A RATE OF 260 G.P.M.
AT A PRESSURE OF 28 P.S.I.
AT BASE OF RISER HOSE ALLOWANCE: 100 G.P.M.
K-FACTOR: 5.6K ORIFICE: 1/2" TEMPERATURE: 200°F
OCCUPANCY CLASS: LIGHT HAZARD
SAFETY MARGIN: 92.84 P.S.I.
NOTES: CALCULATION NODE "B"
HYDRAULIC CALCULATION FILE NAME:
CALC 3 W 2-01

City of Aurora Building Division
Reviewed for Code Compliance
Approved as Noted: *choirst*
Date: *May 28, 2026*
2021 INTERNATIONAL CODES & 2023 NEC

Building Key Plan




I certify to the best of my knowledge, information, and belief that the design of this system complies with all applicable provisions of NFPA standards and local fire codes.

*Dennis T. Scherr*

Dennis T. Scherr
NICET Level IV
Water-Based Systems Layout
Cert. # 113016 Exp. 3/1/2029

Stamp or Seal

MULTI-JURISDICTIONAL ID# 1002183508 EXP 9/1/26
LICENSE # 2001762-023-140
NV STATE FIRE MARSHAL REG. # G 583

*Eric Velasco*
Signature

ERIC VELASCO
NICET LEVEL II, #153055
WATER-BASED SYSTEMS LAYOUT
EXPIRATION DATE: 09/01/2026

SYMBOLS LEGEND:
= Hanger with rod length
= Trapeze Hanger Location
= Hydraulic Reference point
Abbreviations:
TOS = Top of Steel BOW = Bottom of Wood
BOS = Bottom of Steel BOC = Bottom of Concrete
BOP = Bottom of Purlin BOD = Bottom of Deck
TOW = Top or Wood
X" TOS = Centerline of pipe below top of steel
+X-X" AFF = Centerline of pipe above finished floor

| No. | Date | By | Description |
|---|---|---|---|
| 1 | 11/12/25 | NC | ISSUED FOR APPROVAL |
| 2 | 02/12/26 | NC | AHJ COMMENTS |
| 3 | 04/08/26 | NC | AHJ COMMENTS - REV 2 |
| 4 | 05/06/26 | NC | ISSUED FOR APPROVAL |

Company

S&S SHAMBAUGH & SON, L.P.
CONTRACTORS · ENGINEERS
5460 DESERT POINT DR, LAS VEGAS, NV 89118
P. 702-832-4545 www.shambaugh.com
FIRE PROTECTION - FIRE ALARM

Date 05/06/26

Designed NC

Checked EV/DS

QTS DEN1 - DC2

1140 N GUN CLUB RD
AURORA, COLORADO 80018

FIRE PROTECTION SYSTEMS
WET SYS #2.01, PRE-ACT SYS# 2.05, & PRE-ACT SYS# 2.06 LEVEL 2 - DATA HALL 2200

Project Number 227317

Sheet Number FP4.12

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Plotted: 5/6/2026 1:33:40 PM

PERMIT #2026 2513934 | CM 04 | RSN:1975523

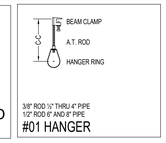
## SPRINKLER SCHEDULE

| | QTY | THRD | K-FACT. | TEMP. | FINISH | RESP. | MANUF. | MODEL | SIN | DESCRIPTION | WRENCH |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | 248 | 1/2" | 5.6 | 200 °F | Brass | Quick | Viking | XT1 | VK3001 | UPRIGHT ON 1" SPRIG | 23559MB |
| Total No. of Sprinklers: 248 | | | | | | | | | | | |

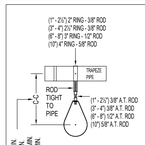



1" AUX. DRAIN GLOBE MODEL AD

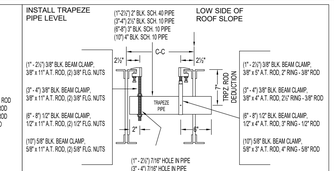
NO SCALE




#01 HANGER




#R3R HANGER



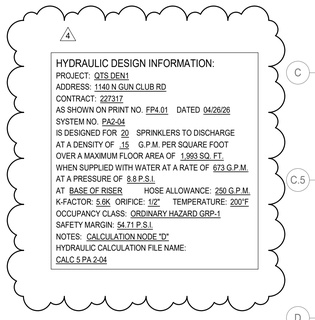

#19A HANGER, UP TO 1/4:12 ROOF SLOPE

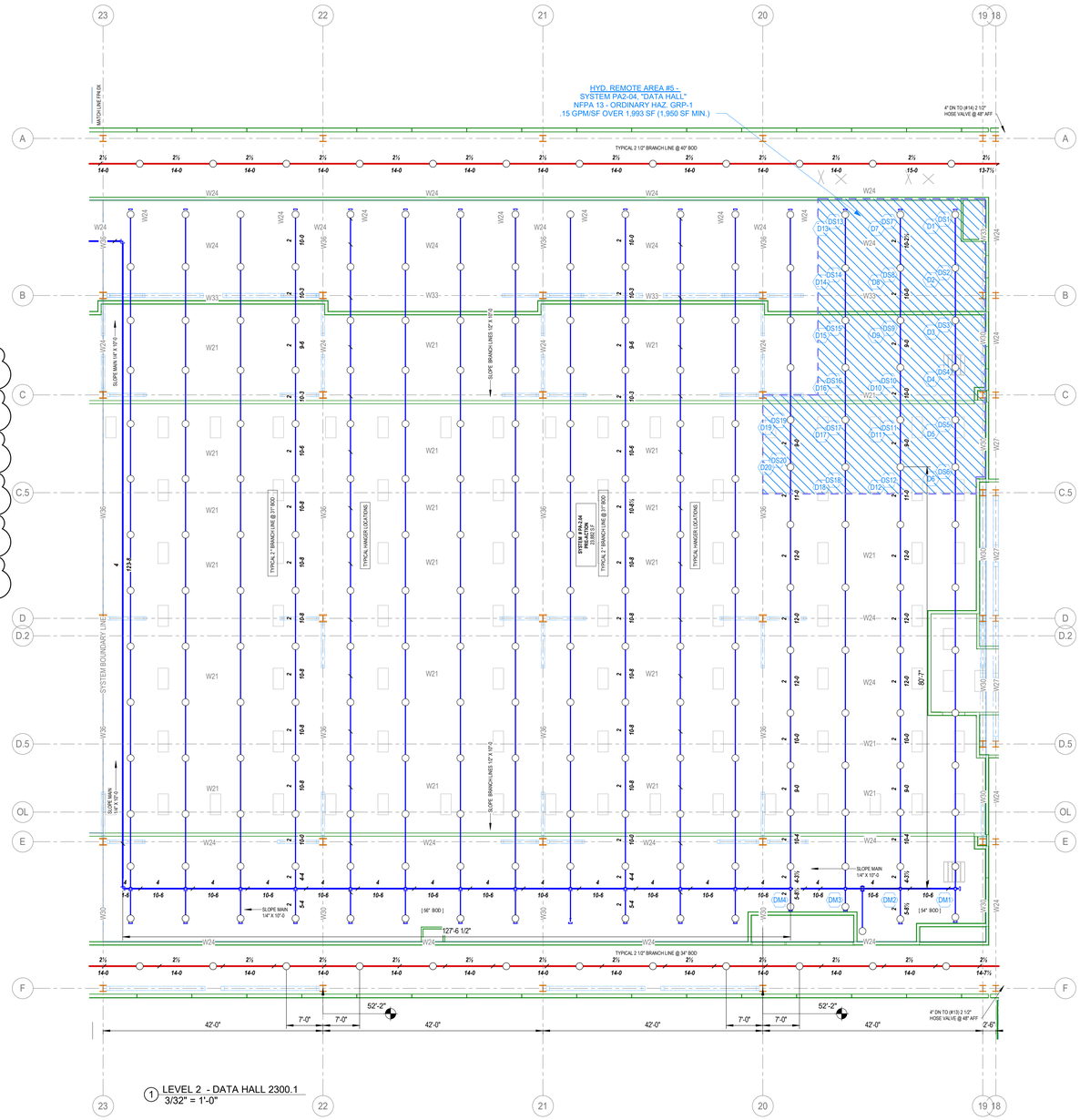
NOTES:
1. ALL PIPING IN PREACTION/DRY SYSTEMS SHALL BE SLOPED PER NFPA
2. ALL PENDENTS SHALL BE CONNECTED VIA FLEX DROPS UNLESS NOTED OTHERWISE
3. OBSTRUCTED CONSTRUCTION DEFLECTOR DISTANCE APPLIED PER NFPA 13 (2019) 10.2.6.1.2
4. HANGERS ARE TOP BEAM CLAMPS WHERE BEAMS PRESENT AND HILTI HUS-EZ CONCRETE ANCHORS WHERE BEAMS ARE NOT PRESENT
5. LEVEL 1 WET AND PREACTION PIPE SIZING BASED ON LEVEL 2 CALCULATIONS

GENERAL PIPING NOTES:
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3. REFER TO DETAILS ON THIS SHEET FOR TYPICAL HANGER ATTACHMENTS.
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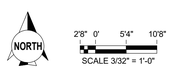
PIPE LEGEND

WET PIPE =
PREACTION PIPE =
DRY PIPE =
STANDPIPE / EXPRESS MAIN =




1 LEVEL 2 - DATA HALL 2300.1
3/32" = 1'-0"




I certify to the best of my knowledge, information, and belief that the design of this system complies with all applicable provisions of NFPA standards and local fire codes.

*Dennis T. Scherr*

Dennis T. Scherr
NICET Level IV
Water-Based Systems Layout
Cert. # 113016 Exp. 3/1/2029

Stamp or Seal

MULTI-JURISDICTIONAL ID# 1002183508 EXP 9/1/26
LICENSE# 2001762-023-140
NV STATE FIRE MARSHAL REG. # G 583

*Eric Velasco*

Signature

ERIC VELASCO
NICET LEVEL II, #153055
WATER-BASED SYSTEMS LAYOUT
EXPIRATION DATE: 09/01/2026

SYMBOLS LEGEND:
= Hanger with rod length
= Trapeze Hanger Location
= Hydraulic Reference point
Abbreviations:
TOS = Top of Steel
BOS = Bottom of Steel
BOP = Bottom of Purlin
TOW = Top of Wood
BOW = Bottom of Wood
BOC = Bottom of Concrete
BOD = Bottom of Deck
X" TOS = Centerline of pipe below top of steel
+X'-X" AFF = Centerline of pipe above finished floor

| No. | Date | By | Description |
|---|---|---|---|
| 1 | 11/12/25 | NC | ISSUSED FOR APPROVAL |
| 2 | 02/12/26 | NC | AHJ COMMENTS |
| 3 | 04/08/26 | NC | AHJ COMMENTS - REV 2 |
| 4 | 05/06/26 | NC | ISSUED FOR APPROVAL |

Company

SHAMBAUGH & SON, L.P.
CONTRACTORS · ENGINEERS
5460 DESERT POINT DR. LAS VEGAS, NV 89118
P. 702-832-4545 www.shambaugh.com
FIRE PROTECTION - FIRE ALARM

Date 05/06/26

Designed NC

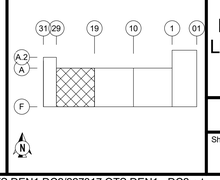
Checked EV/DS

City of Aurora Building Division
Reviewed for Code Compliance
Approved as Noted: *chorst*
Date: *May 28, 2026*
2021 INTERNATIONAL CODES & 2023 NEC

QTS DEN1 - DC2

1140 N GUN CLUB RD
AURORA, COLORADO 80018

Building Key Plan




FIRE PROTECTION SYSTEMS

WET SYS #2.01 & PRE-ACT SYS #2.04 LEVEL 2 - DATA HALL 2300

Project Number 227317

Sheet Number FP4.13

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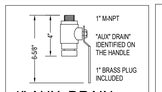
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## SPRINKLER SCHEDULE

| | QTY | THRD | K-FACT. | TEMP. | FINISH | RESP. | MANUF. | MODEL | SIN | DESCRIPTION | WRENCH |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ◌ | 343 | 1/2" | 5.6 | 200 °F | Brass | Quick | Viking | XT1 | VK3001 | UPRIGHT ON 1" SPRIG | 23559MB |
| Total No. of Sprinklers: 343 | | | | | | | | | | | |

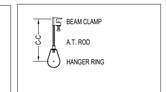
PIPE LEGEND

WET PIPE =
PREACTION PIPE =
DRY PIPE =
STANDPIPE /
EXPRESS MAIN =




1" AUX. DRAIN GLOBE MODEL AD

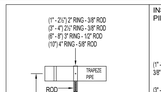
NO SCALE



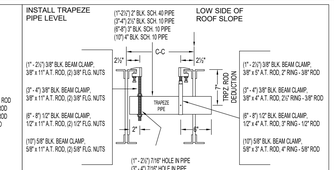

3/8" ROD ½" THRU 4" PIPE
1/2" ROD 8" AND 8" PIPE

#01 HANGER

NOTES:
1. ALL PIPING IN PREACTION/DRY SYSTEMS SHALL BE SLOPED PER NFPA
2. ALL PENDENTS SHALL BE CONNECTED VIA FLEX DROPS UNLESS NOTED OTHERWISE.
3. OBSTRUCTED CONSTRUCTION DEFLECTOR DISTANCE APPLIED PER NFPA 13 (2019) 10.2.6.1.2
4. HANGERS ARE TOP BEAM CLAMPS WHERE BEAMS PRESENT AND HILTI HUS-EZ CONCRETE ANCHORS WHERE BEAMS ARE NOT PRESENT
5. LEVEL 1 WET AND PREACTION PIPE SIZING BASED ON LEVEL 2 CALCULATIONS

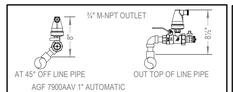



#R3R HANGER



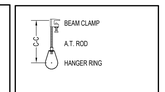

#19A HANGER, UP TO 1/4:12 ROOF SLOPE

GENERAL PIPING NOTES:
1. OVERHEAD PIPE SHALL BE ROLL-GROOVED, AS APPLICABLE, UNLESS NOTED OTHERWISE.
2. MAINS SHALL BE SCH. 10, 2½" BRANCHLINES SHALL BE EDDY FLOW, 1" DROPS SHALL BE SCH. 40.
3. REFER TO DETAILS ON THIS SHEET FOR TYPICAL HANGER ATTACHMENTS.
4. REFER TO SHEETS FP1.0 & FP1.1 FOR ADDITIONAL SPECIFIC FIRE SPRINKLER NOTES & DETAILS.
5. TYPICAL HANGERS ARE #01 TOP BEAM CLAMPS. WHERE JOISTS/BEAMS ARE NOT ACCESSIBLE, #19A TRAPEZE HANGERS SHALL BE USED.



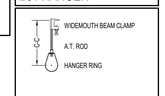

AGF 7900AAV AUTOMATIC AIR VENT

NO SCALE



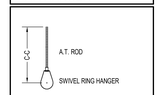

3/8" ROD ½" THRU 4" PIPE
1/2" ROD 8" AND 8" PIPE

#01 HANGER



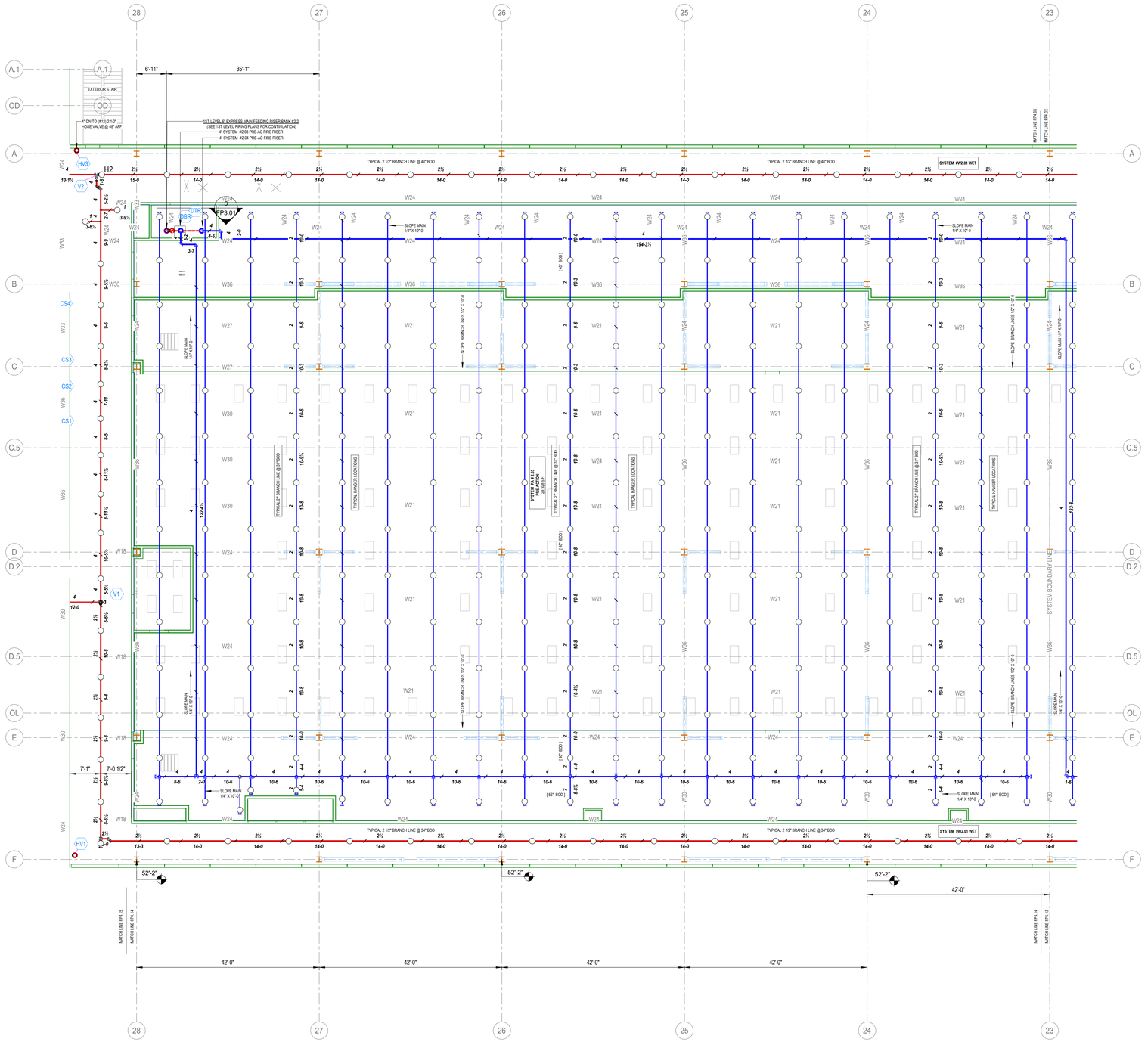

3/8" ROD ½" THRU 4" PIPE
1/2" ROD 8" AND 8" PIPE

#01A HANGER




3/8" ROD ½" THRU 4" PIPE
1/2" ROD 8" AND 8" PIPE

#06 HANGER




5 LEVEL 2 - DATA HALL 2300.2
3/32" = 1'-0"

SCALE 3/32" = 1'-0"

I certify to the best of my knowledge, information, and belief that the design of this system complies with all applicable provisions of NFPA standards and local fire codes.

*Dennis T. Scherr*

Dennis T. Scherr
NICET Level IV
Water-Based Systems Layout
Cert. # 113016 Exp. 3/1/2029

Stamp or Seal

MULTI-JURISDICTIONAL ID# 1002183508 EXP 9/1/26
LICENSE# 2001762-023-140
NV STATE FIRE MARSHAL REG. # G 583

*Eric Velasco*

Signature

ERIC VELASCO
NICET LEVEL II, #153055
WATER-BASED SYSTEMS LAYOUT
EXPIRATION DATE: 09/01/2026

SYMBOLS LEGEND:

= Hanger with rod length
= Trapeze Hanger Location
= Hydraulic Reference point

Abbreviations:
TOS = Top of Steel
BOS = Bottom of Steel
BOP = Bottom of Purlin
TOW = Top of Wood
BOW = Bottom of Wood
BOC = Bottom of Concrete
BOD = Bottom of Deck

X" TOS = Centerline of pipe below top of steel
+X'-X" AFF = Centerline of pipe above finished floor

| No. | Date | By | Description |
|---|---|---|---|
| 1 | 11/12/25 | NC | ISSUED FOR APPROVAL |
| 2 | 02/12/26 | NC | AHJ COMMENTS |
| 3 | 04/08/26 | NC | AHJ COMMENTS - REV 2 |
| 4 | 05/06/26 | NC | ISSUED FOR APPROVAL |

Company

S&S SHAMBAUGH & SON, L.P.
CONTRACTORS - ENGINEERS
5460 DESERT POINT DR, LAS VEGAS, NV 89118
P. 702-832-4545 www.shambaugh.com

FIRE PROTECTION - FIRE ALARM

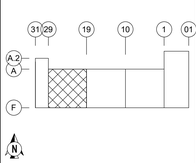
Date: 05/06/26
Designed: NC
Checked: EV/DS

City of Aurora Building Division
Reviewed for Code Compliance
Approved as Noted: *chorst*
Date: *May 28, 2026*
2021 INTERNATIONAL CODES & 2023 NEC

QTS DEN1 - DC2

1140 N GUN CLUB RD
AURORA, COLORADO 80018

Building Key Plan




FIRE PROTECTION SYSTEMS

WET SYS #2.01 & PRE-ACT SYS #2.03 LEVEL 2 - DATA HALL 2300

Project Number: 227317

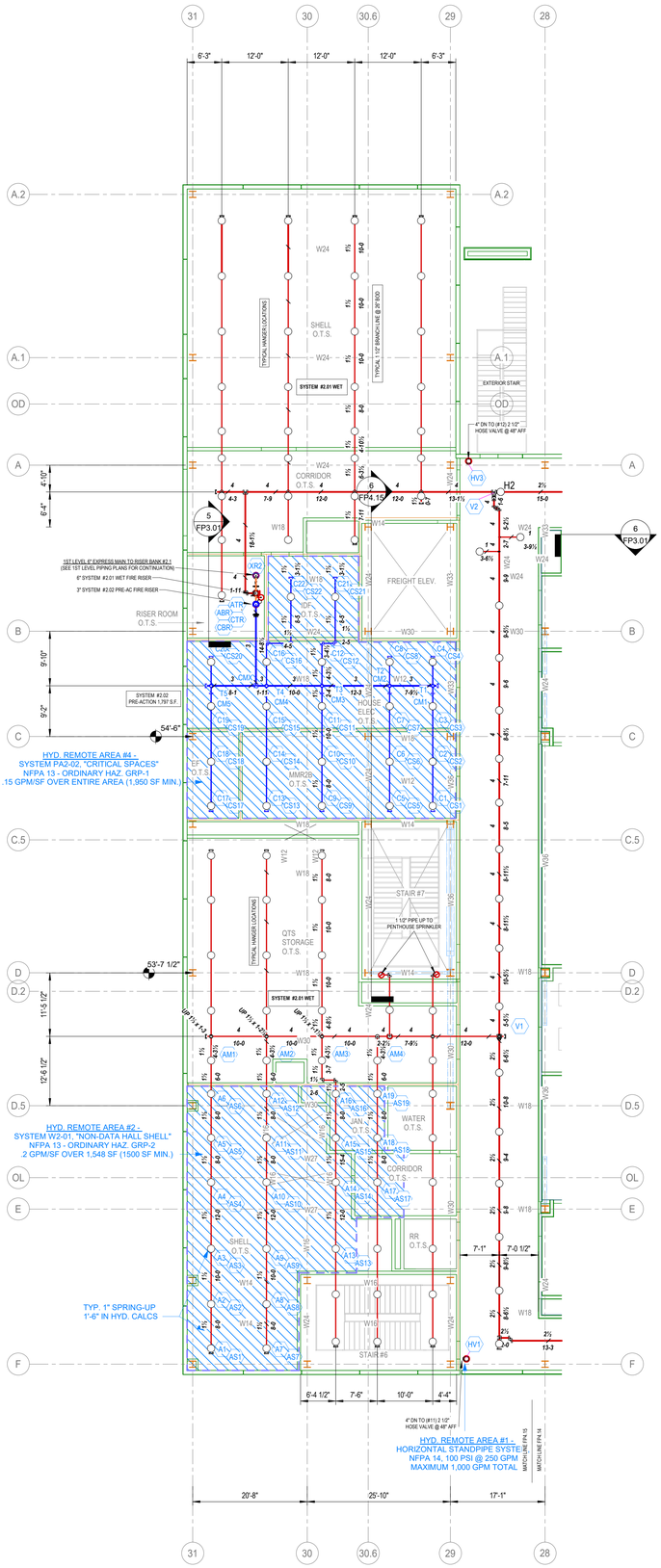
Sheet Number: FP4.14

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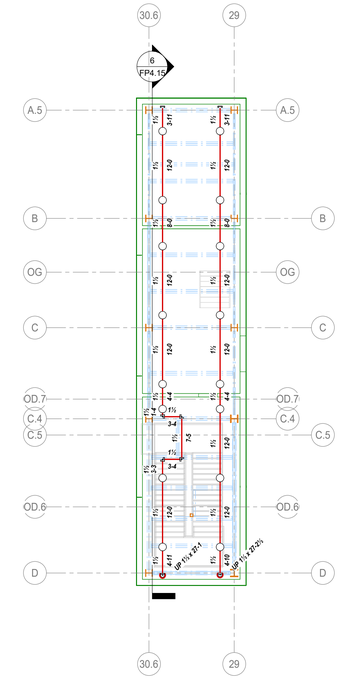


Autodesk Docs://227317-QTS DEN1 DC2/227317 QTS DEN1 - DC2.rvt

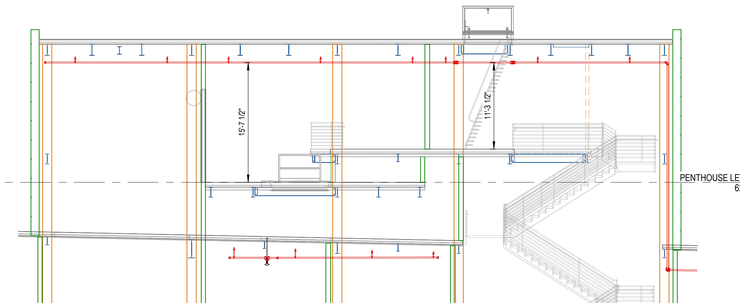
Plotted: 5/6/2026 1:33:43 PM




5 LEVEL 2 - BOH SEGMENT J
3/32" = 1'-0"




7 PENTHOUSE LEVEL PIPING PLAN
3/32" = 1'-0"



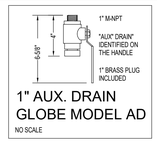

6 PENTHOUSE SECTION
1/8" = 1'-0"

## SPRINKLER SCHEDULE

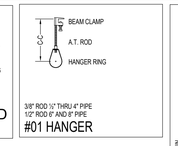
| | QTY | THRD | K-FACT. | TEMP. | FINISH | RESP. | MANUF. | MODEL | SIN | DESCRIPTION | WRENCH |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | 137 | 1/2" | 5.6 | 200 °F | Brass | Quick | Viking | XT1 | VK3001 | UPRIGHT ON 1" SPRIG | 23559MB |
| Total No. of Sprinklers: 137 | | | | | | | | | | | |

PIPE LEGEND

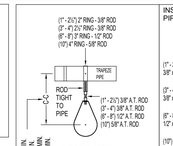
WET PIPE =
PREACTION PIPE =
DRY PIPE =
STANDPIPE /
EXPRESS MAIN =



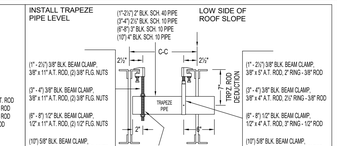

1" AUX. DRAIN GLOBE MODEL AD
NO SCALE




#01 HANGER



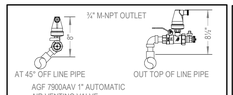

#R3R HANGER



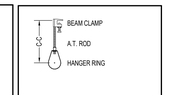

#19A HANGER, UP TO 1/4:12 ROOF SLOPE

NOTES:
1. ALL PIPING IN PREACTION/DRY SYSTEMS SHALL BE SLOPED PER NFPA
2. ALL PENDENTS SHALL BE CONNECTED VIA FLEX DROPS UNLESS NOTED OTHERWISE
3. OBSTRUCTED CONSTRUCTION DEFLECTOR DISTANCE APPLIED PER NFPA 13 (2019) 10.2.6.1.2
4. HANGERS ARE TOP BEAM CLAMPS WHERE BEAMS PRESENT AND HILTI HUS-EZ CONCRETE ANCHORS WHERE BEAMS ARE NOT PRESENT
5. LEVEL 1 WET AND PREACTION PIPE SIZING BASED ON LEVEL 2 CALCULATIONS

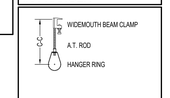
GENERAL PIPING NOTES:
1. OVERHEAD PIPE SHALL BE ROLL-GROOVED, AS APPLICABLE, UNLESS NOTED OTHERWISE.
2. MAINS SHALL BE SCH. 10, 2½" BRANCHLINES SHALL BE EDDY FLOW, 1" DROPS SHALL BE SCH. 40.
3. REFER TO DETAILS ON THIS SHEET FOR TYPICAL HANGER ATTACHMENTS.
4. REFER TO SHEETS FP1.0 & FP1.1 FOR ADDITIONAL SPECIFIC FIRE SPRINKLER NOTES & DETAILS.
5. TYPICAL HANGERS ARE #01 TOP BEAM CLAMPS. WHERE JOISTS/BEAMS ARE NOT ACCESSIBLE, #19A TRAPEZE HANGERS SHALL BE USED.



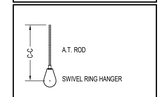

AGF 7900AAV
AUTOMATIC AIR VENT
NO SCALE




#01 HANGER




#01A HANGER




#06 HANGER

HYDRAULIC DESIGN INFORMATION:
PROJECT: QTS DEN1
ADDRESS: 1140 N GUN CLUB RD
CONTRACT: 227317
AS SHOWN ON PRINT NO. FP4.15 DATED 04/27/26
SYSTEM NO. PA2-02
IS DESIGNED FOR 22 SPRINKLERS TO DISCHARGE
AT A DENSITY OF .15 G.P.M. PER SQUARE FOOT
OVER A MAXIMUM FLOOR AREA OF 1,950 SQ. FT.
WHEN SUPPLIED WITH WATER AT A RATE OF 705 G.P.M.
AT A PRESSURE OF 33 P.S.I.
AT BASE OF RISER HOSE ALLOWANCE: 250 G.P.M.
K-FACTOR: 5.6K ORIFICE: 1/2" TEMPERATURE: 200°F
OCCUPANCY CLASS: ORDINARY HAZARD GRP-1
SAFETY MARGIN: 97.20 P.S.I.
NOTES: CALCULATION NODE "C"
HYDRAULIC CALCULATION FILE NAME:
CALC 4 PA 2-02

HYDRAULIC DESIGN INFORMATION:
PROJECT: QTS DEN1
ADDRESS: 1140 N GUN CLUB RD
CONTRACT: 227317
AS SHOWN ON PRINT NO. FP4.01 DATE:04/27/26
SYSTEM NO. : STANDPIPE
IS DESIGNED FOR (4) 2-1/2" HOSE VALVE TO
DISCHARGE 250 GPM PER HOSE VALVE WHEN
SUPPLIED WITH 100 PSI AT EACH HOSE VALVE
TOTAL WATER DISCHARGE RATE OF 1,000 GPM
OCCUPANCY CLASS: CLASS 1 STANDPIPE
SAFETY MARGIN: 1 PSI
HYDRAULIC CALCULATION FILE NAME: CALC1 S.P.

HYDRAULIC DESIGN INFORMATION:
PROJECT: QTS DEN1
ADDRESS: 1140 N GUN CLUB RD
CONTRACT: 227317
AS SHOWN ON PRINT NO. FP4.15 DATED 04/27/26
SYSTEM NO. W2-01
IS DESIGNED FOR 19 SPRINKLERS TO DISCHARGE
AT A DENSITY OF .2 G.P.M. PER SQUARE FOOT
OVER A MAXIMUM FLOOR AREA OF 1,548 SQ. FT.
WHEN SUPPLIED WITH WATER AT A RATE OF 826 G.P.M.
AT A PRESSURE OF 18 P.S.I.
AT BASE OF RISER HOSE ALLOWANCE: 250 G.P.M.
K-FACTOR: 5.6K ORIFICE: 1/2" TEMPERATURE: 200°F
OCCUPANCY CLASS: ORDINARY HAZARD GRP-2
SAFETY MARGIN: 45.14 P.S.I.
NOTES: CALCULATION NODE "A"
HYDRAULIC CALCULATION FILE NAME:
CALC 2 W 2-01

I certify to the best of my knowledge, information, and belief that the design of this system complies with all applicable provisions of NFPA standards and local fire codes.

*Dennis T. Scherr*

Dennis T. Scherr
NICET Level IV
Water-Based Systems Layout
Cert. # 113016 Exp. 3/1/2029

Stamp or Seal

MULTI-JURISDICTIONAL ID# 1002183508 EXP 9/1/26
LICENSE# 2001762-023-140
NV STATE FIRE MARSHAL REG. # G 583

*Eric Velasco*

Signature

ERIC VELASCO
NICET LEVEL II, #153055
WATER-BASED SYSTEMS LAYOUT
EXPIRATION DATE: 09/01/2026

SYMBOLS LEGEND:
= Hanger with rod length
= Trapeze Hanger Location
= Hydraulic Reference point
Abbreviations:
TOS = Top of Steel BOW = Bottom of Wood
BOS = Bottom of Steel BOC = Bottom of Concrete
BOP = Bottom of Purlin BOD = Bottom of Deck
TOW = Top or Wood
X" TOS = Centerline of pipe below top of steel
+X'-X" AFF = Centerline of pipe above finished floor

| No. | Date | By | Description |
|---|---|---|---|
| 1 | 11/12/25 | NC | ISSUED FOR APPROVAL |
| 2 | 02/12/26 | NC | AHJ COMMENTS |
| 3 | 04/08/26 | NC | AHJ COMMENTS - REV 2 |
| 4 | 05/06/26 | NC | ISSUED FOR APPROVAL |

Company

SHAMBAUGH & SON, L.P.
CONTRACTORS · ENGINEERS
5460 DESERT POINT DR, LAS VEGAS, NV 89118
P. 702-832-4545 www.shambaugh.com

FIRE PROTECTION - FIRE ALARM

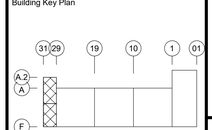
Date 05/06/26

Designed NC

Checked EV/DS

City of Aurora Building Division
Reviewed for Code Compliance
Approved as Noted:chorsf
Date:May 28, 2026
2021 INTERNATIONAL CODES & 2023 NEC

Building Key Plan




QTS DEN1 - DC2

1140 N GUN CLUB RD
AURORA, COLORADO 80018

FIRE PROTECTION SYSTEMS

WET SYS #2.01 & PRE-ACT SYS #2.02 LEVEL 2 - BACK OF HOUSE

Project Number 227317

Sheet Number FP4.15

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SHAMBAUGH & SON, L.P.
CONTRACTORS - ENGINEERS
SINCE 1926

# QTS DC-2

## 1140 N GUN CLUB RD
## AURORA, COLORADO 80018

**Shambaugh & Son L.P. Job #: 227317**

## FIRE PROTECTION
## HYDRUALIC CALCULATION

**Fire Protection Division**
**24 HOUR SERVICE**
**7614 OPPORTUNITY DRIVE**
**FORT WAYNE, IN 46825**
**TELEPHONE 260-487-7777**
**FAX 260-497-1695**
**www.shambaugh.com**

**March 9, 2026**

City of Aurora Building Division
Reviewed for Code Compliance
Approved as Noted: *chorst*
Date: *May 28, 2026*
2021 INTERNATIONAL CODES & 2023 NEC

Aurora Water

Planning & Engineering
26791 E Quincy Ave
Aurora, CO 80018
303.739.7370

City of Aurora
Worth Discovering • auroragov.org

**SITE:** N Gun Club Rd & E 14th Ave
**HYDRANT:** 05U-08
**SCENARIO:** 2024 Summer Day
**DATE:** 07-16-2025

| *Hydraulic Zone* | *Fire-Flow Demand (gpm)* | *Static Pressure (psi)* | *Fire-Flow Demand (mgd)* | *Residual Pressure (psi)* | *Available Flow at Hydrant @ 20 psi (gpm)* |
|---|---|---|---|---|---|
| *3* | *1,500* | *71* | *2.16* | *68* | *8,500* |
| *3* | *2,500* | *71* | *3.60* | *65* | *8,500* |
| *3* | *4,000* | *71* | *5.76* | *58* | *8,500* |

The City of Aurora performs fireflow simulations on the City's Water Distribution Model, using InfoWater Pro software by Autodesk, Inc. The model developed from pipes and node elevations from the City's GIS system, design drawings for pumps and tanks, and diurnal demand patterns from SCADA and historical use records. Comparing the model's performance with SCADA data validates the model. Fireflow simulations are performed under a maximum day demand scenario. These pressures may differ slightly than actual pressures measured in the field.

**Warranty: The City of Aurora, Colorado makes no warranties or guarantees, express or implied, as to the completeness, accuracy, or correctness of this data, nor shall the city incur any liability from any incorrect, incomplete or misleading information contained therein. The City makes no warranties , either express or implied, of the value, design, condition, title, merchantability, or fitness for a particular purpose. The City shall not be liable for any direct, indirect, incidental, consequential, punitive, or special damages, whether foreseeable or unforeseeable, arising out of the authorized or unauthorized use of this data or the inability to use this data or out of any breach of warranty whatsoever.**

## Engineering Specification

Job Name QTS DC - 2

Job Location 1140 N GUN CLUB RD

Engineer Nicole Camacho

Approval

Contractor Shambaugh

Approval

Contractor's P.O. No.

Representative

**LEAD FREE***

# Series 757, 757N

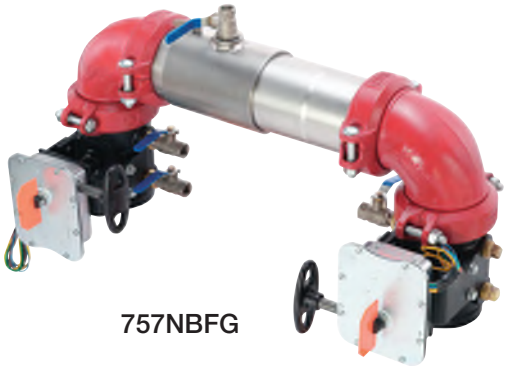
## Double Check Valve Assemblies

### Sizes: 2½" – 10"

Series 757, 757N Double Check Valve Assemblies are used to prevent backflow of non-health hazard pollutants that are objectionable but not toxic, from entering the potable water supply system. Series 757, 757N may be installed under continuous pressure service and may be subjected to backpressure and backsiphonage. Series 757, 757N consists of two independently operating check valves, two shutoff valves, and four test cocks.



757OSY



757NBFG



757OSY
(Vertical)

### Features

- Extremely compact design
- 70% Lighter than traditional designs
- 304 (Schedule 40) Stainless steel housing & sleeve
- Groove fittings allow integral pipeline adjustment
- Patented tri-link check provides lowest pressure loss
- Unmatched ease of serviceability
- Available with grooved butterfly valve shutoffs
- Available for horizontal, vertical or N pattern installations
- Replaceable check disc rubber
- Sizes 2½", 3" and 4" available with quarter-turn ball valve shutoffs

### Specifications

The Double Check Valve Assembly shall consist of two independent tri-link check modules within a single housing, sleeve access port, four test cocks and two drip tight shut-off valves. Tri-link checks shall be removable and serviceable, without the use of special tools. The housing shall be constructed of 304 Schedule 40 stainless steel pipe with groove end connections. Tri-link checks shall have reversible elastomer discs and in operation shall produce drip tight closure against reverse flow caused by backpressure or backsiphonage. Assembly shall be a Watts Series 757, 757N.

*The wetted surface of this product contacted by consumable water contains less than 0.25% of lead by weight.

**NOTICE**

The information contained herein is not intended to replace the full product installation and safety information available or the experience of a trained product installer. You are required to thoroughly read all installation instructions and product safety information before beginning the installation of this product.

Watts product specifications in U.S. customary units and metric are approximate and are provided for reference only. For precise measurements, please contact Watts Technical Service. Watts reserves the right to change or modify product design, construction, specifications, or materials without prior notice and without incurring any obligation to make such changes and modifications on Watts products previously or subsequently sold.

## Available Models

Suffix:

NRS – non-rising stem resilient seated gate valves

OSY – UL/FM outside stem and yoke, resilient seated gate valves

BFG – UL/FM grooved gear operated butterfly valves with tamper switch

QT – 2½", 3" and 4" quarter-turn ball valves

**OSY FxG – Flanged inlet gate connection and grooved outlet gate connection

**OSY GxF – Grooved inlet gate connection and flanged outlet gate connection

**OSY GxG – Grooved inlet gate connection and grooved outlet gate connection

Available with grooved NRS gate valves - consult factory**
Post indicator plate and operating nut available - consult factory**
**Consult factory for dimensions

## Materials

Housing & Sleeve: 304 (Schedule 40) Stainless Steel
Elastomers: EPDM, Silicone and Buna-N
Tri-link Checks: Noryl®, Stainless Steel
Check Discs: Reversible Silicone or EPDM
Test Cocks: Lead Free* Bronze Body
Pins & Fasteners: 300 Series Stainless Steel
Springs: Stainless Steel

## Pressure — Temperature

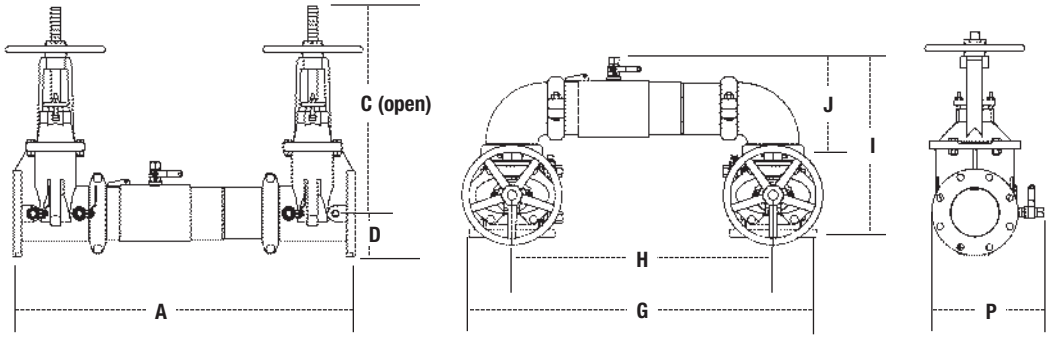
Temperature Range: 33°F – 140°F (0.5°C – 60°C)
Maximum Working Pressure: 175psi (12.1 bar)

## Approvals

- Approved by the Foundation for Cross-Connection Control and Hydraulic Research at The Unversity of Southern California (FCCCHR-USC)
- AWWA C510-97

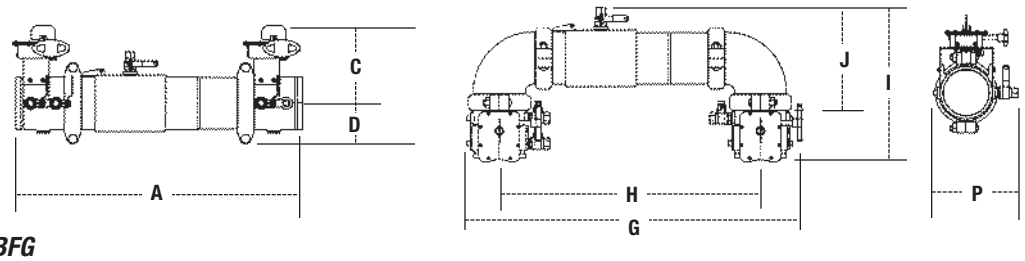
1015 B64.5 (**BFG & OSY Only)

## Dimensions — Weight




***757, 757N***

| SIZE | DIMENSIONS | | | | | | | | | | | | | | | | WEIGHT | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | | C (OSY) | | C (NRS) | | D | | G | | H | | I | | J | | P | | 757NRS | | 757OSY | | 757N NRS | | 757N OSY | |
| *in.* | *in.* | *mm* | *in.* | *mm* | *in.* | *mm* | *in.* | *mm* | *in.* | *mm* | *in.* | *mm* | *in.* | *mm* | *in.* | *mm* | *in.* | *mm* | *lbs.* | *kgs.* | *lbs.* | *kgs.* | *lbs.* | *kgs.* | *lbs.* | *kgs.* |
| 2½ | 30¾ | 781 | 16⅜ | 416 | 9⅜ | 238 | 3½ | 89 | 29 1/16 | 738 | 21½ | 546 | 15½ | 393 | 8 13/16 | 223 | 9 3/16 | 234 | 115 | 52 | 125 | 57 | 123 | 56 | 133 | 60 |
| 3 | 31¾ | 806 | 18⅞ | 479 | 10¼ | 260 | 3 11/16 | 94 | 30¼ | 768 | 22¼ | 565 | 17⅛ | 435 | 9 3/16 | 233 | 10½ | 267 | 131 | 59 | 145 | 66 | 144 | 65 | 158 | 72 |
| 4 | 33¾ | 857 | 22¾ | 578 | 12 3/16 | 310 | 4 | 102 | 33 | 838 | 23½ | 597 | 18½ | 470 | 9 15/16 | 252 | 11 3/16 | 284 | 161 | 73 | 161 | 73 | 184 | 83 | 184 | 83 |
| 6 | 43½ | 1105 | 30⅛ | 765 | 16 | 406 | 5½ | 140 | 44¾ | 1137 | 33½ | 851 | 23 3/16 | 589 | 13 1/16 | 332 | 15 | 381 | 273 | 124 | 295 | 134 | 314 | 142 | 336 | 152 |
| 8 | 49¾ | 1264 | 37¾ | 959 | 19 15/16 | 506 | 6 11/16 | 170 | 54⅛ | 1375 | 40⅛ | 1019 | 27 7/16 | 697 | 15 11/16 | 399 | 17 3/16 | 437 | 438 | 199 | 480 | 218 | 513 | 233 | 555 | 252 |
| 10 | 57¾ | 1467 | 45¾ | 1162 | 23 13/16 | 605 | 8⅜ | 208 | 66 | 1676 | 49½ | 1257 | 32½ | 826 | 17 5/16 | 440 | 20 | 508 | 721 | 327 | 781 | 354 | 891 | 404 | 951 | 431 |

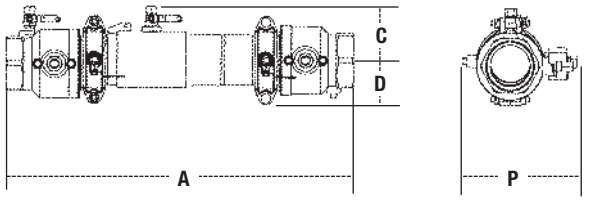


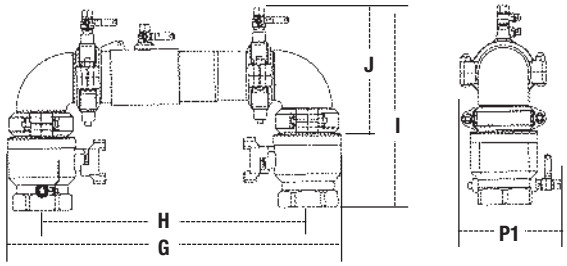

***757BFG, 757NBFG***

| SIZE | DIMENSIONS | | | | | | | | | | | | | | | | | | WEIGHT | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | | C | | D | | G | | H | | I | | J | | P | | 757BFG | | 757N BFG | |
| *in.* | *in.* | *mm* | *in.* | *mm* | *in.* | *mm* | *in.* | *mm* | *in.* | *mm* | *in.* | *mm* | *in.* | *mm* | *in.* | *mm* | *in.* | *mm* | *lbs.* | *kgs.* |
| 2½ | 27¾ | 705 | 8 | 203 | 3½ | 89 | 29⅞ | 759 | 21½ | 546 | 14 15/16 | 379 | 8 13/16 | 223 | 9 | 229 | 56 | 25 | 64 | 29 |
| 3 | 28¼ | 718 | 8 5/16 | 211 | 3 11/16 | 94 | 30 11/16 | 779 | 22¼ | 565 | 15 7/16 | 392 | 9 3/16 | 233 | 9½ | 241 | 54 | 24 | 67 | 30 |
| 4 | 29 | 737 | 8 15/16 | 227 | 3 11/16 | 94 | 31 15/16 | 811 | 23½ | 597 | 16¼ | 412 | 9 15/16 | 252 | 10 | 254 | 61 | 28 | 84 | 38 |
| 6 | 36½ | 927 | 10 | 254 | 5 | 127 | 43 3/16 | 1097 | 33¼ | 845 | 19 11/16 | 500 | 13 1/16 | 332 | 10½ | 267 | 117 | 53 | 157 | 71 |
| 8 | 42¾ | 1086 | 12¼ | 311 | 6½ | 165 | 51 1/16 | 1297 | 40⅛ | 1019 | 23 3/16 | 592 | 15 11/16 | 399 | 14 3/16 | 361 | 261 | 118 | 337 | 153 |

Noryl® is a registered trademark of SHPP Global Technologies B.V.

## Dimensions — Weight continued




***757QT***

| SIZE | DIMENSIONS | | | | | | | | | | | | | | | | | | WEIGHT | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | | C | | D | | G | | H | | I | | J | | P | | P1 | | QT | | QTN | |
| *in.* | *in.* | *mm* | *in.* | *mm* | *in.* | *mm* | *in.* | *mm* | *in.* | *mm* | *in.* | *mm* | *in.* | *mm* | *in.* | *mm* | *in.* | *mm* | *lbs.* | *kgs.* | *lbs.* | *kgs.* |
| 2½ | 27¼ | 692 | 4⅞ | 124 | 6⅞ | 175 | 30¼ | 768 | 24½ | 622 | 16 1/16 | 407 | 11⅜ | 289 | 11 5/16 | 287 | 11 5/16 | 287 | 40 | 18 | 50 | 23 |
| 3 | 28¼ | 718 | 4⅞ | 124 | 6⅞ | 175 | 30¼ | 768 | 24½ | 622 | 16 9/16 | 420 | 11⅜ | 289 | 11 5/16 | 287 | 11 5/16 | 287 | 50 | 23 | 60 | 27 |
| 4 | 31½ | 800 | 4⅞ | 124 | 6⅞ | 175 | 30¼ | 768 | 24½ | 622 | 18 5/16 | 465 | 11⅜ | 289 | 11 5/16 | 287 | 11 5/16 | 287 | 70 | 32 | 80 | 36 |

## Capacity

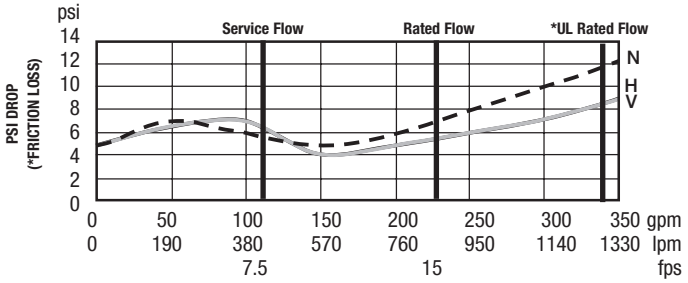
Series 757, 757N flow curves as tested by Underwriters Laboratory. Flow characteristics collected using butterfly shutoff valves

Horizontal  Vertical  N - Pattern

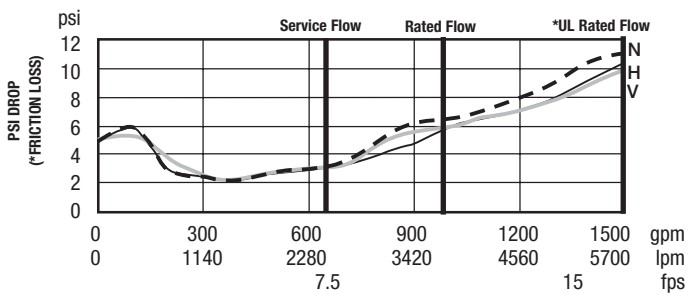
**Flow capacity chart identifies valve performance based upon rated water velocity up to 25fps**

- Service Flow is typically determined by a rated velocity of 7.5fps based upon schedule 40 pipe.
- Rated Flow identifies maximum continuous duty performance determined by AWWA.
- UL Flow Rate is 150% of Rated Flow and is not recommended for continuous duty.
- AWWA Manual M22 [Appendix C] recommends that the maximum water velocity in services be not more than 10fps.

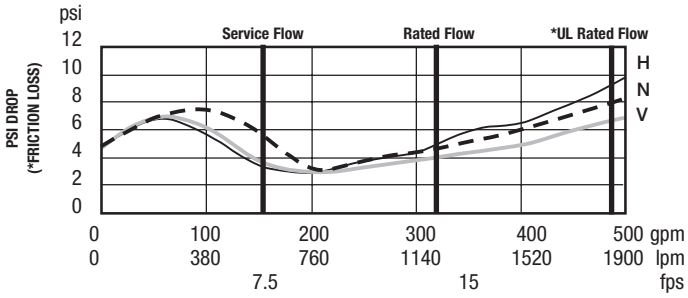
### 2½"



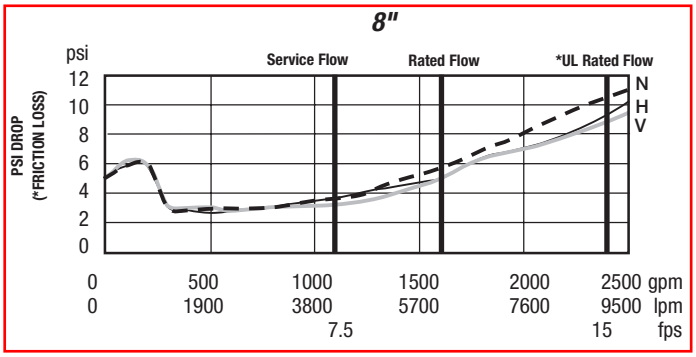

### 6"



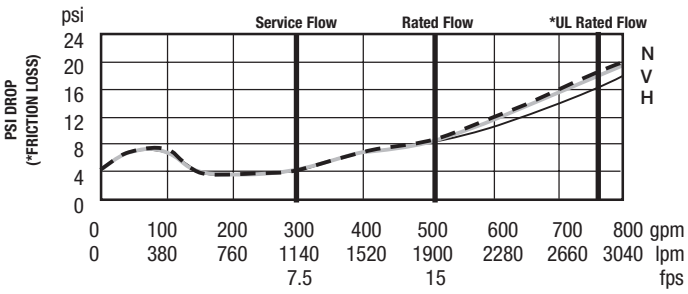

### 3"



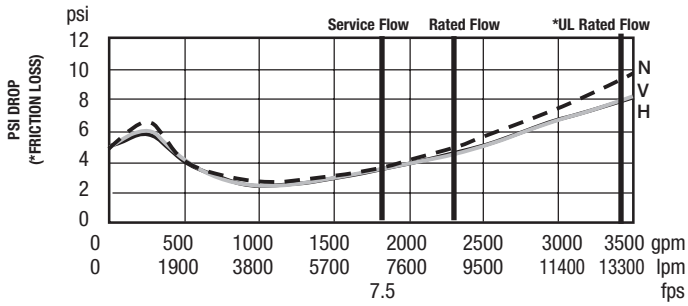

### 8"




### 4"




### 10"




***NOTICE***

Inquire with governing authorities for local installation requirements

**USA:** T: (978) 689-6066 • Watts.com
**Canada:** T: (888) 208-8927 • Watts.ca
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EXCELLENCE IN FIRE PROTECTION DESIGN

Shambaugh & Son L.P.
5460 Desert Point Drive
Las Vegas, NV 89118

. . . Fire Protection by Computer Design

Hydratec Incorporated
64 Haverhill Road
Route 111
Windham, NH 03087
603-434-0502

I certify to the best of my knowledge, information, and belief that the design of this system complies with all applicable provisions of NFPA standards and local fire codes.

Dennis T. Scherr

Dennis T. Scherr
NICET Level IV
Water-Based Systems Layout
Cert. # 113016 Exp. 3/1/2029

| | | |
|---|---|---|
| Job Name | : | 227317 QTS DC2 - CALC 1 SP |
| Drawing | : | FP4 |
| Location | : | 1140 N GUN CLUB RD |
| System | : | CALC 1 SP |
| Contract | : | 227317 |
| Data File | : | 227317 QTS DC2 - CALC1 - S.P. (100PSI @ 250).wxtmp |



Computer Programs by Hydratec Inc. Revision: 50.5520.727

***HYDRAULIC CALCULATIONS***
***for***

***JOB NAME*** QTS DC2
***Location*** 1140 N GUN CLUB RD
***Drawing #*** FP4
***Contract #*** 227317
***Date*** 03.25.26

***DESIGN***

***Remote area #*** CALC 1 SP
***Remote area location*** CALC 1 SP
***Occupancy classification*** STAND PIPE/HOSE VALVE
***Density*** N/A - Gpm/SqFt
***Area of application*** (4 HV) @ 250 - SqFt
***Coverage/sprinkler*** 130ft - SqFt
***Type of sprinkler calculated*** H1000
***# Sprinklers calculated*** 4 OUTLETS
***In-rack demand*** N/A - GPM
***Hose streams*** 250 - GPM
***Total water required (including hose streams)*** 1000 - GPM @ 59.5185 - Psi
***Type of system*** Hose Valves
***Volume of system (dry or pre-action)*** N/A - Gal

***WATER SUPPLY INFORMATION***

***Test date*** 7.16.2025
***Location*** 1140 N GUN CLUB RD
***Source of info*** ONSITE FIRE HYD #05U-08

***CONTRACTOR INFO*** Shambaugh & Son
***Address*** 6445 W. Sunset Rd
***Phone #*** 702-832-4547
***Name of designer*** E.Velasco
***Authority having jurisdiction*** AURORA, CO
***NOTES:*** Saftey Margin: 10.48 PSI
10.48 PSI x 0.1 = 1 PSI (AHJ Approved Saftey Margin)

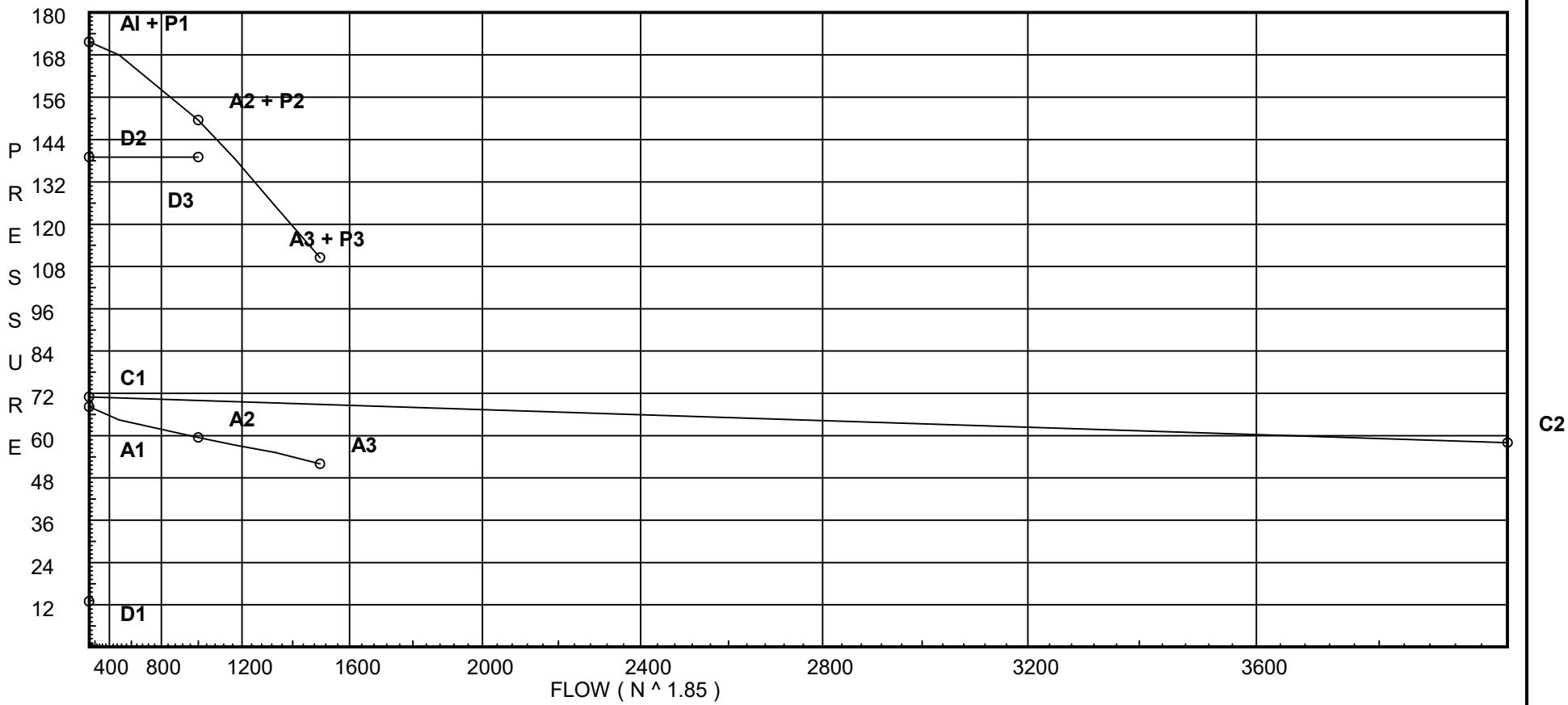
text1(35) - invisible

City Water Supply:
- C1 - Static Pressure : 71
- C2 - Residual Pressure: 58
- C2 - Residual Flow : 4000

City Water Adjusted to Pump Inlet for Pf - Elev - Hose Flow
- A1 - Adjusted Static: 68.200
- A2 - Adj Resid : 59.502 @ 1000
- A3 - Adj Resid : 52.024 @ 1500

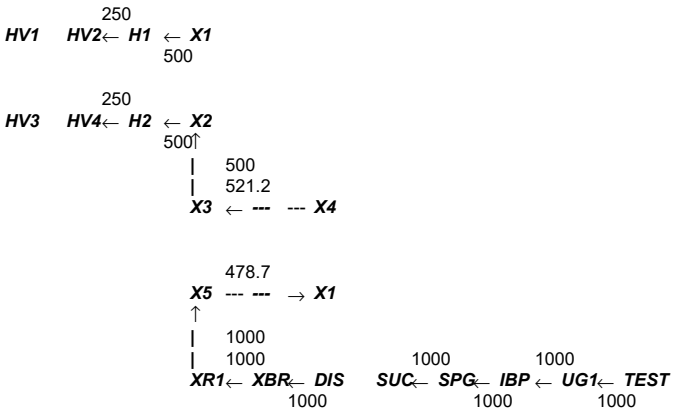
Pump Data:
- P1 - Pump Churn Pressure : 103.5
- P2 - Pump Rated Pressure : 90
- P2 - Pump Rated Flow : 1000
- P3 - Pump Pressure @ Max Flow : 58.5
- P3 - Pump Max Flow : 1500
- City Residual Flow @ 0 = 10014.02
- City Residual Flow @ 20 = 8374.12
- City Water @ 150% of Pump = 68.88

Demand:
- D1 - Elevation : 12.993
- D2 - System Flow : _____
- D2 - System Pressure : 139.021
- Hose ( Demand ) : 1000
- D3 - System Demand : 1000
- Safety Margin : 10.481






Computer Programs by Hydratec Inc. Revision: 50.5520.727


250
HV1 HV2 H1 X1
500
250
HV3 HV4 H2 X2
500
500
521.2
X3 X4
478.7
X5 X1
1000
1000
1000 1000
XR1 XBR DIS SUC SPG IBP UG1 TEST
1000 1000 1000

Fitting Legend

| Abbrev. | Name | ½ | ¾ | 1 | 1¼ | 1½ | 2 | 2½ | 3 | 3½ | 4 | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 24 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B | NFPA 13 Butterfly Valve | 0 | 0 | 0 | 0 | 0 | 6 | 7 | 10 | 0 | 12 | 9 | 10 | 12 | 19 | 21 | 23 | 25 | 0 | 0 | 0 |
| E | 90 - NFPA | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 10 | 12 | 14 | 18 | 22 | 27 | 35 | 40 | 45 | 50 | 61 |
| F | 45 - NFPA | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 4 | 5 | 7 | 9 | 11 | 13 | 17 | 19 | 21 | 24 | 28 |
| G | NFPA 13 Gate Valve | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 10 | 11 | 13 |
| S | Swing Check NFPA 13 | 0 | 0 | 5 | 7 | 9 | 11 | 14 | 16 | 19 | 22 | 27 | 32 | 45 | 55 | 65 | | | | | |
| T | TEE - NFPA | 3 | 4 | 5 | 6 | 8 | 10 | 12 | 15 | 17 | 20 | 25 | 30 | 35 | 50 | 60 | 71 | 81 | 91 | 101 | 121 |
| U | 45 - GROOVED | 0 | 0 | 0.8 | 2.13 | 2.75 | 1.8 | 2.2 | 2.6 | 0 | 3.4 | 4.2 | 5 | 6.5 | 8.3 | 10.0 | 18.5 | 21 | 23.5 | 25.5 | 29.5 |
| V | 90 - GROOVED | 0 | 0 | 1.7 | 2 | 2.6 | 3.5 | 4.3 | 5 | 0 | 6.8 | 8.5 | 10 | 13 | 17 | 20 | 24.5 | 28 | 31 | 34 | 42 |
| X | TEE - GROOVED | 0 | 0 | 4.2 | 7.5 | 6.63 | 8.5 | 10.8 | 13 | 0 | 16 | 21 | 25 | 33 | 41 | 50 | 70 | 80 | 90 | 100 | 120 |
| Zaf | Ames 3000SS | Fitting generates a Fixed Loss Based on Flow | | | | | | | | | | | | | | | | | | | |

Units Summary

| | |
|---|---|
| Diameter Units | Inches |
| Length Units | Feet |
| Flow Units | US Gallons per Minute |
| Pressure Units | Pounds per Square Inch |

Note: Fitting Legend provides equivalent pipe lengths for fittings types of various diameters. Equivalent lengths shown are standard for actual diameters of Sched 40 pipe and CFactors of 120 except as noted with *. The fittings marked with a * show equivalent lengths values supplied by manufacturers based on specific pipe diameters and CFactors and they require no adjustment. All values for fittings not marked with a * will be adjusted in the calculation for CFactors of other than 120 and diameters other than Sched 40 per NFPA.

PERMIT #2026 2513934 - CM 04 | RSN:1975523



## SUPPLY ANALYSIS

| Node at Source | Static Pressure | Residual Pressure | Flow | Available Pressure | Total Demand | Required Pressure |
|---|---|---|---|---|---|---|
| DIS | See Information on Pump Curve | | | 149.502 | 1000.0 | 139.021 |
| TEST | 71.0 | 58 | 4000.0 | 70.0 | 1000.0 | 70.0 |

## NODE ANALYSIS

| Node Tag | Elevation | Node Type | Pressure at Node | Discharge at Node | Notes |
|---|---|---|---|---|---|
| HV1 | 32.0 | | 100.0 | 250.0 | |
| HV2 | 4.0 | | 112.04 | 250.0 | |
| HV3 | 32.0 | | 100.13 | 250.0 | |
| HV4 | 4.0 | | 112.09 | 250.0 | |
| H1 | 21.0 | | 108.65 | | |
| H2 | 21.0 | | 108.74 | | |
| X2 | 24.333 | | 109.72 | | |
| X3 | 24.333 | | 109.82 | | |
| X4 | 24.333 | | 109.89 | | |
| X1 | 24.333 | | 109.81 | | |
| X5 | 24.0 | | 118.78 | | |
| XR1 | 24.0 | | 126.9 | | |
| XBR | 2.0 | | 138.43 | | |
| DIS | 2.0 | | 139.02 | | |
| SUC | 2.0 | | 59.5 | | |
| SPG | 1.0 | | 64.29 | | |
| IBP | -5.0 | | 67.17 | | |
| UG1 | -5.0 | | 68.46 | | |
| TEST | 2.0 | | 70.0 | | |


SHEET 35 of 403

| Node1 to Node2 | Elev1 Elev2 | K Fact | Qa Qt | Nom Act | Fitting or Eqiv | Len | Pipe Ftngs Total | CFact Pf/Ft | Pt Pe Pf | ******* | Notes | ****** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *HOSE VALVES | | | | | | | | | | | | |
| HV1 | 32 | H250 | 250.00 | 4 | X | 21.067 | 11.167 | 120 | 100.000 | | | |
| to | | | | | T | 26.334 | 47.401 | | 7.764 | * * Fixed Loss = 3 | | |
| H1 | 21 | | 250.0 | 4.26 | | | 58.568 | 0.0151 | 0.886 | Vel = 5.63 | | |
| | | | 0.0 | | | | | | | | | |
| H1 | | | 250.00 | | | | | | 108.650 | K Factor = 23.98 | | |
| HV2 | 4 | H250 | 250.00 | 4 | X | 21.067 | 16.833 | 120 | 112.041 | | | |
| to | | | | | T | 26.334 | 47.401 | | -4.363 | * * Fixed Loss = 3 | | |
| H1 | 21 | | 250.0 | 4.26 | | | 64.234 | 0.0151 | 0.972 | Vel = 5.63 | | |
| | | | 0.0 | | | | | | | | | |
| H1 | | | 250.00 | | | | | | 108.650 | K Factor = 23.98 | | |
| HV3 | 32 | H250 | 250.00 | 4 | X | 21.067 | 8.750 | 120 | 100.126 | | | |
| to | | | | | T | 26.334 | 47.401 | | 7.764 | * * Fixed Loss = 3 | | |
| H2 | 21 | | 250.0 | 4.26 | | | 56.151 | 0.0151 | 0.849 | Vel = 5.63 | | |
| | | | 0.0 | | | | | | | | | |
| H2 | | | 250.00 | | | | | | 108.739 | K Factor = 23.97 | | |
| HV4 | 4 | H250 | 250.00 | 4 | X | 21.067 | 19.333 | 120 | 112.092 | | | |
| to | | | | | T | 26.334 | 47.401 | | -4.363 | * * Fixed Loss = 3 | | |
| H2 | 21 | | 250.0 | 4.26 | | | 66.734 | 0.0151 | 1.010 | Vel = 5.63 | | |
| | | | 0.0 | | | | | | | | | |
| H2 | | | 250.00 | | | | | | 108.739 | K Factor = 23.97 | | |
| *BACK TO FEED | | | | | | | | | | | | |
| H1 | 21 | | 500.00 | 4 | V | 8.954 | 17.750 | 120 | 108.650 | | | |
| to | | | | | X | 21.067 | 30.021 | | -1.444 | | | |
| X1 | 24.333 | | 500.0 | 4.26 | | | 47.771 | 0.0545 | 2.605 | Vel = 11.25 | | |
| | | | 0.0 | | | | | | | | | |
| X1 | | | 500.00 | | | | | | 109.811 | K Factor = 47.71 | | |
| H2 | 21 | | 500.00 | 4 | V | 8.954 | 9.250 | 120 | 108.739 | | | |
| to | | | | | T | 26.334 | 35.288 | | -1.444 | | | |
| X2 | 24.333 | | 500.0 | 4.26 | | | 44.538 | 0.0545 | 2.428 | Vel = 11.25 | | |
| | | | 0.0 | | | | | | | | | |
| X2 | | | 500.00 | | | | | | 109.723 | K Factor = 47.73 | | |
| *BAKC TO RISER | | | | | | | | | | | | |
| X2 | 24.333 | | 500.00 | 6 | | | 11.917 | 120 | 109.723 | | | |
| to | | | | | | | | | 0.0 | | | |
| X3 | 24.333 | | 500.0 | 6.357 | | | 11.917 | 0.0078 | 0.093 | Vel = 5.05 | | |
| X3 | 24.333 | | 21.25 | 6 | | | 8.750 | 120 | 109.816 | | | |
| to | | | | | | | | | 0.0 | | | |
| X4 | 24.333 | | 521.25 | 6.357 | | | 8.750 | 0.0083 | 0.073 | Vel = 5.27 | | |
| X4 | 24.333 | | 0.0 | 6 | X | 31.433 | 999.000 | 120 | 109.889 | | | |
| to | | | | | V | 12.573 | 44.006 | | 0.144 | | | |
| X5 | 24 | | 521.25 | 6.357 | | | 1043.006 | 0.0084 | 8.743 | Vel = 5.27 | | |
| | | | 0.0 | | | | | | | | | |
| X5 | | | 521.25 | | | | | | 118.776 | K Factor = 47.83 | | |
| X3 | 24.333 | | -21.25 | 6 | 2X | 62.867 | 150.000 | 120 | 109.816 | | | |
| to | | | | | 2V | 25.147 | 88.014 | | 0.0 | | | |
| X1 | 24.333 | | -21.25 | 6.357 | | | 238.014 | 0 | -0.005 | Vel = 0.21 | | |

PERMIT #2026 2513934 - CM 04 | RSN:1975523



| Node1 to Node2 | Elev1 Elev2 | K Fact | Qa Qt | Nom Act | Fitting or Eqiv | Len | Pipe Ftngs Total | CFact Pf/Ft | Pt Pe Pf | ******* Notes ****** |
|---|---|---|---|---|---|---|---|---|---|---|
| X1 | 24.333 | | 500.00 | 6 | 4V | 50.294 | 1150.000 | 120 | 109.811 | |
| to | | | | | X | 31.433 | 81.727 | | 0.144 | |
| X5 | 24 | | 478.75 | 6.357 | | | 1231.727 | 0.0072 | 8.821 | Vel = 4.84 |
| X5 | 24 | | 521.25 | 6 | 5V | 62.867 | 215.000 | 120 | 118.776 | |
| to | | | | | 2U | 12.573 | 75.440 | | 0.0 | |
| XR1 | 24 | | 1000.0 | 6.357 | | | 290.440 | 0.0280 | 8.126 | Vel = 10.11 |
| XR1 | 24 | | 0.0 | 6 | B | 12.573 | 21.167 | 120 | 126.902 | |
| to | | | | | T | 37.72 | 50.293 | | 9.528 | |
| XBR | 2 | | 1000.0 | 6.357 | | | 71.460 | 0.0280 | 1.999 | Vel = 10.11 |
| | | | 0.0 | | | | | | | |
| XBR | | | 1000.00 | | | | | | 138.429 | K Factor = 84.99 |
| *PUMP | | | | | | | | | | |
| XBR | 2 | | 1000.00 | 8 | B | 14.094 | 8.250 | 120 | 138.429 | |
| to | | | | | S | 52.853 | 66.947 | | 0.0 | |
| DIS | 2 | | 1000.0 | 8.249 | | | 75.197 | 0.0079 | 0.592 | Vel = 6.00 |
| | | | 0.0 | | | | | | | |
| DIS | | | 1000.00 | | | | | | 139.021 | K Factor = 84.81 |
| System Demand Pressure | | | | | | | | | 139.021 | |
| Safety Margin | | | | | | | | | 10.481 | |
| Continuation Pressure | | | | | | | | | 149.502 | |
| Pressure @ Pump Outlet | | | | | | | | | 149.502 | |
| Pressure From Pump Curve | | | | | | | | | -90.000 | |
| Pressure @ Pump Inlet | | | | | | | | | 59.502 | |
| SUC | 2 | | 0.0 | 8 | Zaf | 0.0 | 8.000 | 120 | 59.502 | |
| to | | | | | E | 21.141 | 25.839 | | 4.516 | * * Fixed Loss = 4.083 |
| SPG | 1 | | 1000.0 | 8.249 | G | 4.698 | 33.839 | 0.0079 | 0.267 | Vel = 6.00 |
| SPG | 1 | | 0.0 | 8 | E | 21.141 | 15.000 | 120 | 64.285 | |
| to | | | | | | | 21.141 | | 2.599 | |
| IBP | -5 | | 1000.0 | 8.249 | | | 36.141 | 0.0078 | 0.283 | Vel = 6.00 |
| IBP | -5 | | 0.0 | 8 | F | 11.278 | 120.000 | 150 | 67.167 | |
| to | | | | | T | 43.857 | 55.135 | | 0.0 | |
| UG1 | -5 | | 1000.0 | 7.68 | | | 175.135 | 0.0074 | 1.292 | Vel = 6.93 |
| | | | 0.0 | | | | | | | |
| UG1 | | | 1000.00 | | | | | | 68.459 | K Factor = 120.86 |
| *UG2 | | | | | | | | | | |
| UG1 | -5 | | 1000.00 | 8 | F | 11.278 | 565.000 | 150 | 68.459 | |
| to | | | | | T | 43.857 | 55.135 | | -3.032 | |
| TEST | 2 | | 1000.0 | 7.68 | | | 620.135 | 0.0074 | 4.572 | Vel = 6.93 |
| | | | 0.0 | | | | | | | |
| TEST | | | 1000.00 | | | | | | 69.999 | K Factor = 119.52 |

EXCELLENCE IN FIRE PROTECTION DESIGN

Shambaugh & Son L.P.
5460 Desert Point Drive
Las Vegas, NV 89118

. . . Fire Protection by Computer Design

Hydratec Incorporated
64 Haverhill Road
Route 111
Windham, NH 03087
603-434-0502

I certify to the best of my knowledge, information, and belief that the design of this system complies with all applicable provisions of NFPA standards and local fire codes.

Dennis T. Scherr

Dennis T. Scherr
NICET Level IV
Water-Based Systems Layout
Cert. # 113016 Exp. 3/1/2029

| | | |
|---|---|---|
| Job Name | : | 227317 QTS DC2 - CALC 2 SYS W 2-01 |
| Drawing | : | FP4 |
| Location | : | 1140 N GUN CLUB RD |
| System | : | CALC 2 SYS W 2-01 |
| Contract | : | 227317 |
| Data File | : | 227317 QTS DC2 - CALC2 - SYS W 2-01.wxtmp |

***HYDRAULIC CALCULATIONS***
***for***

***JOB NAME*** QTS DC2 - CALC 2 SYS W 2-01
***Location*** 1140 N GUN CLUB RD
***Drawing #*** FP4
***Contract #*** 227317
***Date*** 03.25.26

***DESIGN***

***Remote area #*** CALC 2 SYS W 2-01
***Remote area location*** CALC 2 SYS W 2-01
***Occupancy classification*** ORDINARY HAZ. GRP-2
***Density*** .2 - Gpm/SqFt
***Area of application*** 1,548 - SqFt
***Coverage/sprinkler*** 130ft - SqFt
***Type of sprinkler calculated*** 5.6K
***# Sprinklers calculated*** 19
***In-rack demand*** N/A - GPM
***Hose streams*** 250 - GPM
***Total water required (including hose streams)*** 825.926 - GPM @ 18.2446 - Psi
***Type of system*** Wet Pipe
***Volume of system (dry or pre-action)*** N/A - Gal

***WATER SUPPLY INFORMATION***

***Test date*** 7.16.2025
***Location*** 1140 N GUN CLUB RD
***Source of info*** ONSITE FIRE HYD #05U-08

***CONTRACTOR INFO*** Shambaugh & Son
***Address*** 6445 W. Sunset Rd
***Phone #*** 702-832-4547
***Name of designer*** E.Velasco
***Authority having jurisdiction*** AURORA, CO
***NOTES:*** Saftey Margin: 45.11 PSI
ACTUAL STATIC: 71
ACTUAL RESIDUAL: 58

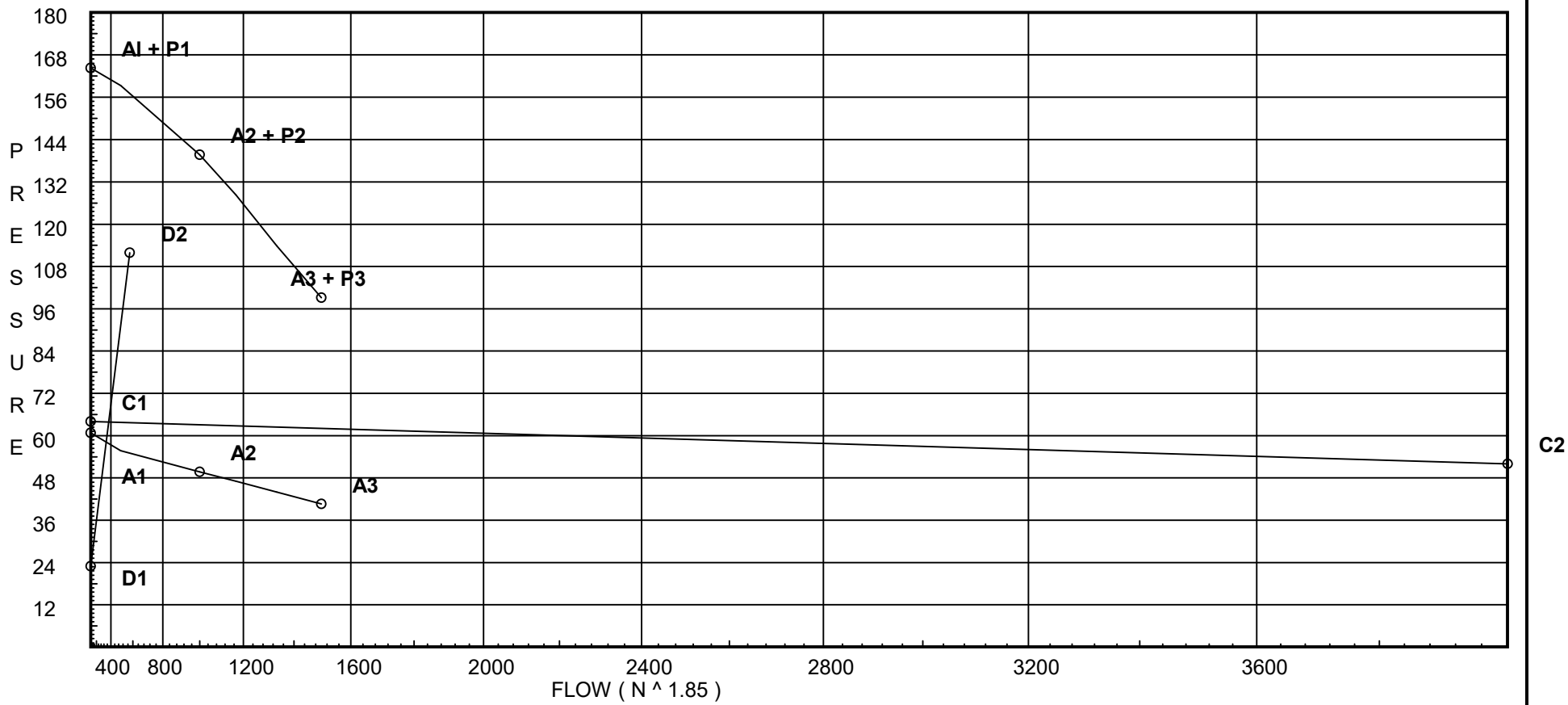
text1(35) - invisible

City Water Supply:
- C1 - Static Pressure : 64
- C2 - Residual Pressure: 52
- C2 - Residual Flow : 4000

City Water Adjusted to Pump Inlet for Pf - Elev - Hose Flow
- A1 - Adjusted Static: 60.777
- A2 - Adj Resid : 49.711 @ 1000
- A3 - Adj Resid : 40.625 @ 1500

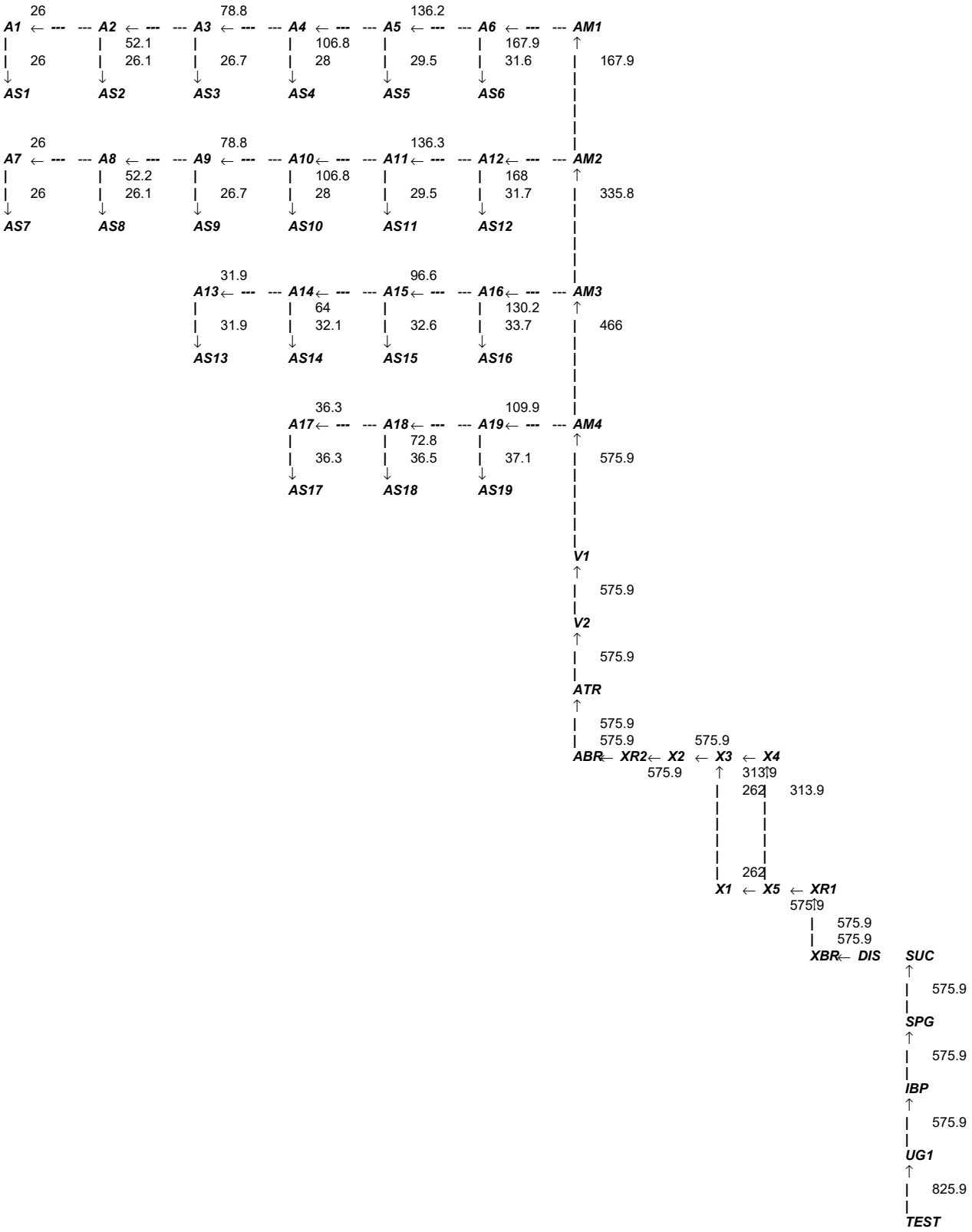
Pump Data:
- P1 - Pump Churn Pressure : 103.5
- P2 - Pump Rated Pressure : 90
- P2 - Pump Rated Flow : 1000
- P3 - Pump Pressure @ Max Flow : 58.5
- P3 - Pump Max Flow : 1500
- City Residual Flow @ 0 = 9886.27
- City Residual Flow @ 20 = 8073.68
- City Water @ 150% of Pump = 62.05

Demand:
- D1 - Elevation : 22.954
- D2 - System Flow : 575.926
- D2 - System Pressure : 111.867
- Hose ( Demand ) :
- D3 - System Demand : 575.926
- Hose ( Adj City ) : 250
- Safety Margin : 45.107






Computer Programs by Hydratec Inc. Revision: 50.5520.727


A1
26
AS1
A2
52.1
26.1
AS2
A3
78.8
26.7
AS3
A4
106.8
28
AS4
A5
136.2
29.5
AS5
A6
167.9
31.6
AS6
AM1
167.9
A7
26
AS7
A8
52.2
26.1
AS8
A9
78.8
26.7
AS9
A10
106.8
28
AS10
A11
136.3
29.5
AS11
A12
168
31.7
AS12
AM2
335.8
A13
31.9
31.9
AS13
A14
64
32.1
AS14
A15
96.6
32.6
AS15
A16
130.2
33.7
AS16
AM3
466
A17
36.3
36.3
AS17
A18
72.8
36.5
AS18
A19
109.9
37.1
AS19
AM4
575.9
V1
575.9
V2
575.9
ATR
575.9
575.9
ABR
XR2
575.9
X2
575.9
X3
313.9
262
X1
262
X4
313.9
X5
XR1
575.9
575.9
575.9
XBR
DIS
SUC
575.9
SPG
575.9
IBP
575.9
UG1
825.9
TEST

Fitting Legend

| Abbrev. | Name | ½ | ¾ | 1 | 1¼ | 1½ | 2 | 2½ | 3 | 3½ | 4 | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 24 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B | NFPA 13 Butterfly Valve | 0 | 0 | 0 | 0 | 0 | 6 | 7 | 10 | 0 | 12 | 9 | 10 | 12 | 19 | 21 | 23 | 25 | 0 | 0 | 0 |
| E | 90 - NFPA | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 10 | 12 | 14 | 18 | 22 | 27 | 35 | 40 | 45 | 50 | 61 |
| F | 45 - NFPA | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 4 | 5 | 7 | 9 | 11 | 13 | 17 | 19 | 21 | 24 | 28 |
| G | NFPA 13 Gate Valve | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 10 | 11 | 13 |
| S | Swing Check NFPA 13 | 0 | 0 | 5 | 7 | 9 | 11 | 14 | 16 | 19 | 22 | 27 | 32 | 45 | 55 | 65 | | | | | |
| T | TEE - NFPA | 3 | 4 | 5 | 6 | 8 | 10 | 12 | 15 | 17 | 20 | 25 | 30 | 35 | 50 | 60 | 71 | 81 | 91 | 101 | 121 |
| U | 45 - GROOVED | 0 | 0 | 0.8 | 2.13 | 2.75 | 1.8 | 2.2 | 2.6 | 0 | 3.4 | 4.2 | 5 | 6.5 | 8.3 | 10.0 | 18.5 | 21 | 23.5 | 25.5 | 29.5 |
| V | 90 - GROOVED | 0 | 0 | 1.7 | 2 | 2.6 | 3.5 | 4.3 | 5 | 0 | 6.8 | 8.5 | 10 | 13 | 17 | 20 | 24.5 | 28 | 31 | 34 | 42 |
| X | TEE - GROOVED | 0 | 0 | 4.2 | 7.5 | 6.63 | 8.5 | 10.8 | 13 | 0 | 16 | 21 | 25 | 33 | 41 | 50 | 70 | 80 | 90 | 100 | 120 |
| Zaf | Ames 3000SS | Fitting generates a Fixed Loss Based on Flow | | | | | | | | | | | | | | | | | | | |

Units Summary

| | |
|---|---|
| Diameter Units | Inches |
| Length Units | Feet |
| Flow Units | US Gallons per Minute |
| Pressure Units | Pounds per Square Inch |

Note: Fitting Legend provides equivalent pipe lengths for fittings types of various diameters. Equivalent lengths shown are standard for actual diameters of Sched 40 pipe and CFactors of 120 except as noted with *. The fittings marked with a * show equivalent lengths values supplied by manufacturers based on specific pipe diameters and CFactors and they require no adjustment. All values for fittings not marked with a * will be adjusted in the calculation for CFactors of other than 120 and diameters other than Sched 40 per NFPA.

## SUPPLY ANALYSIS

| Node at Source | Static Pressure | Residual Pressure | Flow | Available Pressure | Total Demand | Required Pressure |
|---|---|---|---|---|---|---|
| DIS | See Information on Pump Curve | | | 156.974 | 575.93 | 111.867 |
| TEST | 64.0 | 52 | 4000.0 | 63.352 | 825.93 | 63.352 |

## NODE ANALYSIS

| Node Tag | Elevation | Node Type | Pressure at Node | Discharge at Node | Notes | |
|---|---|---|---|---|---|---|
| AS1 | 55.0 | 5.6 | 21.56 | 26.0 | 0.2 | 130 |
| AS2 | 55.0 | 5.6 | 21.75 | 26.12 | 0.2 | 130 |
| AS3 | 55.0 | 5.6 | 22.65 | 26.65 | 0.2 | 130 |
| AS4 | 55.0 | 5.6 | 24.96 | 27.98 | 0.2 | 130 |
| AS5 | 55.0 | 5.6 | 27.67 | 29.46 | 0.2 | 130 |
| AS6 | 55.0 | 5.6 | 31.92 | 31.64 | 0.2 | 130 |
| AS7 | 55.0 | 5.6 | 21.59 | 26.02 | 0.2 | 130 |
| AS8 | 55.0 | 5.6 | 21.78 | 26.14 | 0.2 | 130 |
| AS9 | 55.0 | 5.6 | 22.68 | 26.67 | 0.2 | 130 |
| AS10 | 55.0 | 5.6 | 25.0 | 28.0 | 0.2 | 130 |
| AS11 | 55.0 | 5.6 | 27.71 | 29.48 | 0.2 | 130 |
| AS12 | 55.0 | 5.6 | 31.97 | 31.66 | 0.2 | 130 |
| AS13 | 55.0 | 5.6 | 32.4 | 31.87 | 0.2 | 130 |
| AS14 | 55.0 | 5.6 | 32.83 | 32.09 | 0.2 | 130 |
| AS15 | 55.0 | 5.6 | 33.88 | 32.6 | 0.2 | 130 |
| AS16 | 55.0 | 5.6 | 36.13 | 33.66 | 0.2 | 130 |
| AS17 | 55.0 | 5.6 | 42.1 | 36.33 | 0.2 | 130 |
| AS18 | 55.0 | 5.6 | 42.47 | 36.49 | 0.2 | 130 |
| AS19 | 55.0 | 5.6 | 43.8 | 37.06 | 0.2 | 130 |
| A1 | 52.167 | | 24.16 | | | |
| A2 | 52.167 | | 24.37 | | | |
| A3 | 52.167 | | 25.32 | | | |
| A4 | 52.167 | | 27.77 | | | |
| A5 | 52.167 | | 30.63 | | | |
| A6 | 52.167 | | 35.13 | | | |
| A7 | 52.167 | | 24.19 | | | |
| A8 | 52.167 | | 24.4 | | | |
| A9 | 52.167 | | 25.35 | | | |
| A10 | 52.167 | | 27.8 | | | |
| A11 | 52.167 | | 30.67 | | | |
| A12 | 52.167 | | 35.17 | | | |
| A13 | 52.167 | | 35.63 | | | |
| A14 | 52.167 | | 36.09 | | | |
| A15 | 52.167 | | 37.2 | | | |
| A16 | 52.167 | | 39.58 | | | |
| A17 | 52.167 | | 45.88 | | | |
| A18 | 52.167 | | 46.27 | | | |
| A19 | 52.167 | | 47.68 | | | |
| AM1 | 52.167 | | 56.74 | | | |
| AM2 | 52.167 | | 56.81 | | | |
| AM3 | 52.167 | | 57.07 | | | |

PERMIT #2026 2513934 - CM 04 | RSN:1975523



***NODE ANALYSIS (cont.)***

| *Node Tag* | *Elevation* | *Node Type* | *Pressure at Node* | *Discharge at Node* | *Notes* |
|---|---|---|---|---|---|
| AM4 | 52.167 | | 57.55 | | |
| V1 | 52.167 | | 59.11 | | |
| V2 | 52.167 | | 73.36 | | |
| ATR | 52.167 | | 80.4 | | |
| ABR | 24.333 | | 93.59 | | |
| XR2 | 24.333 | | 94.12 | | |
| X2 | 24.333 | | 94.76 | | |
| X3 | 24.333 | | 94.88 | | |
| X4 | 24.333 | | 94.91 | | |
| X1 | 24.333 | | 95.44 | | |
| X5 | 24.0 | | 98.48 | | |
| XR1 | 24.0 | | 101.41 | | |
| XBR | 2.0 | | 111.65 | | |
| DIS | 2.0 | | 111.87 | | |
| SUC | 2.0 | | 55.03 | | |
| SPG | 1.0 | | 60.01 | | |
| IBP | -5.0 | | 62.71 | | |
| UG1 | -5.0 | | 63.17 | 250.0 | |
| TEST | 2.0 | | 63.35 | | |


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PERMIT #2026 2513934 - CM 04 | RSN:1975523



| Node1<br>to<br>Node2 | Elev1<br><br>Elev2 | K<br><br>Fact | Qa<br><br>Qt | Nom<br><br>Act | Fitting<br>or<br>Eqiv | Len | Pipe<br>Ftngs<br>Total | CFact<br><br>Pf/Ft | Pt<br>Pe<br>Pf | ******* Notes ****** |
|---|---|---|---|---|---|---|---|---|---|---|
| *HEADS | | | | | | | | | | |
| AS1 | 55 | 5.60 | 26.00 | 1 | T | 5.0 | 1.500 | 120 | 21.556 | |
| to | | | | | | | 5.000 | | 1.227 | |
| A1 | 52.167 | | 26.0 | 1.049 | | | 6.500 | 0.2114 | 1.374 | Vel = 9.65 |
| | | | 0.0 | | | | | | | |
| A1 | | | 26.00 | | | | | | 24.157 | K Factor = 5.29 |
| AS2 | 55 | 5.60 | 26.12 | 1 | T | 5.0 | 1.500 | 120 | 21.754 | |
| to | | | | | | | 5.000 | | 1.227 | |
| A2 | 52.167 | | 26.12 | 1.049 | | | 6.500 | 0.2132 | 1.386 | Vel = 9.70 |
| | | | 0.0 | | | | | | | |
| A2 | | | 26.12 | | | | | | 24.367 | K Factor = 5.29 |
| AS3 | 55 | 5.60 | 26.65 | 1 | T | 5.0 | 1.500 | 120 | 22.652 | |
| to | | | | | | | 5.000 | | 1.227 | |
| A3 | 52.167 | | 26.65 | 1.049 | | | 6.500 | 0.2214 | 1.439 | Vel = 9.89 |
| | | | 0.0 | | | | | | | |
| A3 | | | 26.65 | | | | | | 25.318 | K Factor = 5.30 |
| AS4 | 55 | 5.60 | 27.98 | 1 | T | 5.0 | 1.500 | 120 | 24.965 | |
| to | | | | | | | 5.000 | | 1.227 | |
| A4 | 52.167 | | 27.98 | 1.049 | | | 6.500 | 0.2422 | 1.574 | Vel = 10.39 |
| | | | 0.0 | | | | | | | |
| A4 | | | 27.98 | | | | | | 27.766 | K Factor = 5.31 |
| AS5 | 55 | 5.60 | 29.46 | 1 | T | 5.0 | 1.500 | 120 | 27.672 | |
| to | | | | | | | 5.000 | | 1.227 | |
| A5 | 52.167 | | 29.46 | 1.049 | | | 6.500 | 0.2663 | 1.731 | Vel = 10.94 |
| | | | 0.0 | | | | | | | |
| A5 | | | 29.46 | | | | | | 30.630 | K Factor = 5.32 |
| AS6 | 55 | 5.60 | 31.64 | 1 | T | 5.0 | 1.500 | 120 | 31.923 | |
| to | | | | | | | 5.000 | | 1.227 | |
| A6 | 52.167 | | 31.64 | 1.049 | | | 6.500 | 0.3040 | 1.976 | Vel = 11.75 |
| | | | 0.0 | | | | | | | |
| A6 | | | 31.64 | | | | | | 35.126 | K Factor = 5.34 |
| AS7 | 55 | 5.60 | 26.02 | 1 | T | 5.0 | 1.500 | 120 | 21.586 | |
| to | | | | | | | 5.000 | | 1.227 | |
| A7 | 52.167 | | 26.02 | 1.049 | | | 6.500 | 0.2117 | 1.376 | Vel = 9.66 |
| | | | 0.0 | | | | | | | |
| A7 | | | 26.02 | | | | | | 24.189 | K Factor = 5.29 |
| AS8 | 55 | 5.60 | 26.14 | 1 | T | 5.0 | 1.500 | 120 | 21.784 | |
| to | | | | | | | 5.000 | | 1.227 | |
| A8 | 52.167 | | 26.14 | 1.049 | | | 6.500 | 0.2135 | 1.388 | Vel = 9.70 |
| | | | 0.0 | | | | | | | |
| A8 | | | 26.14 | | | | | | 24.399 | K Factor = 5.29 |
| AS9 | 55 | 5.60 | 26.67 | 1 | T | 5.0 | 1.500 | 120 | 22.683 | |
| to | | | | | | | 5.000 | | 1.227 | |
| A9 | 52.167 | | 26.67 | 1.049 | | | 6.500 | 0.2215 | 1.440 | Vel = 9.90 |
| | | | 0.0 | | | | | | | |
| A9 | | | 26.67 | | | | | | 25.350 | K Factor = 5.30 |
| AS10 | 55 | 5.60 | 28.00 | 1 | T | 5.0 | 1.500 | 120 | 24.999 | |
| to | | | | | | | 5.000 | | 1.227 | |
| A10 | 52.167 | | 28.0 | 1.049 | | | 6.500 | 0.2425 | 1.576 | Vel = 10.39 |


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PERMIT #2026 2513934 - CM 04 | RSN:1975523



| Node1 to Node2 | Elev1 Elev2 | K Fact | Qa Qt | Nom Act | Fitting or Eqiv | Len | Pipe Ftngs Total | CFact Pf/Ft | Pt Pe Pf | ******* | Notes | ****** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0.0 | | | | | | | | | |
| A10 | | | 28.00 | | | | | | 27.802 | K Factor = 5.31 | | |
| AS11 | 55 | 5.60 | 29.48 | 1 | T | 5.0 | 1.500 | 120 | 27.709 | | | |
| to | | | | | | | 5.000 | | 1.227 | | | |
| A11 | 52.167 | | 29.48 | 1.049 | | | 6.500 | 0.2668 | 1.734 | Vel = 10.94 | | |
| | | | 0.0 | | | | | | | | | |
| A11 | | | 29.48 | | | | | | 30.670 | K Factor = 5.32 | | |
| AS12 | 55 | 5.60 | 31.66 | 1 | T | 5.0 | 1.500 | 120 | 31.966 | | | |
| to | | | | | | | 5.000 | | 1.227 | | | |
| A12 | 52.167 | | 31.66 | 1.049 | | | 6.500 | 0.3043 | 1.978 | Vel = 11.75 | | |
| | | | 0.0 | | | | | | | | | |
| A12 | | | 31.66 | | | | | | 35.171 | K Factor = 5.34 | | |
| AS13 | 55 | 5.60 | 31.88 | 1 | T | 5.0 | 1.500 | 120 | 32.398 | | | |
| to | | | | | | | 5.000 | | 1.227 | | | |
| A13 | 52.167 | | 31.88 | 1.049 | | | 6.500 | 0.3082 | 2.003 | Vel = 11.83 | | |
| | | | 0.0 | | | | | | | | | |
| A13 | | | 31.88 | | | | | | 35.628 | K Factor = 5.34 | | |
| AS14 | 55 | 5.60 | 32.09 | 1 | T | 5.0 | 1.500 | 120 | 32.832 | | | |
| to | | | | | | | 5.000 | | 1.227 | | | |
| A14 | 52.167 | | 32.09 | 1.049 | | | 6.500 | 0.3120 | 2.028 | Vel = 11.91 | | |
| | | | 0.0 | | | | | | | | | |
| A14 | | | 32.09 | | | | | | 36.087 | K Factor = 5.34 | | |
| AS15 | 55 | 5.60 | 32.60 | 1 | T | 5.0 | 1.500 | 120 | 33.882 | | | |
| to | | | | | | | 5.000 | | 1.227 | | | |
| A15 | 52.167 | | 32.6 | 1.049 | | | 6.500 | 0.3212 | 2.088 | Vel = 12.10 | | |
| | | | 0.0 | | | | | | | | | |
| A15 | | | 32.60 | | | | | | 37.197 | K Factor = 5.35 | | |
| AS16 | 55 | 5.60 | 33.66 | 1 | T | 5.0 | 1.500 | 120 | 36.133 | | | |
| to | | | | | | | 5.000 | | 1.227 | | | |
| A16 | 52.167 | | 33.66 | 1.049 | | | 6.500 | 0.3409 | 2.216 | Vel = 12.50 | | |
| | | | 0.0 | | | | | | | | | |
| A16 | | | 33.66 | | | | | | 39.576 | K Factor = 5.35 | | |
| AS17 | 55 | 5.60 | 36.33 | 1 | T | 5.0 | 1.500 | 120 | 42.097 | | | |
| to | | | | | | | 5.000 | | 1.227 | | | |
| A17 | 52.167 | | 36.33 | 1.049 | | | 6.500 | 0.3926 | 2.552 | Vel = 13.49 | | |
| | | | 0.0 | | | | | | | | | |
| A17 | | | 36.33 | | | | | | 45.876 | K Factor = 5.36 | | |
| AS18 | 55 | 5.60 | 36.49 | 1 | T | 5.0 | 1.500 | 120 | 42.466 | | | |
| to | | | | | | | 5.000 | | 1.227 | | | |
| A18 | 52.167 | | 36.49 | 1.049 | | | 6.500 | 0.3958 | 2.573 | Vel = 13.55 | | |
| | | | 0.0 | | | | | | | | | |
| A18 | | | 36.49 | | | | | | 46.266 | K Factor = 5.36 | | |
| AS19 | 55 | 5.60 | 37.06 | 1 | T | 5.0 | 1.500 | 120 | 43.803 | | | |
| to | | | | | | | 5.000 | | 1.227 | | | |
| A19 | 52.167 | | 37.06 | 1.049 | | | 6.500 | 0.4074 | 2.648 | Vel = 13.76 | | |
| | | | 0.0 | | | | | | | | | |
| A19 | | | 37.06 | | | | | | 47.678 | K Factor = 5.37 | | |


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PERMIT #2026 2513934 - CM 04 | RSN:1975523



| Node1 to Node2 | Elev1 Elev2 | K Fact | Qa Qt | Nom Act | Fitting or Eqiv | Len | Pipe Ftngs Total | CFact Pf/Ft | Pt Pe Pf | ******* | Notes | ****** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *LINE1 | | | | | | | | | | | | |
| A1 | 52.167 | | 26.00 | 1.5 | | | 8.000 | 120 | 24.157 | | | |
| to | | | | | | | | | 0.0 | | | |
| A2 | 52.167 | | 26.0 | 1.61 | | | 8.000 | 0.0262 | 0.210 | Vel = 4.10 | | |
| A2 | 52.167 | | 26.12 | 1.5 | | | 10.000 | 120 | 24.367 | | | |
| to | | | | | | | | | 0.0 | | | |
| A3 | 52.167 | | 52.12 | 1.61 | | | 10.000 | 0.0951 | 0.951 | Vel = 8.21 | | |
| A3 | 52.167 | | 26.65 | 1.5 | | | 12.000 | 120 | 25.318 | | | |
| to | | | | | | | | | 0.0 | | | |
| A4 | 52.167 | | 78.77 | 1.61 | | | 12.000 | 0.2040 | 2.448 | Vel = 12.41 | | |
| A4 | 52.167 | | 27.98 | 1.5 | | | 8.000 | 120 | 27.766 | | | |
| to | | | | | | | | | 0.0 | | | |
| A5 | 52.167 | | 106.75 | 1.61 | | | 8.000 | 0.3580 | 2.864 | Vel = 16.82 | | |
| A5 | 52.167 | | 29.46 | 1.5 | | | 8.000 | 120 | 30.630 | | | |
| to | | | | | | | | | 0.0 | | | |
| A6 | 52.167 | | 136.21 | 1.61 | | | 8.000 | 0.5620 | 4.496 | Vel = 21.47 | | |
| A6 | 52.167 | | 31.64 | 1.5 | X | 6.63 | 11.500 | 120 | 35.126 | | | |
| to | | | | | T | 8.0 | 14.630 | | 0.0 | | | |
| AM1 | 52.167 | | 167.85 | 1.61 | | | 26.130 | 0.8270 | 21.610 | Vel = 26.45 | | |
| | | | 0.0 | | | | | | | | | |
| AM1 | | | 167.85 | | | | | | 56.736 | K Factor = 22.28 | | |
| *LINE2 | | | | | | | | | | | | |
| A7 | 52.167 | | 26.02 | 1.5 | | | 8.000 | 120 | 24.189 | | | |
| to | | | | | | | | | 0.0 | | | |
| A8 | 52.167 | | 26.02 | 1.61 | | | 8.000 | 0.0262 | 0.210 | Vel = 4.10 | | |
| A8 | 52.167 | | 26.14 | 1.5 | | | 10.000 | 120 | 24.399 | | | |
| to | | | | | | | | | 0.0 | | | |
| A9 | 52.167 | | 52.16 | 1.61 | | | 10.000 | 0.0951 | 0.951 | Vel = 8.22 | | |
| A9 | 52.167 | | 26.67 | 1.5 | | | 12.000 | 120 | 25.350 | | | |
| to | | | | | | | | | 0.0 | | | |
| A10 | 52.167 | | 78.83 | 1.61 | | | 12.000 | 0.2043 | 2.452 | Vel = 12.42 | | |
| A10 | 52.167 | | 27.99 | 1.5 | | | 8.000 | 120 | 27.802 | | | |
| to | | | | | | | | | 0.0 | | | |
| A11 | 52.167 | | 106.82 | 1.61 | | | 8.000 | 0.3585 | 2.868 | Vel = 16.83 | | |
| A11 | 52.167 | | 29.48 | 1.5 | | | 8.000 | 120 | 30.670 | | | |
| to | | | | | | | | | 0.0 | | | |
| A12 | 52.167 | | 136.3 | 1.61 | | | 8.000 | 0.5626 | 4.501 | Vel = 21.48 | | |
| A12 | 52.167 | | 31.66 | 1.5 | X | 6.63 | 11.500 | 120 | 35.171 | | | |
| to | | | | | T | 8.0 | 14.630 | | 0.0 | | | |
| AM2 | 52.167 | | 167.96 | 1.61 | | | 26.130 | 0.8281 | 21.637 | Vel = 26.47 | | |
| | | | 0.0 | | | | | | | | | |
| AM2 | | | 167.96 | | | | | | 56.808 | K Factor = 22.28 | | |
| *LINE3 | | | | | | | | | | | | |
| A13 | 52.167 | | 31.88 | 1.5 | | | 12.000 | 120 | 35.628 | | | |
| to | | | | | | | | | 0.0 | | | |
| A14 | 52.167 | | 31.88 | 1.61 | | | 12.000 | 0.0382 | 0.459 | Vel = 5.02 | | |
| A14 | 52.167 | | 32.08 | 1.5 | | | 8.000 | 120 | 36.087 | | | |
| to | | | | | | | | | 0.0 | | | |
| A15 | 52.167 | | 63.96 | 1.61 | | | 8.000 | 0.1388 | 1.110 | Vel = 10.08 | | |


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PERMIT #2026 2513934 - CM 04 | RSN:1975523



| Node1 to Node2 | Elev1 Elev2 | K Fact | Qa Qt | Nom Act | Fitting or Eqiv | Len | Pipe Ftngs Total | CFact Pf/Ft | Pt Pe Pf | ******* Notes ****** |
|---|---|---|---|---|---|---|---|---|---|---|
| A15 | 52.167 | | 32.60 | 1.5 | | | 8.000 | 120 | 37.197 | |
| to | | | | | | | | | 0.0 | |
| A16 | 52.167 | | 96.56 | 1.61 | | | 8.000 | 0.2974 | 2.379 | Vel = 15.22 |
| A16 | 52.167 | | 33.66 | 1.5 | 2V | 5.2 | 14.000 | 120 | 39.576 | |
| to | | | | | X | 6.63 | 19.830 | | 0.0 | |
| AM3 | 52.167 | | 130.22 | 1.61 | T | 8.0 | 33.830 | 0.5171 | 17.494 | Vel = 20.52 |
| | | | 0.0 | | | | | | | |
| AM3 | | | 130.22 | | | | | | 57.070 | K Factor = 17.24 |
| *LINE | | | | | | | | | | |
| A17 | 52.167 | | 36.33 | 1.5 | | | 8.000 | 120 | 45.876 | |
| to | | | | | | | | | 0.0 | |
| A18 | 52.167 | | 36.33 | 1.61 | | | 8.000 | 0.0488 | 0.390 | Vel = 5.73 |
| A18 | 52.167 | | 36.50 | 1.5 | | | 8.000 | 120 | 46.266 | |
| to | | | | | | | | | 0.0 | |
| A19 | 52.167 | | 72.83 | 1.61 | | | 8.000 | 0.1765 | 1.412 | Vel = 11.48 |
| A19 | 52.167 | | 37.06 | 1.5 | X | 6.63 | 11.500 | 120 | 47.678 | |
| to | | | | | T | 8.0 | 14.630 | | 0.0 | |
| AM4 | 52.167 | | 109.89 | 1.61 | | | 26.130 | 0.3777 | 9.870 | Vel = 17.32 |
| | | | 0.0 | | | | | | | |
| AM4 | | | 109.89 | | | | | | 57.548 | K Factor = 14.49 |
| *MAIN | | | | | | | | | | |
| AM1 | 52.167 | | 167.85 | 4 | | | 10.000 | 120 | 56.736 | |
| to | | | | | | | | | 0.0 | |
| AM2 | 52.167 | | 167.85 | 4.26 | | | 10.000 | 0.0072 | 0.072 | Vel = 3.78 |
| AM2 | 52.167 | | 167.97 | 4 | | | 10.000 | 120 | 56.808 | |
| to | | | | | | | | | 0.0 | |
| AM3 | 52.167 | | 335.82 | 4.26 | | | 10.000 | 0.0262 | 0.262 | Vel = 7.56 |
| AM3 | 52.167 | | 130.22 | 4 | | | 10.000 | 120 | 57.070 | |
| to | | | | | | | | | 0.0 | |
| AM4 | 52.167 | | 466.04 | 4.26 | | | 10.000 | 0.0478 | 0.478 | Vel = 10.49 |
| AM4 | 52.167 | | 109.89 | 4 | | | 22.000 | 120 | 57.548 | |
| to | | | | | | | | | 0.0 | |
| V1 | 52.167 | | 575.93 | 4.26 | | | 22.000 | 0.0708 | 1.558 | Vel = 12.96 |
| V1 | 52.167 | | 0.0 | 4 | X | 21.067 | 100.667 | 120 | 59.106 | |
| to | | | | | 2T | 52.668 | 100.596 | | 0.0 | |
| V2 | 52.167 | | 575.93 | 4.26 | 3V | 26.861 | 201.263 | 0.0708 | 14.252 | Vel = 12.96 |
| V2 | 52.167 | | 0.0 | 4 | X | 21.067 | 65.000 | 120 | 73.358 | |
| to | | | | | U | 4.477 | 34.498 | | 0.0 | |
| ATR | 52.167 | | 575.93 | 4.26 | V | 8.954 | 99.498 | 0.0708 | 7.046 | Vel = 12.96 |
| ATR | 52.167 | | 0.0 | 6 | S | 40.235 | 22.167 | 120 | 80.404 | |
| to | | | | | B | 12.573 | 90.528 | | 12.055 | |
| ABR | 24.333 | | 575.93 | 6.357 | T | 37.72 | 112.695 | 0.0101 | 1.135 | Vel = 5.82 |
| | | | 0.0 | | | | | | | |
| ABR | | | 575.93 | | | | | | 93.594 | K Factor = 59.53 |
| *SP1 | | | | | | | | | | |
| ABR | 24.333 | | 575.93 | 6 | V | 12.573 | 8.500 | 120 | 93.594 | |
| to | | | | | X | 31.433 | 44.006 | | 0.0 | |
| XR2 | 24.333 | | 575.93 | 6.357 | | | 52.506 | 0.0101 | 0.530 | Vel = 5.82 |

PERMIT #2026 2513934 - CM 04 | RSN:1975523



| Node1 / to / Node2 | Elev1 / Elev2 | K / Fact | Qa / Qt | Nom / Act | Fitting or Eqiv | Len | Pipe Ftngs Total | CFact / Pf/Ft | Pt / Pe / Pf | ******* Notes ****** |
|---|---|---|---|---|---|---|---|---|---|---|
| XR2 | 24.333 | | 0.0 | 6 | V | 12.573 | 50.833 | 120 | 94.124 | |
| to | | | | | | | 12.573 | | 0.0 | |
| X2 | 24.333 | | 575.93 | 6.357 | | | 63.406 | 0.0101 | 0.639 | Vel = 5.82 |
| X2 | 24.333 | | 0.0 | 6 | | | 11.917 | 120 | 94.763 | |
| to | | | | | | | | | 0.0 | |
| X3 | 24.333 | | 575.93 | 6.357 | | | 11.917 | 0.0101 | 0.120 | Vel = 5.82 |
| X3 | 24.333 | | -261.99 | 6 | | | 8.750 | 120 | 94.883 | |
| to | | | | | | | | | 0.0 | |
| X4 | 24.333 | | 313.94 | 6.357 | | | 8.750 | 0.0033 | 0.029 | Vel = 3.17 |
| X4 | 24.333 | | 0.0 | 6 | X | 31.433 | 999.000 | 120 | 94.912 | |
| to | | | | | V | 12.573 | 44.006 | | 0.144 | |
| X5 | 24 | | 313.94 | 6.357 | | | 1043.006 | 0.0033 | 3.422 | Vel = 3.17 |
| | | | 0.0 | | | | | | | |
| X5 | | | 313.94 | | | | | | 98.478 | K Factor = 31.64 |
| *SP2 | | | | | | | | | | |
| X3 | 24.333 | | 261.99 | 6 | 2X | 62.867 | 150.000 | 120 | 94.883 | |
| to | | | | | 2V | 25.147 | 88.014 | | 0.0 | |
| X1 | 24.333 | | 261.99 | 6.357 | | | 238.014 | 0.0023 | 0.559 | Vel = 2.65 |
| X1 | 24.333 | | 0.0 | 6 | 4V | 50.294 | 1150.000 | 120 | 95.442 | |
| to | | | | | X | 31.433 | 81.727 | | 0.144 | |
| X5 | 24 | | 261.99 | 6.357 | | | 1231.727 | 0.0023 | 2.892 | Vel = 2.65 |
| | | | 0.0 | | | | | | | |
| X5 | | | 261.99 | | | | | | 98.478 | K Factor = 26.40 |
| *SP TO PUMP | | | | | | | | | | |
| X5 | 24 | | 575.93 | 6 | 5V | 62.867 | 215.000 | 120 | 98.478 | |
| to | | | | | 2U | 12.573 | 75.440 | | 0.0 | |
| XR1 | 24 | | 575.93 | 6.357 | | | 290.440 | 0.0101 | 2.928 | Vel = 5.82 |
| XR1 | 24 | | 0.0 | 6 | B | 12.573 | 21.167 | 120 | 101.406 | |
| to | | | | | T | 37.72 | 50.293 | | 9.528 | |
| XBR | 2 | | 575.93 | 6.357 | | | 71.460 | 0.0101 | 0.720 | Vel = 5.82 |
| | | | 0.0 | | | | | | | |
| XBR | | | 575.93 | | | | | | 111.654 | K Factor = 54.50 |
| *PUMP | | | | | | | | | | |
| XBR | 2 | | 575.93 | 8 | B | 14.094 | 8.250 | 120 | 111.654 | |
| to | | | | | S | 52.853 | 66.947 | | 0.0 | |
| DIS | 2 | | 575.93 | 8.249 | | | 75.197 | 0.0028 | 0.213 | Vel = 3.46 |
| | | | 0.0 | | | | | | | |
| DIS | | | 575.93 | | | | | | 111.867 | K Factor = 54.45 |
| System Demand Pressure | | | | | | | | | 111.867 | |
| Safety Margin | | | | | | | | | 45.107 | |
| Continuation Pressure | | | | | | | | | 156.974 | |
| Pressure @ Pump Outlet | | | | | | | | | 156.974 | |
| Pressure From Pump Curve | | | | | | | | | -101.942 | |
| Pressure @ Pump Inlet | | | | | | | | | 55.032 | |
| SUC | 2 | | 0.0 | 8 | Zaf | 0.0 | 8.000 | 120 | 55.032 | |
| to | | | | | E | 21.141 | 25.839 | | 4.879 | * * Fixed Loss = 4.446 |
| SPG | 1 | | 575.93 | 8.249 | G | 4.698 | 33.839 | 0.0028 | 0.096 | Vel = 3.46 |


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PERMIT #2026 2513934 - CM 04 | RSN:1975523



| Node1 to Node2 | Elev1 Elev2 | K Fact | Qa Qt | Nom Act | Fitting or Eqiv | Len | Pipe Ftngs Total | CFact Pf/Ft | Pt Pe Pf | ******* | Notes | ****** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SPG | 1 | | 0.0 | 8 | E | 21.141 | 15.000 | 120 | 60.007 | | | |
| to | | | | | | | 21.141 | | 2.599 | | | |
| IBP | -5 | | 575.93 | 8.249 | | | 36.141 | 0.0028 | 0.102 | Vel = 3.46 | | |
| IBP | -5 | | 0.0 | 8 | F | 11.278 | 120.000 | 150 | 62.708 | | | |
| to | | | | | T | 43.857 | 55.135 | | 0.0 | | | |
| UG1 | -5 | | 575.93 | 7.68 | | | 175.135 | 0.0027 | 0.465 | Vel = 3.99 | | |
| | | | 0.0 | | | | | | | | | |
| UG1 | | | 575.93 | | | | | | 63.173 | K Factor = 72.46 | | |
| *UG2 | | | | | | | | | | | | |
| UG1 | -5 | H250 | 825.93 | 8 | F | 11.278 | 565.000 | 150 | 63.173 | | | |
| to | | | | | T | 43.857 | 55.135 | | -3.032 | | | |
| TEST | 2 | | 825.93 | 7.68 | | | 620.135 | 0.0052 | 3.211 | Vel = 5.72 | | |
| | | | 0.0 | | | | | | | | | |
| TEST | | | 825.93 | | | | | | 63.352 | K Factor = 103.77 | | |


SHEET 50 of 403

EXCELLENCE IN FIRE PROTECTION DESIGN

Shambaugh & Son L.P.
5460 Desert Point Drive
Las Vegas, NV 89118

. . . Fire Protection by Computer Design

Hydratec Incorporated
64 Haverhill Road
Route 111
Windham, NH 03087
603-434-0502

I certify to the best of my knowledge, information, and belief that the design of this system complies with all applicable provisions of NFPA standards and local fire codes.

Dennis T. Scherr

Dennis T. Scherr
NICET Level IV
Water-Based Systems Layout
Cert. # 113016 Exp. 3/1/2029

| | | |
|---|---|---|
| Job Name | : | 227317 QTS DC2 - CALC 3 SYS W 2-01 |
| Drawing | : | FP4 |
| Location | : | 1140 N GUN CLUB RD |
| System | : | CALC 3 SYS W 2-01 |
| Contract | : | 227317 |
| Data File | : | 227317 QTS DC2 - CALC3 - SYS W 2-01.wxtmp |



Computer Programs by Hydratec Inc. Revision: 50.5520.727

***HYDRAULIC CALCULATIONS***
***for***

***JOB NAME*** QTS DC2
***Location*** 1140 N GUN CLUB RD
***Drawing #*** FP4
***Contract #*** 227317
***Date*** 03.25.26

***DESIGN***

***Remote area #*** CALC 3 SYS W 2-01
***Remote area location*** CALC 3 SYS W 2-01
***Occupancy classification*** LIGHT HAZARD
***Density*** .1 - Gpm/SqFt
***Area of application*** 7 HEADS - SqFt
***Coverage/sprinkler*** 225 - SqFt
***Type of sprinkler calculated*** 5.6K
***# Sprinklers calculated*** 7
***In-rack demand*** N/A - GPM
***Hose streams*** 100 - GPM
***Total water required (including hose streams)*** 260.177 - GPM @ -28.9148 - Psi
***Type of system*** Wet Pipe
***Volume of system (dry or pre-action)*** N/A - Gal

***WATER SUPPLY INFORMATION***

***Test date*** 7.16.2025
***Location*** 1140 N GUN CLUB RD
***Source of info*** ONSITE FIRE HYD #05U-08

***CONTRACTOR INFO*** Shambaugh & Son
***Address*** 6445 W. Sunset Rd
***Phone #*** 702-832-4547
***Name of designer*** E.Velasco
***Authority having jurisdiction*** AURORA, CO
***NOTES:*** Saftey Margin: 92.84 PSI
ACTUAL STATIC: 71
ACTUAL RESIDUAL: 58

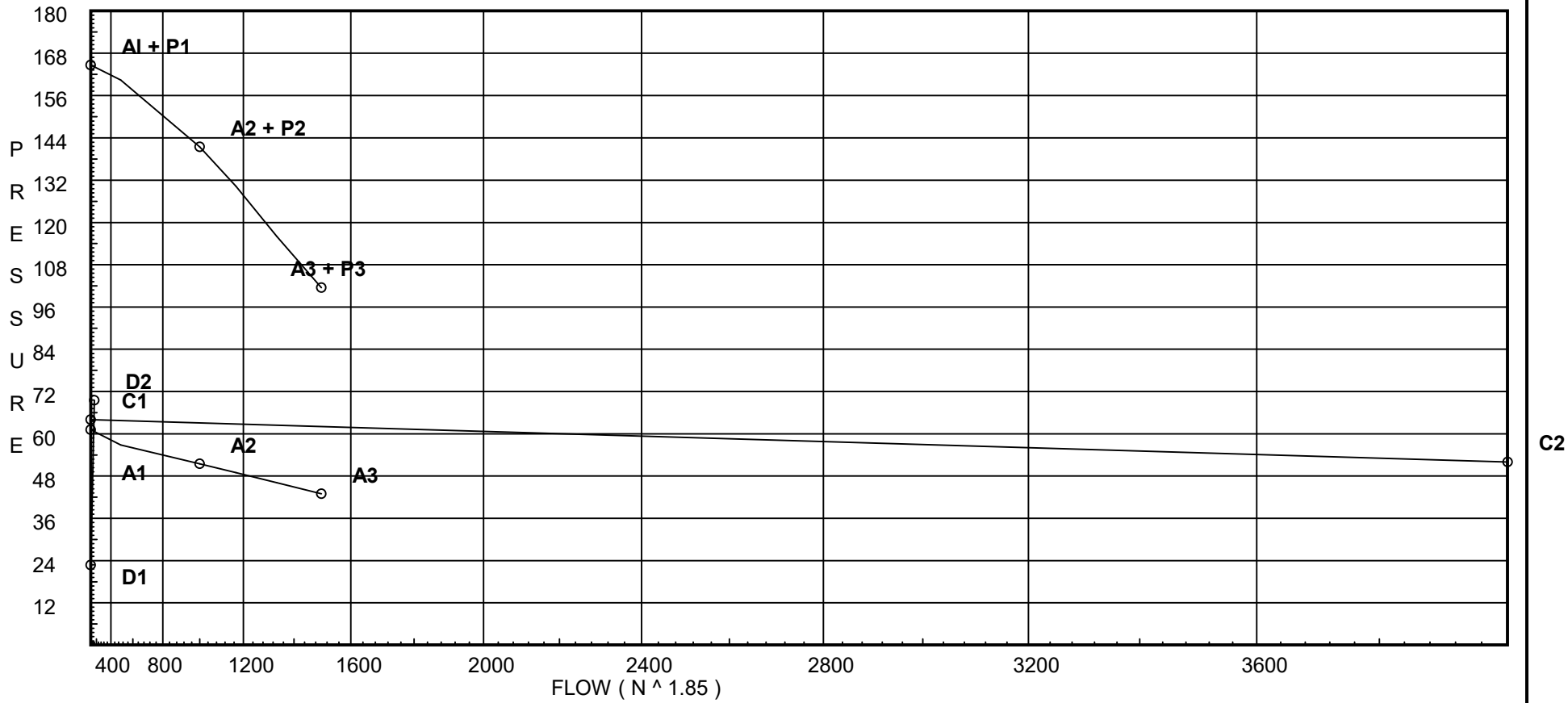
text1(35) - invisible

City Water Supply:
- C1 - Static Pressure : 64
- C2 - Residual Pressure: 52
- C2 - Residual Flow : 4000

City Water Adjusted to Pump Inlet for Pf - Elev - Hose Flow
- A1 - Adjusted Static: 61.122
- A2 - Adj Resid : 51.46 @ 1000
- A3 - Adj Resid : 42.989 @ 1500

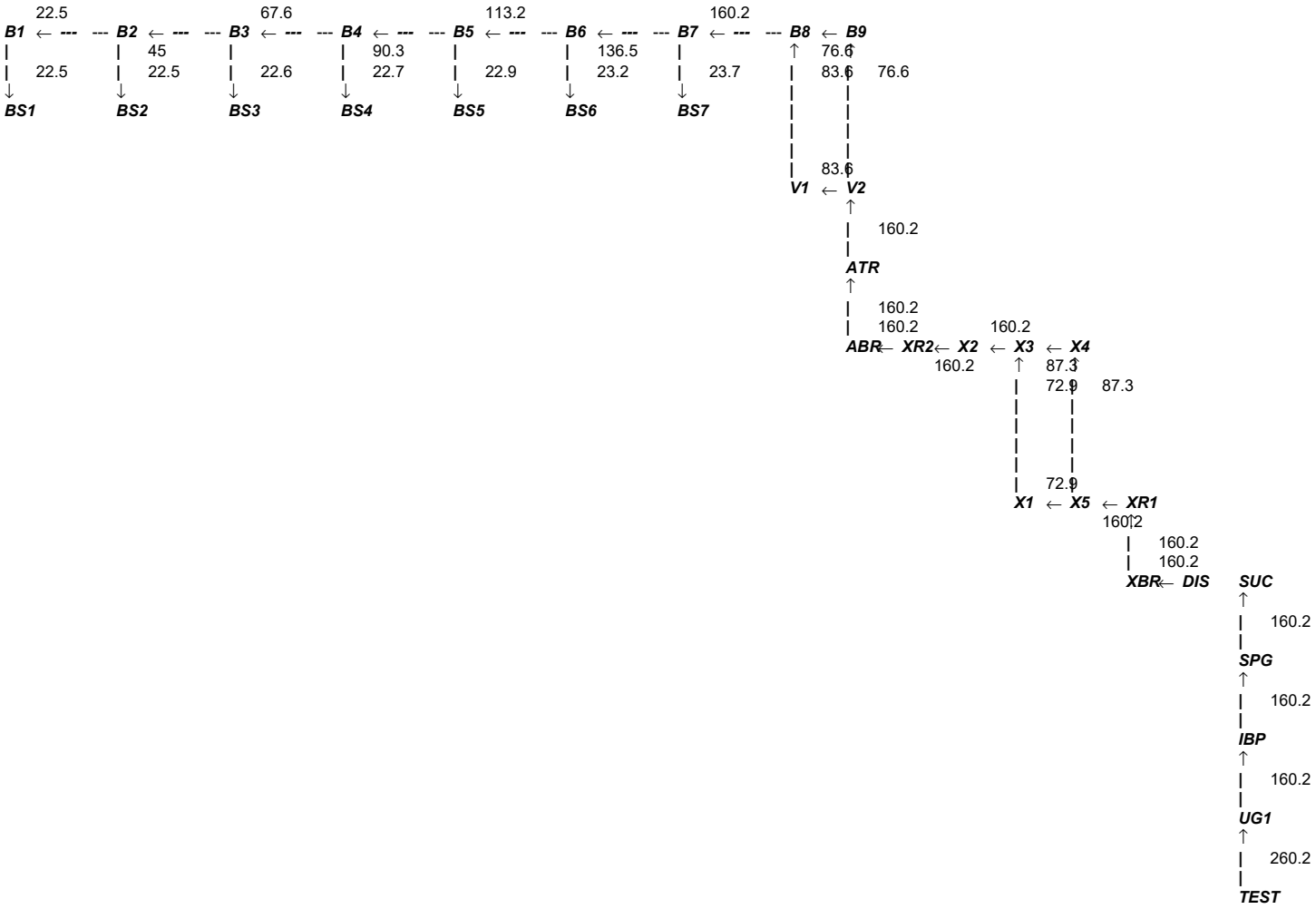
Pump Data:
- P1 - Pump Churn Pressure : 103.5
- P2 - Pump Rated Pressure : 90
- P2 - Pump Rated Flow : 1000
- P3 - Pump Pressure @ Max Flow : 58.5
- P3 - Pump Max Flow : 1500
- City Residual Flow @ 0 = 9886.27
- City Residual Flow @ 20 = 8073.68
- City Water @ 150% of Pump = 62.05

Demand:
- D1 - Elevation : 22.702
- D2 - System Flow : 160.172
- D2 - System Pressure : 69.486
- Hose ( Demand ) :
- D3 - System Demand : 160.172
- Hose ( Adj City ) : 100
- Safety Margin : 92.805






Computer Programs by Hydratec Inc. Revision: 50.5520.727


B1
22.5
22.5
BS1
B2
45
22.5
BS2
B3
67.6
22.6
BS3
B4
90.3
22.7
BS4
B5
113.2
22.9
BS5
B6
136.5
23.2
BS6
B7
160.2
23.7
BS7
B8
76.6
83.6
V1
B9
76.6
83.6
V2
160.2
ATR
160.2
160.2
ABR
XR2
X2
160.2
160.2
X3
87.3
72.9
X1
X4
87.3
72.9
X5
XR1
160.2
160.2
XBR
DIS
SUC
160.2
SPG
160.2
IBP
160.2
UG1
260.2
TEST

Fitting Legend

| Abbrev. | Name | ½ | ¾ | 1 | 1¼ | 1½ | 2 | 2½ | 3 | 3½ | 4 | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 24 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B | NFPA 13 Butterfly Valve | 0 | 0 | 0 | 0 | 0 | 6 | 7 | 10 | 0 | 12 | 9 | 10 | 12 | 19 | 21 | 23 | 25 | 0 | 0 | 0 |
| E | 90 - NFPA | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 10 | 12 | 14 | 18 | 22 | 27 | 35 | 40 | 45 | 50 | 61 |
| F | 45 - NFPA | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 4 | 5 | 7 | 9 | 11 | 13 | 17 | 19 | 21 | 24 | 28 |
| G | NFPA 13 Gate Valve | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 10 | 11 | 13 |
| S | Swing Check NFPA 13 | 0 | 0 | 5 | 7 | 9 | 11 | 14 | 16 | 19 | 22 | 27 | 32 | 45 | 55 | 65 | | | | | |
| T | TEE - NFPA | 3 | 4 | 5 | 6 | 8 | 10 | 12 | 15 | 17 | 20 | 25 | 30 | 35 | 50 | 60 | 71 | 81 | 91 | 101 | 121 |
| U | 45 - GROOVED | 0 | 0 | 0.8 | 2.13 | 2.75 | 1.8 | 2.2 | 2.6 | 0 | 3.4 | 4.2 | 5 | 6.5 | 8.3 | 10.0 | 18.5 | 21 | 23.5 | 25.5 | 29.5 |
| V | 90 - GROOVED | 0 | 0 | 1.7 | 2 | 2.6 | 3.5 | 4.3 | 5 | 0 | 6.8 | 8.5 | 10 | 13 | 17 | 20 | 24.5 | 28 | 31 | 34 | 42 |
| X | TEE - GROOVED | 0 | 0 | 4.2 | 7.5 | 6.63 | 8.5 | 10.8 | 13 | 0 | 16 | 21 | 25 | 33 | 41 | 50 | 70 | 80 | 90 | 100 | 120 |
| Zaf | Ames 3000SS | Fitting generates a Fixed Loss Based on Flow | | | | | | | | | | | | | | | | | | | |

Units Summary

| | |
|---|---|
| Diameter Units | Inches |
| Length Units | Feet |
| Flow Units | US Gallons per Minute |
| Pressure Units | Pounds per Square Inch |

Note: Fitting Legend provides equivalent pipe lengths for fittings types of various diameters. Equivalent lengths shown are standard for actual diameters of Sched 40 pipe and CFactors of 120 except as noted with *. The fittings marked with a * show equivalent lengths values supplied by manufacturers based on specific pipe diameters and CFactors and they require no adjustment. All values for fittings not marked with a * will be adjusted in the calculation for CFactors of other than 120 and diameters other than Sched 40 per NFPA.

PERMIT #2026 2513934 - CM 04 | RSN:1975523



## SUPPLY ANALYSIS

| Node at Source | Static Pressure | Residual Pressure | Flow | Available Pressure | Total Demand | Required Pressure |
|---|---|---|---|---|---|---|
| DIS | See Information on Pump Curve | | | 162.291 | 160.17 | 69.486 |
| TEST | 64.0 | 52 | 4000.0 | 63.924 | 260.17 | 63.924 |

## NODE ANALYSIS

| Node Tag | Elevation | Node Type | Pressure at Node | Discharge at Node | Notes | |
|---|---|---|---|---|---|---|
| BS1 | 54.417 | 5.6 | 16.14 | 22.5 | 0.1 | 225 |
| BS2 | 54.417 | 5.6 | 16.17 | 22.52 | 0.1 | 225 |
| BS3 | 54.417 | 5.6 | 16.26 | 22.58 | 0.1 | 225 |
| BS4 | 54.417 | 5.6 | 16.44 | 22.71 | 0.1 | 225 |
| BS5 | 54.417 | 5.6 | 16.76 | 22.92 | 0.1 | 225 |
| BS6 | 54.417 | 5.6 | 17.23 | 23.25 | 0.1 | 225 |
| BS7 | 54.417 | 5.6 | 17.91 | 23.7 | 0.1 | 225 |
| B1 | 52.167 | | 18.17 | | | |
| B2 | 52.167 | | 18.2 | | | |
| B3 | 52.167 | | 18.29 | | | |
| B4 | 52.167 | | 18.48 | | | |
| B5 | 52.167 | | 18.82 | | | |
| B6 | 52.167 | | 19.33 | | | |
| B7 | 52.167 | | 20.04 | | | |
| B8 | 52.167 | | 35.66 | | | |
| B9 | 0.0 | | 61.51 | | | |
| V1 | 52.167 | | 45.78 | | | |
| V2 | 52.167 | | 46.19 | | | |
| ATR | 52.167 | | 46.85 | | | |
| ABR | 24.333 | | 59.01 | | | |
| XR2 | 24.333 | | 59.06 | | | |
| X2 | 24.333 | | 59.12 | | | |
| X3 | 24.333 | | 59.13 | | | |
| X4 | 24.333 | | 59.13 | | | |
| X1 | 24.333 | | 59.18 | | | |
| X5 | 24.0 | | 59.6 | | | |
| XR1 | 24.0 | | 59.87 | | | |
| XBR | 2.0 | | 69.47 | | | |
| DIS | 2.0 | | 69.49 | | | |
| SUC | 2.0 | | 58.79 | | | |
| SPG | 1.0 | | 63.93 | | | |
| IBP | -5.0 | | 66.53 | | | |
| UG1 | -5.0 | | 66.58 | 100.0 | | |
| TEST | 2.0 | | 63.92 | | | |

PERMIT #2026 2513934 - CM 04 | RSN:1975523



| Node1 to Node2 | Elev1 Elev2 | K Fact | Qa Qt | Nom Act | Fitting or Eqiv | Len | Pipe Ftngs Total | CFact Pf/Ft | Pt Pe Pf | ******* | Notes | ****** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *HEADS | | | | | | | | | | | | |
| BS1 | 54.417 | 5.60 | 22.50 | 1 | T | 5.0 | 1.500 | 120 | 16.143 | | | |
| to | | | | | | | 5.000 | | 0.974 | | | |
| B1 | 52.167 | | 22.5 | 1.049 | | | 6.500 | 0.1618 | 1.052 | Vel = 8.35 | | |
| | | | 0.0 | | | | | | | | | |
| B1 | | | 22.50 | | | | | | 18.169 | K Factor = 5.28 | | |
| BS2 | 54.417 | 5.60 | 22.52 | 1 | T | 5.0 | 1.500 | 120 | 16.169 | | | |
| to | | | | | | | 5.000 | | 0.974 | | | |
| B2 | 52.167 | | 22.52 | 1.049 | | | 6.500 | 0.1622 | 1.054 | Vel = 8.36 | | |
| | | | 0.0 | | | | | | | | | |
| B2 | | | 22.52 | | | | | | 18.197 | K Factor = 5.28 | | |
| BS3 | 54.417 | 5.60 | 22.58 | 1 | T | 5.0 | 1.500 | 120 | 16.256 | | | |
| to | | | | | | | 5.000 | | 0.974 | | | |
| B3 | 52.167 | | 22.58 | 1.049 | | | 6.500 | 0.1629 | 1.059 | Vel = 8.38 | | |
| | | | 0.0 | | | | | | | | | |
| B3 | | | 22.58 | | | | | | 18.289 | K Factor = 5.28 | | |
| BS4 | 54.417 | 5.60 | 22.71 | 1 | T | 5.0 | 1.500 | 120 | 16.440 | | | |
| to | | | | | | | 5.000 | | 0.974 | | | |
| B4 | 52.167 | | 22.71 | 1.049 | | | 6.500 | 0.1646 | 1.070 | Vel = 8.43 | | |
| | | | 0.0 | | | | | | | | | |
| B4 | | | 22.71 | | | | | | 18.484 | K Factor = 5.28 | | |
| BS5 | 54.417 | 5.60 | 22.92 | 1 | T | 5.0 | 1.500 | 120 | 16.755 | | | |
| to | | | | | | | 5.000 | | 0.974 | | | |
| B5 | 52.167 | | 22.92 | 1.049 | | | 6.500 | 0.1675 | 1.089 | Vel = 8.51 | | |
| | | | 0.0 | | | | | | | | | |
| B5 | | | 22.92 | | | | | | 18.818 | K Factor = 5.28 | | |
| BS6 | 54.417 | 5.60 | 23.25 | 1 | T | 5.0 | 1.500 | 120 | 17.234 | | | |
| to | | | | | | | 5.000 | | 0.974 | | | |
| B6 | 52.167 | | 23.25 | 1.049 | | | 6.500 | 0.1720 | 1.118 | Vel = 8.63 | | |
| | | | 0.0 | | | | | | | | | |
| B6 | | | 23.25 | | | | | | 19.326 | K Factor = 5.29 | | |
| BS7 | 54.417 | 5.60 | 23.70 | 1 | T | 5.0 | 1.500 | 120 | 17.910 | | | |
| to | | | | | | | 5.000 | | 0.974 | | | |
| B7 | 52.167 | | 23.7 | 1.049 | | | 6.500 | 0.1782 | 1.158 | Vel = 8.80 | | |
| | | | 0.0 | | | | | | | | | |
| B7 | | | 23.70 | | | | | | 20.042 | K Factor = 5.29 | | |
| *LINE | | | | | | | | | | | | |
| B1 | 52.167 | | 22.50 | 2.5 | | | 15.000 | 120 | 18.169 | | | |
| to | | | | | | | | | 0.0 | | | |
| B2 | 52.167 | | 22.5 | 2.635 | | | 15.000 | 0.0019 | 0.028 | Vel = 1.32 | | |
| B2 | 52.167 | | 22.52 | 2.5 | | | 14.000 | 120 | 18.197 | | | |
| to | | | | | | | | | 0.0 | | | |
| B3 | 52.167 | | 45.02 | 2.635 | | | 14.000 | 0.0066 | 0.092 | Vel = 2.65 | | |
| B3 | 52.167 | | 22.58 | 2.5 | | | 14.000 | 120 | 18.289 | | | |
| to | | | | | | | | | 0.0 | | | |
| B4 | 52.167 | | 67.6 | 2.635 | | | 14.000 | 0.0139 | 0.195 | Vel = 3.98 | | |
| B4 | 52.167 | | 22.70 | 2.5 | | | 14.000 | 120 | 18.484 | | | |
| to | | | | | | | | | 0.0 | | | |
| B5 | 52.167 | | 90.3 | 2.635 | | | 14.000 | 0.0239 | 0.334 | Vel = 5.31 | | |


SHEET 57 of 402

PERMIT #2026 2513934 - CM 04 | RSN:1975523



| Node1 to Node2 | Elev1 Elev2 | K Fact | Qa Qt | Nom Act | Fitting or Eqiv | Len | Pipe Ftngs Total | CFact Pf/Ft | Pt Pe Pf | ******* Notes ****** |
|---|---|---|---|---|---|---|---|---|---|---|
| B5 | 52.167 | | 22.92 | 2.5 | | | 14.000 | 120 | 18.818 | |
| to | | | | | | | | | 0.0 | |
| B6 | 52.167 | | 113.22 | 2.635 | | | 14.000 | 0.0363 | 0.508 | Vel = 6.66 |
| B6 | 52.167 | | 23.25 | 2.5 | | | 14.000 | 120 | 19.326 | |
| to | | | | | | | | | 0.0 | |
| B7 | 52.167 | | 136.47 | 2.635 | | | 14.000 | 0.0511 | 0.716 | Vel = 8.03 |
| B7 | 52.167 | | 23.70 | 2.5 | X | 14.827 | 211.917 | 120 | 20.042 | |
| to | | | | | | | 14.827 | | 0.0 | |
| B8 | 52.167 | | 160.17 | 2.635 | | | 226.744 | 0.0689 | 15.613 | Vel = 9.42 |
| B8 | 52.167 | | -83.60 | 2.5 | 6V | 35.42 | 154.000 | 120 | 35.655 | |
| to | | | | | X | 14.827 | 50.247 | | 22.269 | |
| B9 | 0 | | 76.57 | 2.635 | | | 204.247 | 0.0176 | 3.590 | Vel = 4.50 |
| | | | 0.0 | | | | | | | |
| B9 | | | 76.57 | | | | | | 61.514 | K Factor = 9.76 |
| B8 | 52.167 | | 83.60 | 2.5 | 2V | 11.807 | 448.417 | 120 | 35.655 | |
| to | | | | | 2X | 29.654 | 41.461 | | 0.0 | |
| V1 | 52.167 | | 83.6 | 2.635 | | | 489.878 | 0.0207 | 10.130 | Vel = 4.92 |
| | | | 0.0 | | | | | | | |
| V1 | | | 83.60 | | | | | | 45.785 | K Factor = 12.36 |
| B9 | 0 | | 76.57 | 2.5 | | | 394.833 | 120 | 61.514 | |
| to | | | | | | | | | -22.269 | |
| V2 | 52.167 | | 76.57 | 2.635 | | | 394.833 | 0.0176 | 6.941 | Vel = 4.50 |
| | | | 0.0 | | | | | | | |
| V2 | | | 76.57 | | | | | | 46.186 | K Factor = 11.27 |
| *BACK TO RISER | | | | | | | | | | |
| V1 | 52.167 | | 83.60 | 4 | X | 21.067 | 100.667 | 120 | 45.785 | |
| to | | | | | 2T | 52.668 | 100.596 | | 0.0 | |
| V2 | 52.167 | | 83.6 | 4.26 | 3V | 26.861 | 201.263 | 0.0020 | 0.401 | Vel = 1.88 |
| V2 | 52.167 | | 76.57 | 4 | X | 21.067 | 65.000 | 120 | 46.186 | |
| to | | | | | U | 4.477 | 34.498 | | 0.0 | |
| ATR | 52.167 | | 160.17 | 4.26 | V | 8.954 | 99.498 | 0.0066 | 0.660 | Vel = 3.61 |
| ATR | 52.167 | | 0.0 | 6 | S | 40.235 | 22.167 | 120 | 46.846 | |
| to | | | | | B | 12.573 | 90.528 | | 12.055 | |
| ABR | 24.333 | | 160.17 | 6.357 | T | 37.72 | 112.695 | 0.0009 | 0.107 | Vel = 1.62 |
| ABR | 24.333 | | 0.0 | 6 | V | 12.573 | 8.500 | 120 | 59.008 | |
| to | | | | | X | 31.433 | 44.006 | | 0.0 | |
| XR2 | 24.333 | | 160.17 | 6.357 | | | 52.506 | 0.0009 | 0.049 | Vel = 1.62 |
| XR2 | 24.333 | | 0.0 | 6 | V | 12.573 | 50.833 | 120 | 59.057 | |
| to | | | | | | | 12.573 | | 0.0 | |
| X2 | 24.333 | | 160.17 | 6.357 | | | 63.406 | 0.0009 | 0.060 | Vel = 1.62 |
| X2 | 24.333 | | 0.0 | 6 | | | 11.917 | 120 | 59.117 | |
| to | | | | | | | | | 0.0 | |
| X3 | 24.333 | | 160.17 | 6.357 | | | 11.917 | 0.0009 | 0.011 | Vel = 1.62 |
| X3 | 24.333 | | -72.86 | 6 | | | 8.750 | 120 | 59.128 | |
| to | | | | | | | | | 0.0 | |
| X4 | 24.333 | | 87.31 | 6.357 | | | 8.750 | 0.0003 | 0.003 | Vel = 0.88 |
| X4 | 24.333 | | 0.0 | 6 | X | 31.433 | 999.000 | 120 | 59.131 | |
| to | | | | | V | 12.573 | 44.006 | | 0.144 | |
| X5 | 24 | | 87.31 | 6.357 | | | 1043.006 | 0.0003 | 0.321 | Vel = 0.88 |

PERMIT #2026 2513934 - CM 04 | RSN:1975523



| Node1 to Node2 | Elev1 Elev2 | K Fact | Qa Qt | Nom Act | Fitting or Eqiv | Len | Pipe Ftngs Total | CFact Pf/Ft | Pt Pe Pf | ******* | Notes | ****** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0.0 | | | | | | | | | |
| X5 | | | 87.31 | | | | | | 59.596 | K Factor = 11.31 | | |
| X3 | 24.333 | | 72.86 | 6 | 2X | 62.867 | 150.000 | 120 | 59.128 | | | |
| to | | | | | 2V | 25.147 | 88.014 | | 0.0 | | | |
| X1 | 24.333 | | 72.86 | 6.357 | | | 238.014 | 0.0002 | 0.053 | Vel = 0.74 | | |
| X1 | 24.333 | | 0.0 | 6 | 4V | 50.294 | 1150.000 | 120 | 59.181 | | | |
| to | | | | | X | 31.433 | 81.727 | | 0.144 | | | |
| X5 | 24 | | 72.86 | 6.357 | | | 1231.727 | 0.0002 | 0.271 | Vel = 0.74 | | |
| X5 | 24 | | 87.31 | 6 | 5V | 62.867 | 215.000 | 120 | 59.596 | | | |
| to | | | | | 2U | 12.573 | 75.440 | | 0.0 | | | |
| XR1 | 24 | | 160.17 | 6.357 | | | 290.440 | 0.0009 | 0.274 | Vel = 1.62 | | |
| XR1 | 24 | | 0.0 | 6 | B | 12.573 | 21.167 | 120 | 59.870 | | | |
| to | | | | | T | 37.72 | 50.293 | | 9.528 | | | |
| XBR | 2 | | 160.17 | 6.357 | | | 71.460 | 0.0010 | 0.068 | Vel = 1.62 | | |
| | | | 0.0 | | | | | | | | | |
| XBR | | | 160.17 | | | | | | 69.466 | K Factor = 19.22 | | |
| *PUMP | | | | | | | | | | | | |
| XBR | 2 | | 160.17 | 8 | B | 14.094 | 8.250 | 120 | 69.466 | | | |
| to | | | | | S | 52.853 | 66.947 | | 0.0 | | | |
| DIS | 2 | | 160.17 | 8.249 | | | 75.197 | 0.0003 | 0.020 | Vel = 0.96 | | |
| | | | 0.0 | | | | | | | | | |
| DIS | | | 160.17 | | | | | | 69.486 | K Factor = 19.21 | | |
| System Demand Pressure | | | | | | | | | 69.486 | | | |
| Safety Margin | | | | | | | | | 92.805 | | | |
| Continuation Pressure | | | | | | | | | 162.291 | | | |
| Pressure @ Pump Outlet | | | | | | | | | 162.291 | | | |
| Pressure From Pump Curve | | | | | | | | | -103.499 | | | |
| Pressure @ Pump Inlet | | | | | | | | | 58.792 | | | |
| SUC | 2 | | 0.0 | 8 | Zaf | 0.0 | 8.000 | 120 | 58.792 | | | |
| to | | | | | E | 21.141 | 25.839 | | 5.123 | * * Fixed Loss = 4.69 | | |
| SPG | 1 | | 160.17 | 8.249 | G | 4.698 | 33.839 | 0.0003 | 0.010 | Vel = 0.96 | | |
| SPG | 1 | | 0.0 | 8 | E | 21.141 | 15.000 | 120 | 63.925 | | | |
| to | | | | | | | 21.141 | | 2.599 | | | |
| IBP | -5 | | 160.17 | 8.249 | | | 36.141 | 0.0002 | 0.009 | Vel = 0.96 | | |
| IBP | -5 | | 0.0 | 8 | F | 11.278 | 120.000 | 150 | 66.533 | | | |
| to | | | | | T | 43.857 | 55.135 | | 0.0 | | | |
| UG1 | -5 | | 160.17 | 7.68 | | | 175.135 | 0.0002 | 0.043 | Vel = 1.11 | | |
| | | | 0.0 | | | | | | | | | |
| UG1 | | | 160.17 | | | | | | 66.576 | K Factor = 19.63 | | |
| *UG2 | | | | | | | | | | | | |
| UG1 | -5 | H100 | 260.17 | 8 | F | 11.278 | 565.000 | 150 | 66.576 | | | |
| to | | | | | T | 43.857 | 55.135 | | -3.032 | | | |
| TEST | 2 | | 260.17 | 7.68 | | | 620.135 | 0.0006 | 0.379 | Vel = 1.80 | | |
| | | | 0.0 | | | | | | | | | |
| TEST | | | 260.17 | | | | | | 63.923 | K Factor = 32.54 | | |

EXCELLENCE IN FIRE PROTECTION DESIGN

Shambaugh & Son L.P.
5460 Desert Point Drive
Las Vegas, NV 89118

. . . Fire Protection by Computer Design

Hydratec Incorporated
64 Haverhill Road
Route 111
Windham, NH 03087
603-434-0502

I certify to the best of my knowledge, information, and belief that the design of this system complies with all applicable provisions of NFPA standards and local fire codes.

*Dennis T. Scherr*

Dennis T. Scherr
NICET Level IV
Water-Based Systems Layout
Cert. # 113016 Exp. 3/1/2029

| | | |
|---|---|---|
| Job Name | : | 227317 QTS DC2 - CALC 4 SYS PA 2-02 |
| Drawing | : | FP4 |
| Location | : | 1140 N GUN CLUB RD |
| System | : | CALC 4 SYS PA 2-02 |
| Contract | : | 227317 |
| Data File | : | 227317 QTS DC2 - CALC4 - SYS PA 2-01.wxtmp |



Computer Programs by Hydratec Inc. Revision: 50.5520.727

***HYDRAULIC CALCULATIONS***
***for***

***JOB NAME*** QTS DC2
***Location*** 1140 N GUN CLUB RD
***Drawing #*** FP4
***Contract #*** 227317
***Date*** 03.25.26

***DESIGN***

***Remote area #*** CALC 4 SYS PA 2-02
***Remote area location*** CALC 4 SYS PA 2-02
***Occupancy classification*** ORDINARY HAZ. GRP-1
***Density*** .15 - Gpm/SqFt
***Area of application*** ENTIRE AREA - SqFt
***Coverage/sprinkler*** 130 - SqFt
***Type of sprinkler calculated*** 5.6K
***# Sprinklers calculated*** 22
***In-rack demand*** N/A - GPM
***Hose streams*** 250 - GPM
***Total water required (including hose streams)*** 705.639 - GPM @ -27.0914 - Psi
***Type of system*** Pre-Action
***Volume of system (dry or pre-action)*** N/A - Gal

***WATER SUPPLY INFORMATION***

***Test date*** 7.16.2025
***Location*** 1140 N GUN CLUB RD
***Source of info*** ONSITE FIRE HYD #05U-08

***CONTRACTOR INFO*** Shambaugh & Son
***Address*** 6445 W. Sunset Rd
***Phone #*** 702-832-4547
***Name of designer*** E.Velasco
***Authority having jurisdiction*** AURORA, CO
***NOTES:*** Saftey Margin: 97.20 PSI
ACTUAL STATIC: 71
ACTUAL RESIDUAL: 58

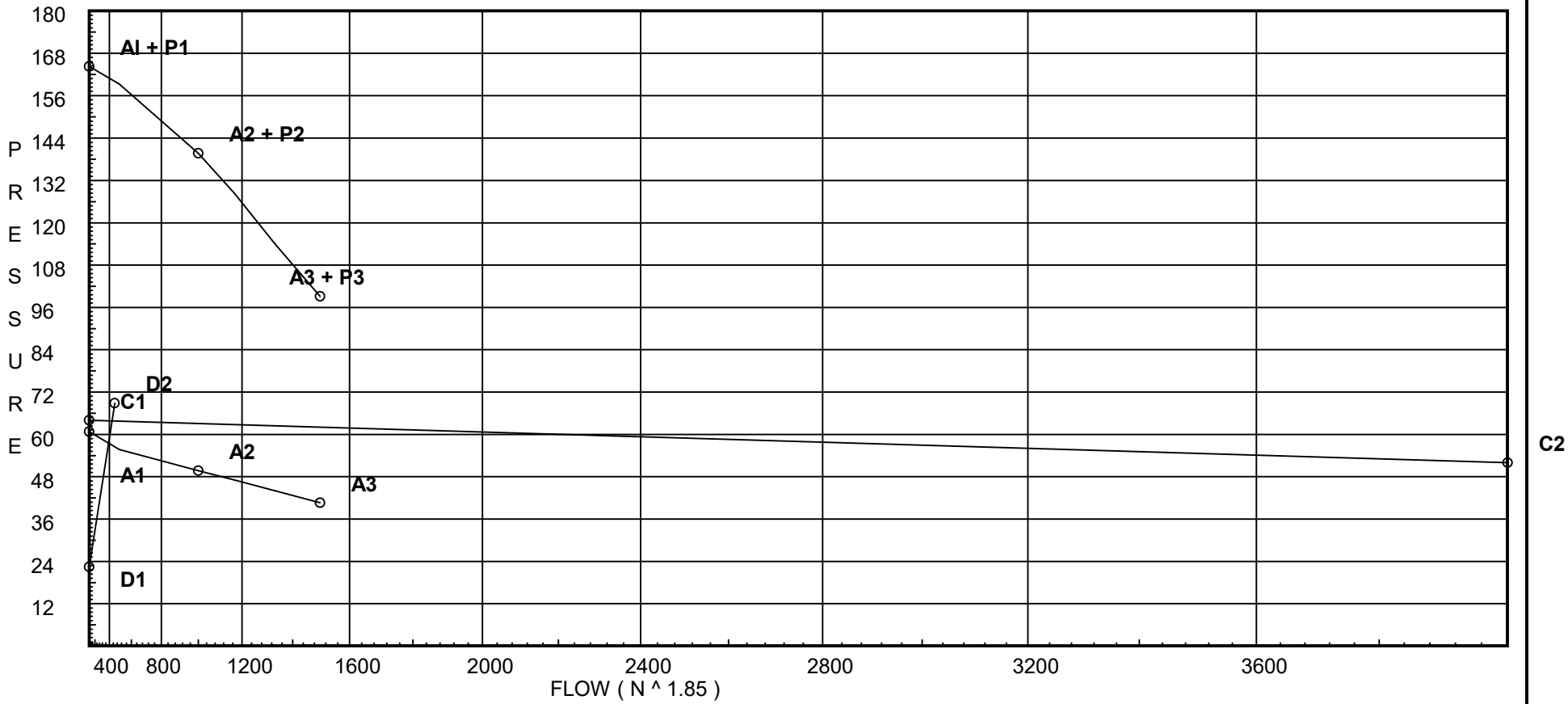
text1(35) - invisible

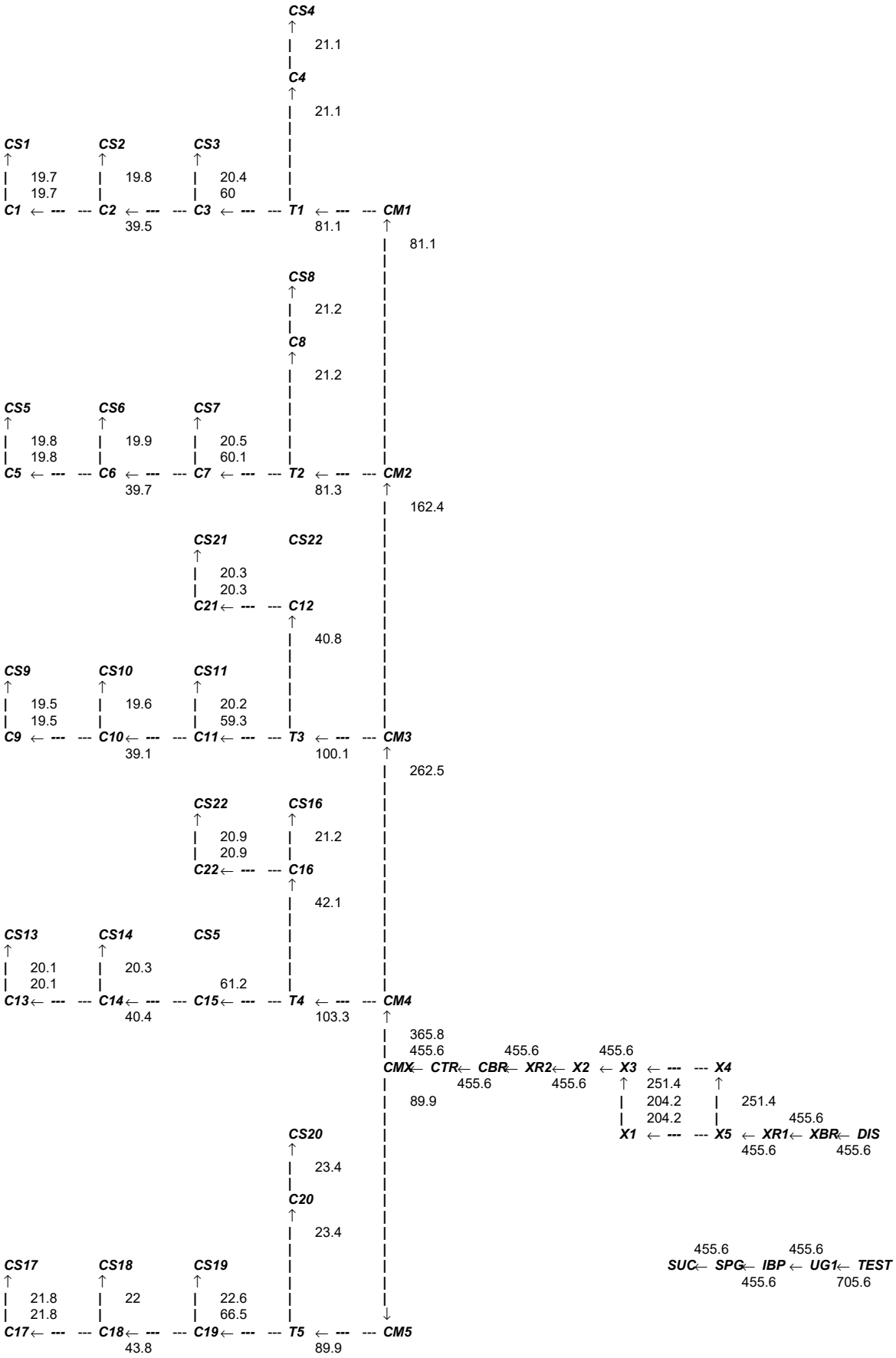
City Water Supply:
- C1 - Static Pressure : 64
- C2 - Residual Pressure: 52
- C2 - Residual Flow : 4000

City Water Adjusted to Pump Inlet for Pf - Elev - Hose Flow
- A1 - Adjusted Static: 60.777
- A2 - Adj Resid : 49.711 @ 1000
- A3 - Adj Resid : 40.625 @ 1500

Pump Data:
- P1 - Pump Churn Pressure : 103.5
- P2 - Pump Rated Pressure : 90
- P2 - Pump Rated Flow : 1000
- P3 - Pump Pressure @ Max Flow : 58.5
- P3 - Pump Max Flow : 1500
- City Residual Flow @ 0 = 9886.27
- City Residual Flow @ 20 = 8073.68
- City Water @ 150% of Pump = 62.05

Demand:
- D1 - Elevation : 22.449
- D2 - System Flow : 455.639
- D2 - System Pressure : 68.849
- Hose ( Demand ) : _____
- D3 - System Demand : 455.639
- Hose ( Adj City ) : 250
- Safety Margin : 90.607




CS4
21.1
C4
21.1
CS1
19.7
19.7
C1
CS2
19.8
C2
39.5
CS3
20.4
60
C3
T1
81.1
CM1
81.1
CS8
21.2
C8
21.2
CS5
19.8
19.8
C5
CS6
19.9
C6
39.7
CS7
20.5
60.1
C7
T2
81.3
CM2
162.4
CS21
20.3
20.3
C21
CS22
C12
40.8
CS9
19.5
19.5
C9
CS10
19.6
C10
39.1
CS11
20.2
59.3
C11
T3
100.1
CM3
262.5
CS22
20.9
20.9
C22
CS16
21.2
C16
42.1
CS13
20.1
20.1
C13
CS14
20.3
C14
40.4
CS5
61.2
C15
T4
103.3
CM4
365.8
455.6
CMX
CTR
455.6
CBR
455.6
XR2
455.6
X2
455.6
X3
251.4
204.2
204.2
X4
251.4
455.6
X1
X5
455.6
XR1
455.6
XBR
455.6
DIS
CS20
23.4
C20
23.4
455.6
455.6
SUC
SPG
455.6
IBP
UG1
705.6
TEST
CS17
21.8
21.8
C17
CS18
22
C18
43.8
CS19
22.6
66.5
C19
T5
89.9
CM5

Fitting Legend

| Abbrev. | Name | ½ | ¾ | 1 | 1¼ | 1½ | 2 | 2½ | 3 | 3½ | 4 | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 24 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B | NFPA 13 Butterfly Valve | 0 | 0 | 0 | 0 | 0 | 6 | 7 | 10 | 0 | 12 | 9 | 10 | 12 | 19 | 21 | 23 | 25 | 0 | 0 | 0 |
| E | 90 - NFPA | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 10 | 12 | 14 | 18 | 22 | 27 | 35 | 40 | 45 | 50 | 61 |
| F | 45 - NFPA | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 4 | 5 | 7 | 9 | 11 | 13 | 17 | 19 | 21 | 24 | 28 |
| G | NFPA 13 Gate Valve | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 10 | 11 | 13 |
| S | Swing Check NFPA 13 | 0 | 0 | 5 | 7 | 9 | 11 | 14 | 16 | 19 | 22 | 27 | 32 | 45 | 55 | 65 | | | | | |
| T | TEE - NFPA | 3 | 4 | 5 | 6 | 8 | 10 | 12 | 15 | 17 | 20 | 25 | 30 | 35 | 50 | 60 | 71 | 81 | 91 | 101 | 121 |
| U | 45 - GROOVED | 0 | 0 | 0.8 | 2.13 | 2.75 | 1.8 | 2.2 | 2.6 | 0 | 3.4 | 4.2 | 5 | 6.5 | 8.3 | 10.0 | 18.5 | 21 | 23.5 | 25.5 | 29.5 |
| V | 90 - GROOVED | 0 | 0 | 1.7 | 2 | 2.6 | 3.5 | 4.3 | 5 | 0 | 6.8 | 8.5 | 10 | 13 | 17 | 20 | 24.5 | 28 | 31 | 34 | 42 |
| X | TEE - GROOVED | 0 | 0 | 4.2 | 7.5 | 6.63 | 8.5 | 10.8 | 13 | 0 | 16 | 21 | 25 | 33 | 41 | 50 | 70 | 80 | 90 | 100 | 120 |
| Zaf | Ames 3000SS | Fitting generates a Fixed Loss Based on Flow | | | | | | | | | | | | | | | | | | | |

Units Summary

| | |
|---|---|
| Diameter Units | Inches |
| Length Units | Feet |
| Flow Units | US Gallons per Minute |
| Pressure Units | Pounds per Square Inch |

Note: Fitting Legend provides equivalent pipe lengths for fittings types of various diameters. Equivalent lengths shown are standard for actual diameters of Sched 40 pipe and CFactors of 120 except as noted with *. The fittings marked with a * show equivalent lengths values supplied by manufacturers based on specific pipe diameters and CFactors and they require no adjustment. All values for fittings not marked with a * will be adjusted in the calculation for CFactors of other than 120 and diameters other than Sched 40 per NFPA.

PERMIT #2026 2513934 - CM 04 | RSN:1975523



## SUPPLY ANALYSIS

| Node at Source | Static Pressure | Residual Pressure | Flow | Available Pressure | Total Demand | Required Pressure |
|---|---|---|---|---|---|---|
| DIS | See Information on Pump Curve | | | 159.456 | 455.64 | 68.849 |
| TEST | 64.0 | 52 | 4000.0 | 63.516 | 705.64 | 63.515 |

## NODE ANALYSIS

| Node Tag | Elevation | Node Type | Pressure at Node | Discharge at Node | Notes | |
|---|---|---|---|---|---|---|
| CS1 | 53.833 | 5.6 | 12.38 | 19.7 | 0.15 | 130 |
| CS2 | 53.833 | 5.6 | 12.54 | 19.83 | 0.15 | 130 |
| CS3 | 53.833 | 5.6 | 13.29 | 20.42 | 0.15 | 130 |
| CS4 | 53.833 | 5.6 | 14.22 | 21.12 | 0.15 | 130 |
| CS5 | 53.833 | 5.6 | 12.45 | 19.76 | 0.15 | 130 |
| CS6 | 53.833 | 5.6 | 12.62 | 19.89 | 0.15 | 130 |
| CS7 | 53.833 | 5.6 | 13.37 | 20.48 | 0.15 | 130 |
| CS8 | 53.833 | 5.6 | 14.3 | 21.18 | 0.15 | 130 |
| CS9 | 53.833 | 5.6 | 12.12 | 19.5 | 0.15 | 130 |
| CS10 | 53.833 | 5.6 | 12.29 | 19.63 | 0.15 | 130 |
| CS11 | 53.833 | 5.6 | 13.02 | 20.21 | 0.15 | 130 |
| CS12 | 53.833 | 5.6 | 13.42 | 20.52 | 0.15 | 130 |
| CS13 | 53.833 | 5.6 | 12.91 | 20.12 | 0.15 | 130 |
| CS14 | 53.833 | 5.6 | 13.08 | 20.25 | 0.15 | 130 |
| CS15 | 53.833 | 5.6 | 13.86 | 20.85 | 0.15 | 130 |
| CS16 | 53.833 | 5.6 | 14.29 | 21.17 | 0.15 | 130 |
| CS17 | 53.833 | 5.6 | 15.22 | 21.85 | 0.15 | 130 |
| CS18 | 53.833 | 5.6 | 15.42 | 21.99 | 0.15 | 130 |
| CS19 | 53.833 | 5.6 | 16.32 | 22.63 | 0.15 | 130 |
| CS20 | 53.833 | 5.6 | 17.45 | 23.39 | 0.15 | 130 |
| CS21 | 53.833 | 5.6 | 13.11 | 20.27 | 0.15 | 130 |
| CS22 | 53.833 | 5.6 | 13.91 | 20.88 | 0.15 | 130 |
| C1 | 51.5 | | 14.29 | | | |
| C2 | 51.5 | | 14.46 | | | |
| C3 | 51.5 | | 15.26 | | | |
| C4 | 51.5 | | 16.25 | | | |
| T1 | 51.5 | | 16.48 | | | |
| C5 | 51.5 | | 14.37 | | | |
| C6 | 51.5 | | 14.54 | | | |
| C7 | 51.5 | | 15.35 | | | |
| C8 | 51.5 | | 16.34 | | | |
| T2 | 51.5 | | 16.57 | | | |
| C9 | 51.5 | | 14.02 | | | |
| C10 | 51.5 | | 14.19 | | | |
| C11 | 51.5 | | 14.97 | | | |
| C21 | 51.5 | | 15.06 | | | |
| C12 | 51.5 | | 15.4 | | | |
| T3 | 51.5 | | 16.17 | | | |
| C13 | 51.5 | | 14.86 | | | |
| C14 | 51.5 | | 15.04 | | | |
| C15 | 51.5 | | 15.87 | | | |

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***NODE ANALYSIS (cont.)***

| *Node Tag* | *Elevation* | *Node Type* | *Pressure at Node* | *Discharge at Node* | *Notes* |
|---|---|---|---|---|---|
| C22 | 51.5 | | 15.92 | | |
| C16 | 51.5 | | 16.32 | | |
| T4 | 51.5 | | 17.14 | | |
| C17 | 51.5 | | 17.32 | | |
| C18 | 51.5 | | 17.53 | | |
| C19 | 51.5 | | 18.5 | | |
| C20 | 51.5 | | 19.7 | | |
| T5 | 51.5 | | 19.97 | | |
| CM1 | 51.5 | | 18.55 | | |
| CM2 | 51.5 | | 18.66 | | |
| CM3 | 51.5 | | 19.23 | | |
| CM4 | 51.5 | | 20.38 | | |
| CM5 | 51.5 | | 22.48 | | |
| CMX | 51.5 | | 22.75 | | |
| CTR | 51.5 | | 28.34 | | |
| CBR | 30.0 | | 51.08 | | |
| XR2 | 24.333 | | 53.89 | | |
| X2 | 24.333 | | 54.31 | | |
| X3 | 24.333 | | 54.38 | | |
| X4 | 24.333 | | 54.4 | | |
| X1 | 24.333 | | 54.74 | | |
| X5 | 24.0 | | 56.82 | | |
| XR1 | 24.0 | | 58.72 | | |
| XBR | 2.0 | | 68.71 | | |
| DIS | 2.0 | | 68.85 | | |
| SUC | 2.0 | | 55.96 | | |
| SPG | 1.0 | | 61.18 | | |
| IBP | -5.0 | | 63.85 | | |
| UG1 | -5.0 | | 64.15 | 250.0 | |
| TEST | 2.0 | | 63.52 | | |

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| Node1 to Node2 | Elev1 Elev2 | K Fact | Qa Qt | Nom Act | Fitting or Eqiv | Len | Pipe Ftngs Total | CFact Pf/Ft | Pt Pe Pf | ******* | Notes | ****** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *HEADS | | | | | | | | | | | | |
| CS1 | 53.833 | 5.60 | 19.70 | 1 | T | 3.568 | 1.500 | 100 | 12.378 | | | |
| to | | | | | | | 3.568 | | 1.010 | | | |
| C1 | 51.500 | | 19.7 | 1.049 | | | 5.068 | 0.1774 | 0.899 | Vel = 7.31 | | |
| | | | 0.0 | | | | | | | | | |
| C1 | | | 19.70 | | | | | | 14.287 | K Factor = 5.21 | | |
| CS2 | 53.833 | 5.60 | 19.83 | 1 | T | 3.568 | 1.500 | 100 | 12.543 | | | |
| to | | | | | | | 3.568 | | 1.010 | | | |
| C2 | 51.500 | | 19.83 | 1.049 | | | 5.068 | 0.1796 | 0.910 | Vel = 7.36 | | |
| | | | 0.0 | | | | | | | | | |
| C2 | | | 19.83 | | | | | | 14.463 | K Factor = 5.21 | | |
| CS3 | 53.833 | 5.60 | 20.42 | 1 | T | 3.568 | 1.500 | 100 | 13.291 | | | |
| to | | | | | | | 3.568 | | 1.010 | | | |
| C3 | 51.500 | | 20.42 | 1.049 | | | 5.068 | 0.1896 | 0.961 | Vel = 7.58 | | |
| | | | 0.0 | | | | | | | | | |
| C3 | | | 20.42 | | | | | | 15.262 | K Factor = 5.23 | | |
| CS4 | 53.833 | 5.60 | 21.12 | 1 | T | 3.568 | 1.500 | 100 | 14.221 | | | |
| to | | | | | | | 3.568 | | 1.010 | | | |
| C4 | 51.500 | | 21.12 | 1.049 | | | 5.068 | 0.2019 | 1.023 | Vel = 7.84 | | |
| | | | 0.0 | | | | | | | | | |
| C4 | | | 21.12 | | | | | | 16.254 | K Factor = 5.24 | | |
| CS5 | 53.833 | 5.60 | 19.76 | 1 | T | 3.568 | 1.500 | 100 | 12.452 | | | |
| to | | | | | | | 3.568 | | 1.010 | | | |
| C5 | 51.500 | | 19.76 | 1.049 | | | 5.068 | 0.1784 | 0.904 | Vel = 7.34 | | |
| | | | 0.0 | | | | | | | | | |
| C5 | | | 19.76 | | | | | | 14.366 | K Factor = 5.21 | | |
| CS6 | 53.833 | 5.60 | 19.89 | 1 | T | 3.568 | 1.500 | 100 | 12.618 | | | |
| to | | | | | | | 3.568 | | 1.010 | | | |
| C6 | 51.500 | | 19.89 | 1.049 | | | 5.068 | 0.1805 | 0.915 | Vel = 7.38 | | |
| | | | 0.0 | | | | | | | | | |
| C6 | | | 19.89 | | | | | | 14.543 | K Factor = 5.22 | | |
| CS7 | 53.833 | 5.60 | 20.48 | 1 | T | 3.568 | 1.500 | 100 | 13.370 | | | |
| to | | | | | | | 3.568 | | 1.010 | | | |
| C7 | 51.500 | | 20.48 | 1.049 | | | 5.068 | 0.1906 | 0.966 | Vel = 7.60 | | |
| | | | 0.0 | | | | | | | | | |
| C7 | | | 20.48 | | | | | | 15.346 | K Factor = 5.23 | | |
| CS8 | 53.833 | 5.60 | 21.18 | 1 | T | 3.568 | 1.500 | 100 | 14.305 | | | |
| to | | | | | | | 3.568 | | 1.010 | | | |
| C8 | 51.500 | | 21.18 | 1.049 | | | 5.068 | 0.2028 | 1.028 | Vel = 7.86 | | |
| | | | 0.0 | | | | | | | | | |
| C8 | | | 21.18 | | | | | | 16.343 | K Factor = 5.24 | | |
| CS9 | 53.833 | 5.60 | 19.50 | 1 | T | 3.568 | 1.500 | 100 | 12.125 | | | |
| to | | | | | | | 3.568 | | 1.010 | | | |
| C9 | 51.500 | | 19.5 | 1.049 | | | 5.068 | 0.1742 | 0.883 | Vel = 7.24 | | |
| | | | 0.0 | | | | | | | | | |
| C9 | | | 19.50 | | | | | | 14.018 | K Factor = 5.21 | | |
| CS10 | 53.833 | 5.60 | 19.63 | 1 | T | 3.568 | 1.500 | 100 | 12.287 | | | |
| to | | | | | | | 3.568 | | 1.010 | | | |
| C10 | 51.500 | | 19.63 | 1.049 | | | 5.068 | 0.1762 | 0.893 | Vel = 7.29 | | |

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| Node1 to Node2 | Elev1 Elev2 | K Fact | Qa Qt | Nom Act | Fitting or Eqiv | Len | Pipe Ftngs Total | CFact Pf/Ft | Pt Pe Pf | ******* | Notes | ****** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0.0 | | | | | | | | | |
| C10 | | | 19.63 | | | | | | 14.190 | K Factor = 5.21 | | |
| CS11 | 53.833 | 5.60 | 20.21 | 1 | T | 3.568 | 1.500 | 100 | 13.022 | | | |
| to | | | | | | | 3.568 | | 1.010 | | | |
| C11 | 51.500 | | 20.21 | 1.049 | | | 5.068 | 0.1859 | 0.942 | Vel = 7.50 | | |
| | | | 0.0 | | | | | | | | | |
| C11 | | | 20.21 | | | | | | 14.974 | K Factor = 5.22 | | |
| CS12 | 53.833 | 5.60 | 20.52 | 1 | T | 3.568 | 1.500 | 100 | 13.423 | | | |
| to | | | | | | | 3.568 | | 1.010 | | | |
| C12 | 51.500 | | 20.52 | 1.049 | | | 5.068 | 0.1914 | 0.970 | Vel = 7.62 | | |
| | | | 0.0 | | | | | | | | | |
| C12 | | | 20.52 | | | | | | 15.403 | K Factor = 5.23 | | |
| CS13 | 53.833 | 5.60 | 20.12 | 1 | T | 3.568 | 1.500 | 100 | 12.911 | | | |
| to | | | | | | | 3.568 | | 1.010 | | | |
| C13 | 51.500 | | 20.12 | 1.049 | | | 5.068 | 0.1845 | 0.935 | Vel = 7.47 | | |
| | | | 0.0 | | | | | | | | | |
| C13 | | | 20.12 | | | | | | 14.856 | K Factor = 5.22 | | |
| CS14 | 53.833 | 5.60 | 20.26 | 1 | T | 3.568 | 1.500 | 100 | 13.082 | | | |
| to | | | | | | | 3.568 | | 1.010 | | | |
| C14 | 51.500 | | 20.26 | 1.049 | | | 5.068 | 0.1869 | 0.947 | Vel = 7.52 | | |
| | | | 0.0 | | | | | | | | | |
| C14 | | | 20.26 | | | | | | 15.039 | K Factor = 5.22 | | |
| CS15 | 53.833 | 5.60 | 20.85 | 1 | T | 3.568 | 1.500 | 100 | 13.861 | | | |
| to | | | | | | | 3.568 | | 1.010 | | | |
| C15 | 51.500 | | 20.85 | 1.049 | | | 5.068 | 0.1969 | 0.998 | Vel = 7.74 | | |
| | | | 0.0 | | | | | | | | | |
| C15 | | | 20.85 | | | | | | 15.869 | K Factor = 5.23 | | |
| CS16 | 53.833 | 5.60 | 21.17 | 1 | T | 3.568 | 1.500 | 100 | 14.288 | | | |
| to | | | | | | | 3.568 | | 1.010 | | | |
| C16 | 51.500 | | 21.17 | 1.049 | | | 5.068 | 0.2026 | 1.027 | Vel = 7.86 | | |
| | | | 0.0 | | | | | | | | | |
| C16 | | | 21.17 | | | | | | 16.325 | K Factor = 5.24 | | |
| CS17 | 53.833 | 5.60 | 21.85 | 1 | T | 3.568 | 1.500 | 100 | 15.218 | | | |
| to | | | | | | | 3.568 | | 1.010 | | | |
| C17 | 51.500 | | 21.85 | 1.049 | | | 5.068 | 0.2147 | 1.088 | Vel = 8.11 | | |
| | | | 0.0 | | | | | | | | | |
| C17 | | | 21.85 | | | | | | 17.316 | K Factor = 5.25 | | |
| CS18 | 53.833 | 5.60 | 21.99 | 1 | T | 3.568 | 1.500 | 100 | 15.418 | | | |
| to | | | | | | | 3.568 | | 1.010 | | | |
| C18 | 51.500 | | 21.99 | 1.049 | | | 5.068 | 0.2174 | 1.102 | Vel = 8.16 | | |
| | | | 0.0 | | | | | | | | | |
| C18 | | | 21.99 | | | | | | 17.530 | K Factor = 5.25 | | |
| CS19 | 53.833 | 5.60 | 22.63 | 1 | T | 3.568 | 1.500 | 100 | 16.325 | | | |
| to | | | | | | | 3.568 | | 1.010 | | | |
| C19 | 51.500 | | 22.63 | 1.049 | | | 5.068 | 0.2291 | 1.161 | Vel = 8.40 | | |
| | | | 0.0 | | | | | | | | | |
| C19 | | | 22.63 | | | | | | 18.496 | K Factor = 5.26 | | |

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| Node1<br>to<br>Node2 | Elev1<br><br>Elev2 | K<br><br>Fact | Qa<br><br>Qt | Nom<br><br>Act | Fitting<br>or<br>Eqiv | Len | Pipe<br>Ftngs<br>Total | CFact<br><br>Pf/Ft | Pt<br>Pe<br>Pf | ******* Notes ****** |
|---|---|---|---|---|---|---|---|---|---|---|
| CS20 | 53.833 | 5.60 | 23.39 | 1 | T | 3.568 | 1.500 | 100 | 17.451 | |
| to | | | | | | | 3.568 | | 1.010 | |
| C20 | 51.500 | | 23.39 | 1.049 | | | 5.068 | 0.2439 | 1.236 | Vel = 8.68 |
| | | | 0.0 | | | | | | | |
| C20 | | | 23.39 | | | | | | 19.697 | K Factor = 5.27 |
| CS21 | 53.833 | 5.60 | 20.27 | 1 | T | 3.568 | 1.500 | 100 | 13.107 | |
| to | | | | | | | 3.568 | | 1.010 | |
| C21 | 51.500 | | 20.27 | 1.049 | | | 5.068 | 0.1871 | 0.948 | Vel = 7.52 |
| | | | 0.0 | | | | | | | |
| C21 | | | 20.27 | | | | | | 15.065 | K Factor = 5.22 |
| CS22 | 53.833 | 5.60 | 20.88 | 1 | T | 3.568 | 1.500 | 100 | 13.908 | |
| to | | | | | | | 3.568 | | 1.010 | |
| C22 | 51.500 | | 20.88 | 1.049 | | | 5.068 | 0.1975 | 1.001 | Vel = 7.75 |
| | | | 0.0 | | | | | | | |
| C22 | | | 20.88 | | | | | | 15.919 | K Factor = 5.23 |
| *LINE1 | | | | | | | | | | |
| C1 | 51.500 | | 19.70 | 1.5 | | | 8.000 | 100 | 14.287 | |
| to | | | | | | | | | 0.0 | |
| C2 | 51.500 | | 19.7 | 1.61 | | | 8.000 | 0.0220 | 0.176 | Vel = 3.10 |
| C2 | 51.500 | | 19.83 | 1.5 | | | 10.000 | 100 | 14.463 | |
| to | | | | | | | | | 0.0 | |
| C3 | 51.500 | | 39.53 | 1.61 | | | 10.000 | 0.0799 | 0.799 | Vel = 6.23 |
| C3 | 51.500 | | 20.42 | 1.5 | X | 4.732 | 2.333 | 100 | 15.262 | |
| to | | | | | | | 4.732 | | 0.0 | |
| T1 | 51.500 | | 59.95 | 1.61 | | | 7.065 | 0.1725 | 1.219 | Vel = 9.45 |
| | | | 0.0 | | | | | | | |
| T1 | | | 59.95 | | | | | | 16.481 | K Factor = 14.77 |
| C4 | 51.500 | | 21.12 | 1.5 | X | 4.732 | 4.333 | 100 | 16.254 | |
| to | | | | | | | 4.732 | | 0.0 | |
| T1 | 51.500 | | 21.12 | 1.61 | | | 9.065 | 0.0250 | 0.227 | Vel = 3.33 |
| T1 | 51.500 | | 59.95 | 1.5 | T | 5.71 | 1.167 | 100 | 16.481 | |
| to | | | | | | | 5.710 | | 0.0 | |
| CM1 | 51.500 | | 81.07 | 1.61 | | | 6.877 | 0.3014 | 2.073 | Vel = 12.78 |
| | | | 0.0 | | | | | | | |
| CM1 | | | 81.07 | | | | | | 18.554 | K Factor = 18.82 |
| *LINE2 | | | | | | | | | | |
| C5 | 51.500 | | 19.76 | 1.5 | | | 8.000 | 100 | 14.366 | |
| to | | | | | | | | | 0.0 | |
| C6 | 51.500 | | 19.76 | 1.61 | | | 8.000 | 0.0221 | 0.177 | Vel = 3.11 |
| C6 | 51.500 | | 19.89 | 1.5 | | | 10.000 | 100 | 14.543 | |
| to | | | | | | | | | 0.0 | |
| C7 | 51.500 | | 39.65 | 1.61 | | | 10.000 | 0.0803 | 0.803 | Vel = 6.25 |
| C7 | 51.500 | | 20.48 | 1.5 | X | 4.732 | 2.333 | 100 | 15.346 | |
| to | | | | | | | 4.732 | | 0.0 | |
| T2 | 51.500 | | 60.13 | 1.61 | | | 7.065 | 0.1734 | 1.225 | Vel = 9.48 |
| | | | 0.0 | | | | | | | |
| T2 | | | 60.13 | | | | | | 16.571 | K Factor = 14.77 |

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Hydratec Incorporated
227317 QTS DC2 - CALC 4 SYS PA 2-02



| Node1 to Node2 | Elev1 Elev2 | K Fact | Qa Qt | Nom Act | Fitting or Eqiv | Len | Pipe Ftngs Total | CFact Pf/Ft | Pt Pe Pf | ******* Notes ****** |
|---|---|---|---|---|---|---|---|---|---|---|
| C8 | 51.500 | | 21.18 | 1.5 | X | 4.732 | 4.333 | 100 | 16.343 | |
| to | | | | | | | 4.732 | | 0.0 | |
| T2 | 51.500 | | 21.18 | 1.61 | | | 9.065 | 0.0252 | 0.228 | Vel = 3.34 |
| T2 | 51.500 | | 60.13 | 1.5 | T | 5.71 | 1.167 | 100 | 16.571 | |
| to | | | | | | | 5.710 | | 0.0 | |
| CM2 | 51.500 | | 81.31 | 1.61 | | | 6.877 | 0.3032 | 2.085 | Vel = 12.81 |
| | | | 0.0 | | | | | | | |
| CM2 | | | 81.31 | | | | | | 18.656 | K Factor = 18.82 |
| *LINE3 | | | | | | | | | | |
| C9 | 51.500 | | 19.50 | 1.5 | | | 8.000 | 100 | 14.018 | |
| to | | | | | | | | | 0.0 | |
| C10 | 51.500 | | 19.5 | 1.61 | | | 8.000 | 0.0215 | 0.172 | Vel = 3.07 |
| C10 | 51.500 | | 19.63 | 1.5 | | | 10.000 | 100 | 14.190 | |
| to | | | | | | | | | 0.0 | |
| C11 | 51.500 | | 39.13 | 1.61 | | | 10.000 | 0.0784 | 0.784 | Vel = 6.17 |
| C11 | 51.500 | | 20.21 | 1.5 | X | 4.732 | 2.333 | 100 | 14.974 | |
| to | | | | | | | 4.732 | | 0.0 | |
| T3 | 51.500 | | 59.34 | 1.61 | | | 7.065 | 0.1693 | 1.196 | Vel = 9.35 |
| | | | 0.0 | | | | | | | |
| T3 | | | 59.34 | | | | | | 16.170 | K Factor = 14.76 |
| C21 | 51.500 | | 20.27 | 1.5 | 2V | 3.711 | 10.833 | 100 | 15.065 | |
| to | | | | | | | 3.711 | | 0.0 | |
| C12 | 51.500 | | 20.27 | 1.61 | | | 14.544 | 0.0232 | 0.338 | Vel = 3.19 |
| C12 | 51.500 | | 20.52 | 1.5 | X | 4.732 | 4.333 | 100 | 15.403 | |
| to | | | | | | | 4.732 | | 0.0 | |
| T3 | 51.500 | | 40.79 | 1.61 | | | 9.065 | 0.0846 | 0.767 | Vel = 6.43 |
| T3 | 51.500 | | 59.34 | 1.5 | T | 5.71 | 1.167 | 100 | 16.170 | |
| to | | | | | | | 5.710 | | 0.0 | |
| CM3 | 51.500 | | 100.13 | 1.61 | | | 6.877 | 0.4455 | 3.064 | Vel = 15.78 |
| | | | 0.0 | | | | | | | |
| CM3 | | | 100.13 | | | | | | 19.234 | K Factor = 22.83 |
| *LINE4 | | | | | | | | | | |
| C13 | 51.500 | | 20.12 | 1.5 | | | 8.000 | 100 | 14.856 | |
| to | | | | | | | | | 0.0 | |
| C14 | 51.500 | | 20.12 | 1.61 | | | 8.000 | 0.0229 | 0.183 | Vel = 3.17 |
| C14 | 51.500 | | 20.26 | 1.5 | | | 10.000 | 100 | 15.039 | |
| to | | | | | | | | | 0.0 | |
| C15 | 51.500 | | 40.38 | 1.61 | | | 10.000 | 0.0830 | 0.830 | Vel = 6.36 |
| C15 | 51.500 | | 20.84 | 1.5 | X | 4.732 | 2.333 | 100 | 15.869 | |
| to | | | | | | | 4.732 | | 0.0 | |
| T4 | 51.500 | | 61.22 | 1.61 | | | 7.065 | 0.1793 | 1.267 | Vel = 9.65 |
| | | | 0.0 | | | | | | | |
| T4 | | | 61.22 | | | | | | 17.136 | K Factor = 14.79 |
| C22 | 51.500 | | 20.88 | 1.5 | 2V | 3.711 | 12.833 | 100 | 15.919 | |
| to | | | | | | | 3.711 | | 0.0 | |
| C16 | 51.500 | | 20.88 | 1.61 | | | 16.544 | 0.0245 | 0.406 | Vel = 3.29 |
| C16 | 51.500 | | 21.17 | 1.5 | X | 4.732 | 4.333 | 100 | 16.325 | |
| to | | | | | | | 4.732 | | 0.0 | |
| T4 | 51.500 | | 42.05 | 1.61 | | | 9.065 | 0.0895 | 0.811 | Vel = 6.63 |

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| Node1 to Node2 | Elev1 Elev2 | K Fact | Qa Qt | Nom Act | Fitting or Eqiv | Len | Pipe Ftngs Total | CFact Pf/Ft | Pt Pe Pf | ******* Notes ****** |
|---|---|---|---|---|---|---|---|---|---|---|
| T4 | 51.500 | | 61.23 | 1.5 | T | 5.71 | 1.167 | 100 | 17.136 | |
| to | | | | | | | 5.710 | | 0.0 | |
| CM4 | 51.500 | | 103.28 | 1.61 | | | 6.877 | 0.4719 | 3.245 | Vel = 16.28 |
| | | | 0.0 | | | | | | | |
| CM4 | | | 103.28 | | | | | | 20.381 | K Factor = 22.88 |
| *LINE5 | | | | | | | | | | |
| C17 | 51.500 | | 21.85 | 1.5 | | | 8.000 | 100 | 17.316 | |
| to | | | | | | | | | 0.0 | |
| C18 | 51.500 | | 21.85 | 1.61 | | | 8.000 | 0.0268 | 0.214 | Vel = 3.44 |
| C18 | 51.500 | | 21.98 | 1.5 | | | 10.000 | 100 | 17.530 | |
| to | | | | | | | | | 0.0 | |
| C19 | 51.500 | | 43.83 | 1.61 | | | 10.000 | 0.0966 | 0.966 | Vel = 6.91 |
| C19 | 51.500 | | 22.63 | 1.5 | X | 4.732 | 2.333 | 100 | 18.496 | |
| to | | | | | | | 4.732 | | 0.0 | |
| T5 | 51.500 | | 66.46 | 1.61 | | | 7.065 | 0.2088 | 1.475 | Vel = 10.47 |
| | | | 0.0 | | | | | | | |
| T5 | | | 66.46 | | | | | | 19.971 | K Factor = 14.87 |
| C20 | 51.500 | | 23.39 | 1.5 | X | 4.732 | 4.333 | 100 | 19.697 | |
| to | | | | | | | 4.732 | | 0.0 | |
| T5 | 51.500 | | 23.39 | 1.61 | | | 9.065 | 0.0302 | 0.274 | Vel = 3.69 |
| T5 | 51.500 | | 66.46 | 1.5 | T | 5.71 | 1.167 | 100 | 19.971 | |
| to | | | | | | | 5.710 | | 0.0 | |
| CM5 | 51.500 | | 89.85 | 1.61 | | | 6.877 | 0.3647 | 2.508 | Vel = 14.16 |
| | | | 0.0 | | | | | | | |
| CM5 | | | 89.85 | | | | | | 22.479 | K Factor = 18.95 |
| *MAIN | | | | | | | | | | |
| CM1 | 51.500 | | 81.07 | 3 | | | 7.833 | 100 | 18.554 | |
| to | | | | | | | | | 0.0 | |
| CM2 | 51.500 | | 81.07 | 3.068 | | | 7.833 | 0.0130 | 0.102 | Vel = 3.52 |
| CM2 | 51.500 | | 81.31 | 3 | | | 12.250 | 100 | 18.656 | |
| to | | | | | | | | | 0.0 | |
| CM3 | 51.500 | | 162.38 | 3.068 | | | 12.250 | 0.0472 | 0.578 | Vel = 7.05 |
| CM3 | 51.500 | | 100.13 | 3 | | | 10.000 | 100 | 19.234 | |
| to | | | | | | | | | 0.0 | |
| CM4 | 51.500 | | 262.51 | 3.068 | | | 10.000 | 0.1147 | 1.147 | Vel = 11.39 |
| CM4 | 51.500 | | 103.27 | 3 | X | 9.278 | 1.917 | 100 | 20.381 | |
| to | | | | | | | 9.278 | | 0.0 | |
| CMX | 51.500 | | 365.78 | 3.068 | | | 11.195 | 0.2119 | 2.372 | Vel = 15.87 |
| | | | 0.0 | | | | | | | |
| CMX | | | 365.78 | | | | | | 22.753 | K Factor = 76.68 |
| CM5 | 51.500 | | 89.85 | 3 | X | 9.278 | 8.083 | 100 | 22.479 | |
| to | | | | | | | 9.278 | | 0.0 | |
| CMX | 51.500 | | 89.85 | 3.068 | | | 17.361 | 0.0158 | 0.274 | Vel = 3.90 |
| CMX | 51.500 | | 365.79 | 3 | V | 3.568 | 14.000 | 100 | 22.753 | |
| to | | | | | | | 3.568 | | 0.0 | |
| CTR | 51.500 | | 455.64 | 3.068 | | | 17.568 | 0.3181 | 5.589 | Vel = 19.77 |
| CTR | 51.500 | | 0.0 | 3 | Eql | 20.626 | 21.583 | 100 | 28.342 | |
| to | | | | | | | 20.626 | | 9.312 | |
| CBR | 30 | | 455.64 | 3.068 | | | 42.209 | 0.3181 | 13.428 | Vel = 19.77 |

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| Node1 / to / Node2 | Elev1 / Elev2 | K / Fact | Qa / Qt | Nom / Act | Fitting or Eqiv | Len | Pipe Ftngs Total | CFact / Pf/Ft | Pt / Pe / Pf | ******* Notes ****** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0.0 | | | | | | | |
| CBR | | | 455.64 | | | | | | 51.082 | K Factor = 63.75 |
| *BACK TO RISER | | | | | | | | | | |
| CBR | 30 | | 455.64 | 6 | V | 12.573 | 10.500 | 120 | 51.082 | |
| to | | | | | X | 31.433 | 44.006 | | 2.454 | |
| XR2 | 24.333 | | 455.64 | 6.357 | | | 54.506 | 0.0065 | 0.356 | Vel = 4.61 |
| XR2 | 24.333 | | 0.0 | 6 | V | 12.573 | 50.833 | 120 | 53.892 | |
| to | | | | | | | 12.573 | | 0.0 | |
| X2 | 24.333 | | 455.64 | 6.357 | | | 63.406 | 0.0065 | 0.414 | Vel = 4.61 |
| X2 | 24.333 | | 0.0 | 6 | | | 11.917 | 120 | 54.306 | |
| to | | | | | | | | | 0.0 | |
| X3 | 24.333 | | 455.64 | 6.357 | | | 11.917 | 0.0065 | 0.078 | Vel = 4.61 |
| X3 | 24.333 | | -204.20 | 6 | | | 8.750 | 120 | 54.384 | |
| to | | | | | | | | | 0.0 | |
| X4 | 24.333 | | 251.44 | 6.357 | | | 8.750 | 0.0022 | 0.019 | Vel = 2.54 |
| X4 | 24.333 | | 0.0 | 6 | X | 31.433 | 999.333 | 120 | 54.403 | |
| to | | | | | V | 12.573 | 44.006 | | 0.144 | |
| X5 | 24 | | 251.44 | 6.357 | | | 1043.339 | 0.0022 | 2.271 | Vel = 2.54 |
| | | | 0.0 | | | | | | | |
| X5 | | | 251.44 | | | | | | 56.818 | K Factor = 33.36 |
| X3 | 24.333 | | 204.20 | 6 | 2X | 62.867 | 150.583 | 120 | 54.384 | |
| to | | | | | 2V | 25.147 | 88.014 | | 0.0 | |
| X1 | 24.333 | | 204.2 | 6.357 | | | 238.597 | 0.0015 | 0.354 | Vel = 2.06 |
| X1 | 24.333 | | 0.0 | 6 | 5X | 157.167 | 1150.500 | 120 | 54.738 | |
| to | | | | | | | 157.167 | | 0.144 | |
| X5 | 24 | | 204.2 | 6.357 | | | 1307.667 | 0.0015 | 1.936 | Vel = 2.06 |
| X5 | 24 | | 251.44 | 6 | 5V | 62.867 | 215.000 | 120 | 56.818 | |
| to | | | | | 2U | 12.573 | 75.440 | | 0.0 | |
| XR1 | 24 | | 455.64 | 6.357 | | | 290.440 | 0.0065 | 1.898 | Vel = 4.61 |
| XR1 | 24 | | 0.0 | 6 | B | 12.573 | 21.167 | 120 | 58.716 | |
| to | | | | | T | 37.72 | 50.293 | | 9.528 | |
| XBR | 2 | | 455.64 | 6.357 | | | 71.460 | 0.0065 | 0.467 | Vel = 4.61 |
| | | | 0.0 | | | | | | | |
| XBR | | | 455.64 | | | | | | 68.711 | K Factor = 54.97 |
| *PUMP | | | | | | | | | | |
| XBR | 2 | | 455.64 | 8 | B | 14.094 | 8.250 | 120 | 68.711 | |
| to | | | | | S | 52.853 | 66.947 | | 0.0 | |
| DIS | 2 | | 455.64 | 8.249 | | | 75.197 | 0.0018 | 0.138 | Vel = 2.74 |
| | | | 0.0 | | | | | | | |
| DIS | | | 455.64 | | | | | | 68.849 | K Factor = 54.91 |
| System Demand Pressure | | | | | | | | | 68.849 | |
| Safety Margin | | | | | | | | | 90.607 | |
| Continuation Pressure | | | | | | | | | 159.456 | |
| Pressure @ Pump Outlet | | | | | | | | | 159.456 | |
| Pressure From Pump Curve | | | | | | | | | -103.491 | |
| Pressure @ Pump Inlet | | | | | | | | | 55.965 | |
| SUC | 2 | | 0.0 | 8 | Zaf | 0.0 | 8.000 | 120 | 55.965 | |
| to | | | | | E | 21.141 | 25.839 | | 5.155 | * * Fixed Loss = 4.722 |
| SPG | 1 | | 455.64 | 8.249 | G | 4.698 | 33.839 | 0.0018 | 0.062 | Vel = 2.74 |


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| Node1 / to / Node2 | Elev1 / Elev2 | K / Fact | Qa / Qt | Nom / Act | Fitting or Eqiv | Len | Pipe Ftngs Total | CFact / Pf/Ft | Pt / Pe / Pf | ******* Notes ****** |
|---|---|---|---|---|---|---|---|---|---|---|
| SPG | 1 | | 0.0 | 8 | E | 21.141 | 15.000 | 120 | 61.182 | |
| to | | | | | | | 21.141 | | 2.599 | |
| IBP | -5 | | 455.64 | 8.249 | | | 36.141 | 0.0018 | 0.066 | Vel = 2.74 |
| IBP | -5 | | 0.0 | 8 | F | 11.278 | 120.000 | 150 | 63.847 | |
| to | | | | | T | 43.857 | 55.135 | | 0.0 | |
| UG1 | -5 | | 455.64 | 7.68 | | | 175.135 | 0.0017 | 0.301 | Vel = 3.16 |
| | | | 0.0 | | | | | | | |
| UG1 | | | 455.64 | | | | | | 64.148 | K Factor = 56.89 |
| *UG2 | | | | | | | | | | |
| UG1 | -5 | H250 | 705.64 | 8 | F | 11.278 | 565.000 | 150 | 64.148 | |
| to | | | | | T | 43.857 | 55.135 | | -3.032 | |
| TEST | 2 | | 705.64 | 7.68 | | | 620.135 | 0.0039 | 2.400 | Vel = 4.89 |
| | | | 0.0 | | | | | | | |
| TEST | | | 705.64 | | | | | | 63.516 | K Factor = 88.54 |


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EXCELLENCE IN FIRE PROTECTION DESIGN

Shambaugh & Son L.P.
5460 Desert Point Drive
Las Vegas, NV 89118

. . . Fire Protection by Computer Design

Hydratec Incorporated
64 Haverhill Road
Route 111
Windham, NH 03087
603-434-0502

I certify to the best of my knowledge, information, and belief that the design of this system complies with all applicable provisions of NFPA standards and local fire codes.

Dennis T. Scherr

Dennis T. Scherr
NICET Level IV
Water-Based Systems Layout
Cert. # 113016 Exp. 3/1/2029

| | | |
|---|---|---|
| Job Name | : | 227317 QTS DC2 - CALC5 - SYS PA 2-04 |
| Drawing | : | FP4 |
| Location | : | 1140 N GUN CLUB RD |
| System | : | CALC 5 SYS PA 2-04 |
| Contract | : | 227317 |
| Data File | : | 227317 QTS DC2 - CALC5 - SYS PA 2-02.wxtmp |



Computer Programs by Hydratec Inc. Revision: 50.5520.727

***HYDRAULIC CALCULATIONS***
***for***

***JOB NAME*** QTS DC2
***Location*** 1140 N GUN CLUB RD
***Drawing #*** FP4
***Contract #*** 227317
***Date*** 03.25.26

***DESIGN***

***Remote area #*** CALC 5 SYS PA 2-04
***Remote area location*** CALC 5 SYS PA 2-04
***Occupancy classification*** ORDINARY HAZ. GRP-1
***Density*** .15 - Gpm/SqFt
***Area of application*** 1,993 - SqFt
***Coverage/sprinkler*** 130 - SqFt
***Type of sprinkler calculated*** 5.6K
***# Sprinklers calculated*** 20
***In-rack demand*** N/A - GPM
***Hose streams*** 250 - GPM
***Total water required (including hose streams)*** 673.115 - GPM @ 8.59242 - Psi
***Type of system*** Pre-Action
***Volume of system (dry or pre-action)*** N/A - Gal

***WATER SUPPLY INFORMATION***

***Test date*** 7.16.2025
***Location*** 1140 N GUN CLUB RD
***Source of info*** ONSITE FIRE HYD #05U-08

***CONTRACTOR INFO*** Shambaugh & Son
***Address*** 6445 W. Sunset Rd
***Phone #*** 702-832-4547
***Name of designer*** E.Velasco
***Authority having jurisdiction*** AURORA, CO
***NOTES:*** Saftey Margin: 54.71 PSI
ACTUAL STATIC: 71
ACTUAL RESIDUAL: 58

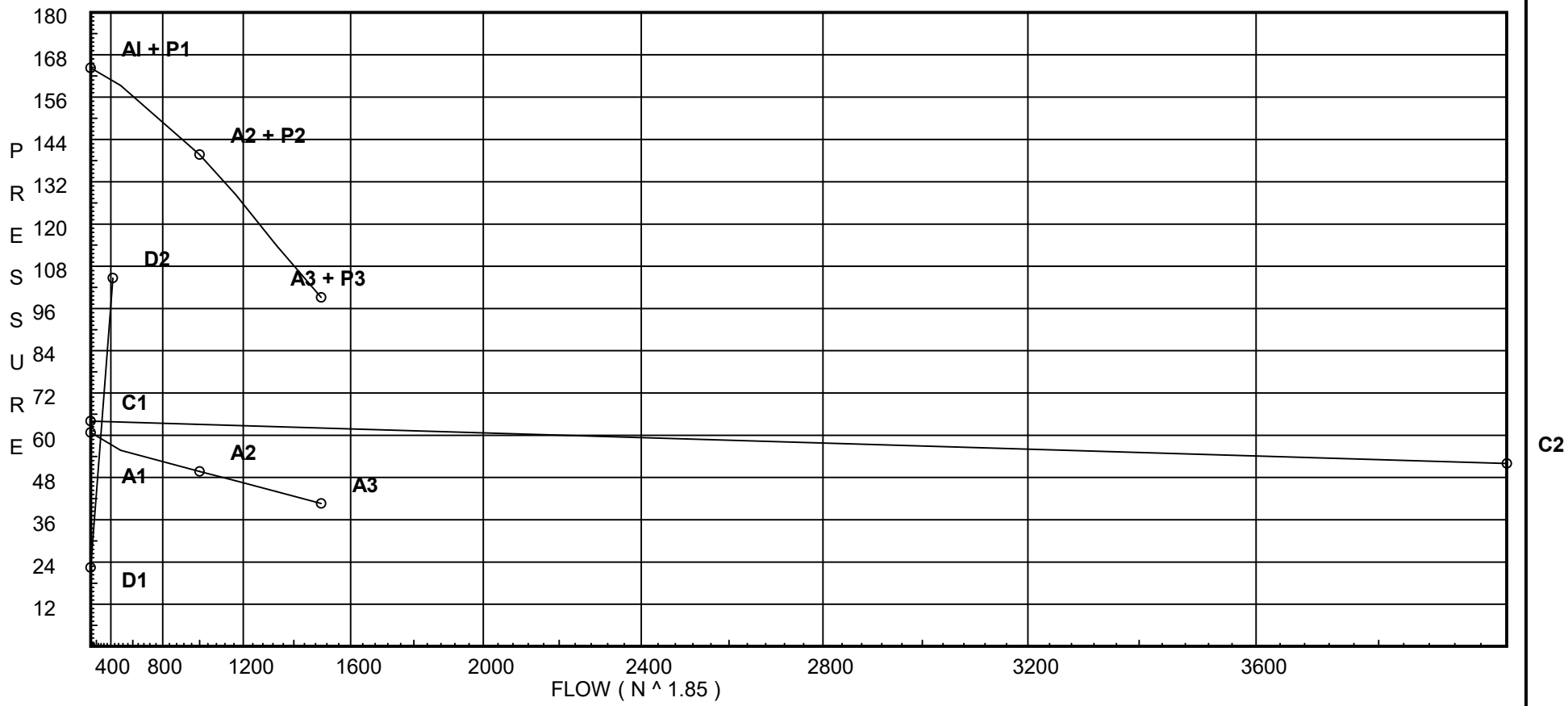
text1(35) - invisible

City Water Supply:
- C1 - Static Pressure : 64
- C2 - Residual Pressure: 52
- C2 - Residual Flow : 4000

City Water Adjusted to Pump Inlet for Pf - Elev - Hose Flow
- A1 - Adjusted Static: 60.777
- A2 - Adj Resid : 49.711 @ 1000
- A3 - Adj Resid : 40.625 @ 1500

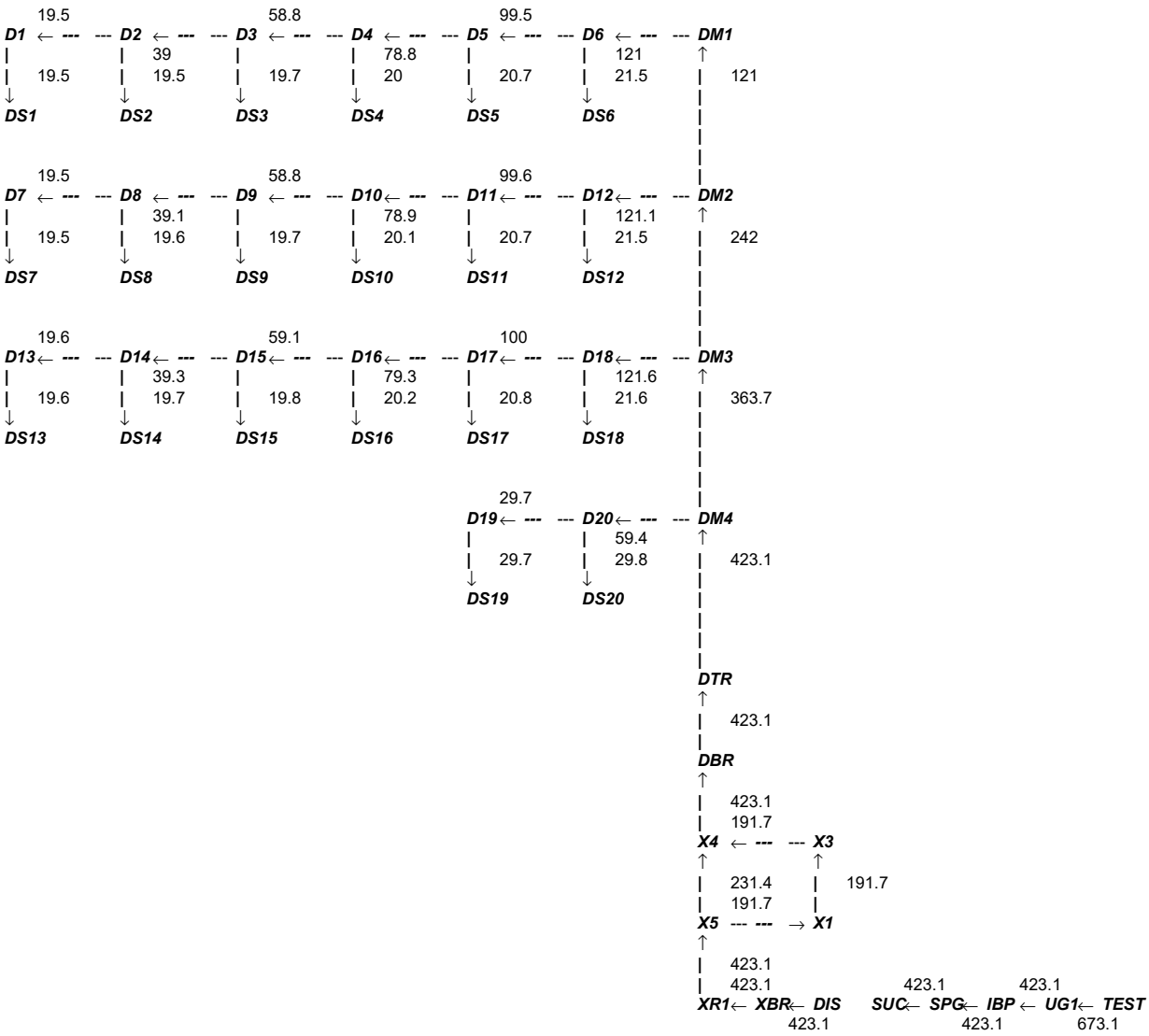
Pump Data:
- P1 - Pump Churn Pressure : 103.5
- P2 - Pump Rated Pressure : 90
- P2 - Pump Rated Flow : 1000
- P3 - Pump Pressure @ Max Flow : 58.5
- P3 - Pump Max Flow : 1500
- City Residual Flow @ 0 = 9886.27
- City Residual Flow @ 20 = 8073.68
- City Water @ 150% of Pump = 62.05

Demand:
- D1 - Elevation : 22.449
- D2 - System Flow : 423.115
- D2 - System Pressure : 104.627
- Hose ( Demand ) : _____
- D3 - System Demand : 423.115
- Hose ( Adj City ) : 250
- Safety Margin : 54.964






Computer Programs by Hydratec Inc. Revision: 50.5520.727


D1 19.5 DS1
D2 39 19.5 DS2
D3 58.8 19.7 DS3
D4 78.8 20 DS4
D5 99.5 20.7 DS5
D6 121 21.5 DS6
DM1 121
D7 19.5 DS7
D8 39.1 19.6 DS8
D9 58.8 19.7 DS9
D10 78.9 20.1 DS10
D11 99.6 20.7 DS11
D12 121.1 21.5 DS12
DM2 242
D13 19.6 DS13
D14 39.3 19.7 DS14
D15 59.1 19.8 DS15
D16 79.3 20.2 DS16
D17 100 20.8 DS17
D18 121.6 21.6 DS18
DM3 363.7
D19 29.7 DS19
D20 59.4 29.8 DS20
DM4 423.1
DTR 423.1
DBR 423.1 191.7
X4 X3 231.4 191.7
X5 X1 191.7
XR1 423.1 XBR 423.1 DIS 423.1
SUC 423.1 SPG 423.1 IBP 423.1 UG1 673.1 TEST

Fitting Legend

| Abbrev. | Name | ½ | ¾ | 1 | 1¼ | 1½ | 2 | 2½ | 3 | 3½ | 4 | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 24 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B | NFPA 13 Butterfly Valve | 0 | 0 | 0 | 0 | 0 | 6 | 7 | 10 | 0 | 12 | 9 | 10 | 12 | 19 | 21 | 23 | 25 | 0 | 0 | 0 |
| E | 90 - NFPA | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 10 | 12 | 14 | 18 | 22 | 27 | 35 | 40 | 45 | 50 | 61 |
| F | 45 - NFPA | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 4 | 5 | 7 | 9 | 11 | 13 | 17 | 19 | 21 | 24 | 28 |
| G | NFPA 13 Gate Valve | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 10 | 11 | 13 |
| S | Swing Check NFPA 13 | 0 | 0 | 5 | 7 | 9 | 11 | 14 | 16 | 19 | 22 | 27 | 32 | 45 | 55 | 65 | | | | | |
| T | TEE - NFPA | 3 | 4 | 5 | 6 | 8 | 10 | 12 | 15 | 17 | 20 | 25 | 30 | 35 | 50 | 60 | 71 | 81 | 91 | 101 | 121 |
| U | 45 - GROOVED | 0 | 0 | 0.8 | 2.13 | 2.75 | 1.8 | 2.2 | 2.6 | 0 | 3.4 | 4.2 | 5 | 6.5 | 8.3 | 10.0 | 18.5 | 21 | 23.5 | 25.5 | 29.5 |
| V | 90 - GROOVED | 0 | 0 | 1.7 | 2 | 2.6 | 3.5 | 4.3 | 5 | 0 | 6.8 | 8.5 | 10 | 13 | 17 | 20 | 24.5 | 28 | 31 | 34 | 42 |
| X | TEE - GROOVED | 0 | 0 | 4.2 | 7.5 | 6.63 | 8.5 | 10.8 | 13 | 0 | 16 | 21 | 25 | 33 | 41 | 50 | 70 | 80 | 90 | 100 | 120 |
| Zaf | Ames 3000SS | Fitting generates a Fixed Loss Based on Flow | | | | | | | | | | | | | | | | | | | |

Units Summary

| | |
|---|---|
| Diameter Units | Inches |
| Length Units | Feet |
| Flow Units | US Gallons per Minute |
| Pressure Units | Pounds per Square Inch |

Note: Fitting Legend provides equivalent pipe lengths for fittings types of various diameters. Equivalent lengths shown are standard for actual diameters of Sched 40 pipe and CFactors of 120 except as noted with *. The fittings marked with a * show equivalent lengths values supplied by manufacturers based on specific pipe diameters and CFactors and they require no adjustment. All values for fittings not marked with a * will be adjusted in the calculation for CFactors of other than 120 and diameters other than Sched 40 per NFPA.

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## SUPPLY ANALYSIS

| Node at Source | Static Pressure | Residual Pressure | Flow | Available Pressure | Total Demand | Required Pressure |
|---|---|---|---|---|---|---|
| DIS | See Information on Pump Curve | | | 159.591 | 423.12 | 104.627 |
| TEST | 64.0 | 52 | 4000.0 | 63.556 | 673.12 | 63.556 |

## NODE ANALYSIS

| Node Tag | Elevation | Node Type | Pressure at Node | Discharge at Node | Notes | |
|---|---|---|---|---|---|---|
| DS1 | 53.833 | 5.6 | 12.12 | 19.5 | 0.15 | 130 |
| DS2 | 53.833 | 5.6 | 12.19 | 19.55 | 0.15 | 130 |
| DS3 | 53.833 | 5.6 | 12.4 | 19.72 | 0.15 | 130 |
| DS4 | 53.833 | 5.6 | 12.82 | 20.05 | 0.15 | 130 |
| DS5 | 53.833 | 5.6 | 13.61 | 20.66 | 0.15 | 130 |
| DS6 | 53.833 | 5.6 | 14.71 | 21.48 | 0.15 | 130 |
| DS7 | 53.833 | 5.6 | 12.16 | 19.52 | 0.15 | 130 |
| DS8 | 53.833 | 5.6 | 12.22 | 19.57 | 0.15 | 130 |
| DS9 | 53.833 | 5.6 | 12.43 | 19.75 | 0.15 | 130 |
| DS10 | 53.833 | 5.6 | 12.85 | 20.07 | 0.15 | 130 |
| DS11 | 53.833 | 5.6 | 13.64 | 20.68 | 0.15 | 130 |
| DS12 | 53.833 | 5.6 | 14.74 | 21.5 | 0.15 | 130 |
| DS13 | 53.833 | 5.6 | 12.26 | 19.61 | 0.15 | 130 |
| DS14 | 53.833 | 5.6 | 12.32 | 19.66 | 0.15 | 130 |
| DS15 | 53.833 | 5.6 | 12.54 | 19.83 | 0.15 | 130 |
| DS16 | 53.833 | 5.6 | 12.96 | 20.16 | 0.15 | 130 |
| DS17 | 53.833 | 5.6 | 13.76 | 20.77 | 0.15 | 130 |
| DS18 | 53.833 | 5.6 | 14.87 | 21.59 | 0.15 | 130 |
| DS19 | 53.833 | 5.6 | 28.11 | 29.69 | 0.15 | 130 |
| DS20 | 53.833 | 5.6 | 28.23 | 29.75 | 0.15 | 130 |
| D1 | 54.083 | | 12.94 | | | |
| D2 | 54.083 | | 13.01 | | | |
| D3 | 54.083 | | 13.24 | | | |
| D4 | 54.083 | | 13.68 | | | |
| D5 | 54.083 | | 14.53 | | | |
| D6 | 54.083 | | 15.7 | | | |
| D7 | 54.083 | | 12.97 | | | |
| D8 | 54.083 | | 13.04 | | | |
| D9 | 54.083 | | 13.27 | | | |
| D10 | 54.083 | | 13.72 | | | |
| D11 | 54.083 | | 14.56 | | | |
| D12 | 54.083 | | 15.74 | | | |
| D13 | 54.083 | | 13.09 | | | |
| D14 | 54.083 | | 13.15 | | | |
| D15 | 54.083 | | 13.39 | | | |
| D16 | 54.083 | | 13.83 | | | |
| D17 | 54.083 | | 14.69 | | | |
| D18 | 54.083 | | 15.88 | | | |
| D19 | 54.083 | | 30.02 | | | |
| D20 | 54.083 | | 30.14 | | | |
| DM1 | 47.917 | | 35.93 | | | |

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***NODE ANALYSIS (cont.)***

| *Node Tag* | *Elevation* | *Node Type* | *Pressure at Node* | *Discharge at Node* | *Notes* |
|---|---|---|---|---|---|
| DM2 | 47.917 | | 36.01 | | |
| DM3 | 47.917 | | 36.28 | | |
| DM4 | 47.917 | | 36.87 | | |
| DTR | 47.917 | | 71.89 | | |
| DBR | 47.917 | | 76.15 | | |
| X3 | 24.333 | | 90.84 | | |
| X4 | 24.333 | | 90.82 | | |
| X1 | 24.333 | | 91.15 | | |
| X5 | 24.0 | | 92.92 | | |
| XR1 | 24.0 | | 94.57 | | |
| XBR | 2.0 | | 104.51 | | |
| DIS | 2.0 | | 104.63 | | |
| SUC | 2.0 | | 56.1 | | |
| SPG | 1.0 | | 61.47 | | |
| IBP | -5.0 | | 64.13 | | |
| UG1 | -5.0 | | 64.39 | 250.0 | |
| TEST | 2.0 | | 63.56 | | |


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PERMIT #2026 2513934 - CM 04 | RSN:1975523



| Node1 to Node2 | Elev1 Elev2 | K Fact | Qa Qt | Nom Act | Fitting or Eqiv | Len | Pipe Ftngs Total | CFact Pf/Ft | Pt Pe Pf | ******* | Notes | ****** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *HEADS | | | | | | | | | | | | |
| DS1 | 53.833 | 5.60 | 19.50 | 1 | T | 3.568 | 1.750 | 100 | 12.125 | | | |
| to | | | | | | | 3.568 | | -0.108 | | | |
| D1 | 54.083 | | 19.5 | 1.049 | | | 5.318 | 0.1739 | 0.925 | Vel = 7.24 | | |
| | | | 0.0 | | | | | | | | | |
| D1 | | | 19.50 | | | | | | 12.942 | K Factor = 5.42 | | |
| DS2 | 53.833 | 5.60 | 19.55 | 1 | T | 3.568 | 1.750 | 100 | 12.187 | | | |
| to | | | | | | | 3.568 | | -0.108 | | | |
| D2 | 54.083 | | 19.55 | 1.049 | | | 5.318 | 0.1747 | 0.929 | Vel = 7.26 | | |
| | | | 0.0 | | | | | | | | | |
| D2 | | | 19.55 | | | | | | 13.008 | K Factor = 5.42 | | |
| DS3 | 53.833 | 5.60 | 19.72 | 1 | T | 3.568 | 1.750 | 100 | 12.402 | | | |
| to | | | | | | | 3.568 | | -0.108 | | | |
| D3 | 54.083 | | 19.72 | 1.049 | | | 5.318 | 0.1777 | 0.945 | Vel = 7.32 | | |
| | | | 0.0 | | | | | | | | | |
| D3 | | | 19.72 | | | | | | 13.239 | K Factor = 5.42 | | |
| DS4 | 53.833 | 5.60 | 20.05 | 1 | T | 3.568 | 1.750 | 100 | 12.817 | | | |
| to | | | | | | | 3.568 | | -0.108 | | | |
| D4 | 54.083 | | 20.05 | 1.049 | | | 5.318 | 0.1830 | 0.973 | Vel = 7.44 | | |
| | | | 0.0 | | | | | | | | | |
| D4 | | | 20.05 | | | | | | 13.682 | K Factor = 5.42 | | |
| DS5 | 53.833 | 5.60 | 20.66 | 1 | T | 3.568 | 1.750 | 100 | 13.609 | | | |
| to | | | | | | | 3.568 | | -0.108 | | | |
| D5 | 54.083 | | 20.66 | 1.049 | | | 5.318 | 0.1935 | 1.029 | Vel = 7.67 | | |
| | | | 0.0 | | | | | | | | | |
| D5 | | | 20.66 | | | | | | 14.530 | K Factor = 5.42 | | |
| DS6 | 53.833 | 5.60 | 21.48 | 1 | T | 3.568 | 1.750 | 100 | 14.706 | | | |
| to | | | | | | | 3.568 | | -0.108 | | | |
| D6 | 54.083 | | 21.48 | 1.049 | | | 5.318 | 0.2078 | 1.105 | Vel = 7.97 | | |
| | | | 0.0 | | | | | | | | | |
| D6 | | | 21.48 | | | | | | 15.703 | K Factor = 5.42 | | |
| DS7 | 53.833 | 5.60 | 19.52 | 1 | T | 3.568 | 1.750 | 100 | 12.155 | | | |
| to | | | | | | | 3.568 | | -0.108 | | | |
| D7 | 54.083 | | 19.52 | 1.049 | | | 5.318 | 0.1743 | 0.927 | Vel = 7.25 | | |
| | | | 0.0 | | | | | | | | | |
| D7 | | | 19.52 | | | | | | 12.974 | K Factor = 5.42 | | |
| DS8 | 53.833 | 5.60 | 19.57 | 1 | T | 3.568 | 1.750 | 100 | 12.216 | | | |
| to | | | | | | | 3.568 | | -0.108 | | | |
| D8 | 54.083 | | 19.57 | 1.049 | | | 5.318 | 0.1751 | 0.931 | Vel = 7.26 | | |
| | | | 0.0 | | | | | | | | | |
| D8 | | | 19.57 | | | | | | 13.039 | K Factor = 5.42 | | |
| DS9 | 53.833 | 5.60 | 19.74 | 1 | T | 3.568 | 1.750 | 100 | 12.432 | | | |
| to | | | | | | | 3.568 | | -0.108 | | | |
| D9 | 54.083 | | 19.74 | 1.049 | | | 5.318 | 0.1781 | 0.947 | Vel = 7.33 | | |
| | | | 0.0 | | | | | | | | | |
| D9 | | | 19.74 | | | | | | 13.271 | K Factor = 5.42 | | |
| DS10 | 53.833 | 5.60 | 20.07 | 1 | T | 3.568 | 1.750 | 100 | 12.847 | | | |
| to | | | | | | | 3.568 | | -0.108 | | | |
| D10 | 54.083 | | 20.07 | 1.049 | | | 5.318 | 0.1835 | 0.976 | Vel = 7.45 | | |

PERMIT #2026 2513934 - CM 04 | RSN:1975523



| Node1 to Node2 | Elev1 Elev2 | K Fact | Qa Qt | Nom Act | Fitting or Eqiv | Len | Pipe Ftngs Total | CFact Pf/Ft | Pt Pe Pf | ******* | Notes | ****** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0.0 | | | | | | | | | |
| D10 | | | 20.07 | | | | | | 13.715 | K Factor = 5.42 | | |
| DS11 | 53.833 | 5.60 | 20.68 | 1 | T | 3.568 | 1.750 | 100 | 13.641 | | | |
| to | | | | | | | 3.568 | | -0.108 | | | |
| D11 | 54.083 | | 20.68 | 1.049 | | | 5.318 | 0.1941 | 1.032 | Vel = 7.68 | | |
| | | | 0.0 | | | | | | | | | |
| D11 | | | 20.68 | | | | | | 14.565 | K Factor = 5.42 | | |
| DS12 | 53.833 | 5.60 | 21.50 | 1 | T | 3.568 | 1.750 | 100 | 14.741 | | | |
| to | | | | | | | 3.568 | | -0.108 | | | |
| D12 | 54.083 | | 21.5 | 1.049 | | | 5.318 | 0.2083 | 1.108 | Vel = 7.98 | | |
| | | | 0.0 | | | | | | | | | |
| D12 | | | 21.50 | | | | | | 15.741 | K Factor = 5.42 | | |
| DS13 | 53.833 | 5.60 | 19.61 | 1 | T | 3.568 | 1.750 | 100 | 12.260 | | | |
| to | | | | | | | 3.568 | | -0.108 | | | |
| D13 | 54.083 | | 19.61 | 1.049 | | | 5.318 | 0.1758 | 0.935 | Vel = 7.28 | | |
| | | | 0.0 | | | | | | | | | |
| D13 | | | 19.61 | | | | | | 13.087 | K Factor = 5.42 | | |
| DS14 | 53.833 | 5.60 | 19.66 | 1 | T | 3.568 | 1.750 | 100 | 12.322 | | | |
| to | | | | | | | 3.568 | | -0.108 | | | |
| D14 | 54.083 | | 19.66 | 1.049 | | | 5.318 | 0.1766 | 0.939 | Vel = 7.30 | | |
| | | | 0.0 | | | | | | | | | |
| D14 | | | 19.66 | | | | | | 13.153 | K Factor = 5.42 | | |
| DS15 | 53.833 | 5.60 | 19.83 | 1 | T | 3.568 | 1.750 | 100 | 12.540 | | | |
| to | | | | | | | 3.568 | | -0.108 | | | |
| D15 | 54.083 | | 19.83 | 1.049 | | | 5.318 | 0.1794 | 0.954 | Vel = 7.36 | | |
| | | | 0.0 | | | | | | | | | |
| D15 | | | 19.83 | | | | | | 13.386 | K Factor = 5.42 | | |
| DS16 | 53.833 | 5.60 | 20.16 | 1 | T | 3.568 | 1.750 | 100 | 12.959 | | | |
| to | | | | | | | 3.568 | | -0.108 | | | |
| D16 | 54.083 | | 20.16 | 1.049 | | | 5.318 | 0.1848 | 0.983 | Vel = 7.48 | | |
| | | | 0.0 | | | | | | | | | |
| D16 | | | 20.16 | | | | | | 13.834 | K Factor = 5.42 | | |
| DS17 | 53.833 | 5.60 | 20.77 | 1 | T | 3.568 | 1.750 | 100 | 13.759 | | | |
| to | | | | | | | 3.568 | | -0.108 | | | |
| D17 | 54.083 | | 20.77 | 1.049 | | | 5.318 | 0.1956 | 1.040 | Vel = 7.71 | | |
| | | | 0.0 | | | | | | | | | |
| D17 | | | 20.77 | | | | | | 14.691 | K Factor = 5.42 | | |
| DS18 | 53.833 | 5.60 | 21.59 | 1 | T | 3.568 | 1.750 | 100 | 14.867 | | | |
| to | | | | | | | 3.568 | | -0.108 | | | |
| D18 | 54.083 | | 21.59 | 1.049 | | | 5.318 | 0.2100 | 1.117 | Vel = 8.01 | | |
| | | | 0.0 | | | | | | | | | |
| D18 | | | 21.59 | | | | | | 15.876 | K Factor = 5.42 | | |
| DS19 | 53.833 | 5.60 | 29.69 | 1 | T | 3.568 | 1.750 | 100 | 28.112 | | | |
| to | | | | | | | 3.568 | | -0.108 | | | |
| D19 | 54.083 | | 29.69 | 1.049 | | | 5.318 | 0.3787 | 2.014 | Vel = 11.02 | | |
| | | | 0.0 | | | | | | | | | |
| D19 | | | 29.69 | | | | | | 30.018 | K Factor = 5.42 | | |

PERMIT #2026 2513934 - CM 04 | RSN:1975523



| Node1 to Node2 | Elev1 Elev2 | K Fact | Qa Qt | Nom Act | Fitting or Eqiv | Len | Pipe Ftngs Total | CFact Pf/Ft | Pt Pe Pf | ******* Notes ****** |
|---|---|---|---|---|---|---|---|---|---|---|
| DS20 | 53.833 | 5.60 | 29.75 | 1 | T | 3.568 | 1.750 | 100 | 28.230 | |
| to | | | | | | | 3.568 | | -0.108 | |
| D20 | 54.083 | | 29.75 | 1.049 | | | 5.318 | 0.3802 | 2.022 | Vel = 11.04 |
| | | | 0.0 | | | | | | | |
| D20 | | | 29.75 | | | | | | 30.144 | K Factor = 5.42 |
| *LINE1 | | | | | | | | | | |
| D1 | 54.083 | | 19.50 | 2 | | | 10.250 | 100 | 12.942 | |
| to | | | | | | | | | 0.0 | |
| D2 | 54.083 | | 19.5 | 2.067 | | | 10.250 | 0.0064 | 0.066 | Vel = 1.86 |
| D2 | 54.083 | | 19.55 | 2 | | | 10.000 | 100 | 13.008 | |
| to | | | | | | | | | 0.0 | |
| D3 | 54.083 | | 39.05 | 2.067 | | | 10.000 | 0.0231 | 0.231 | Vel = 3.73 |
| D3 | 54.083 | | 19.72 | 2 | | | 9.000 | 100 | 13.239 | |
| to | | | | | | | | | 0.0 | |
| D4 | 54.083 | | 58.77 | 2.067 | | | 9.000 | 0.0492 | 0.443 | Vel = 5.62 |
| D4 | 54.083 | | 20.05 | 2 | | | 10.000 | 100 | 13.682 | |
| to | | | | | | | | | 0.0 | |
| D5 | 54.083 | | 78.82 | 2.067 | | | 10.000 | 0.0848 | 0.848 | Vel = 7.54 |
| D5 | 54.083 | | 20.66 | 2 | | | 9.000 | 100 | 14.530 | |
| to | | | | | | | | | 0.0 | |
| D6 | 54.083 | | 99.48 | 2.067 | | | 9.000 | 0.1303 | 1.173 | Vel = 9.51 |
| D6 | 54.083 | | 21.47 | 2 | X | 6.066 | 80.583 | 100 | 15.703 | |
| to | | | | | T | 7.137 | 13.203 | | 2.670 | |
| DM1 | 47.917 | | 120.95 | 2.067 | | | 93.786 | 0.1872 | 17.556 | Vel = 11.56 |
| | | | 0.0 | | | | | | | |
| DM1 | | | 120.95 | | | | | | 35.929 | K Factor = 20.18 |
| *LINE2 | | | | | | | | | | |
| D7 | 54.083 | | 19.52 | 2 | | | 10.250 | 100 | 12.974 | |
| to | | | | | | | | | 0.0 | |
| D8 | 54.083 | | 19.52 | 2.067 | | | 10.250 | 0.0063 | 0.065 | Vel = 1.87 |
| D8 | 54.083 | | 19.58 | 2 | | | 10.000 | 100 | 13.039 | |
| to | | | | | | | | | 0.0 | |
| D9 | 54.083 | | 39.1 | 2.067 | | | 10.000 | 0.0232 | 0.232 | Vel = 3.74 |
| D9 | 54.083 | | 19.74 | 2 | | | 9.000 | 100 | 13.271 | |
| to | | | | | | | | | 0.0 | |
| D10 | 54.083 | | 58.84 | 2.067 | | | 9.000 | 0.0493 | 0.444 | Vel = 5.63 |
| D10 | 54.083 | | 20.07 | 2 | | | 10.000 | 100 | 13.715 | |
| to | | | | | | | | | 0.0 | |
| D11 | 54.083 | | 78.91 | 2.067 | | | 10.000 | 0.0850 | 0.850 | Vel = 7.54 |
| D11 | 54.083 | | 20.69 | 2 | | | 9.000 | 100 | 14.565 | |
| to | | | | | | | | | 0.0 | |
| D12 | 54.083 | | 99.6 | 2.067 | | | 9.000 | 0.1307 | 1.176 | Vel = 9.52 |
| D12 | 54.083 | | 21.50 | 2 | X | 6.066 | 80.583 | 100 | 15.741 | |
| to | | | | | T | 7.137 | 13.203 | | 2.670 | |
| DM2 | 47.917 | | 121.1 | 2.067 | | | 93.786 | 0.1876 | 17.594 | Vel = 11.58 |
| | | | 0.0 | | | | | | | |
| DM2 | | | 121.10 | | | | | | 36.005 | K Factor = 20.18 |

PERMIT #2026 2513934 - CM 04 | RSN:1975523



| Node1 to Node2 | Elev1 Elev2 | K Fact | Qa Qt | Nom Act | Fitting or Eqiv | Len | Pipe Ftngs Total | CFact Pf/Ft | Pt Pe Pf | ******* Notes ****** |
|---|---|---|---|---|---|---|---|---|---|---|
| *LINE3 | | | | | | | | | | |
| D13 | 54.083 | | 19.61 | 2 | | | 10.250 | 100 | 13.087 | |
| to | | | | | | | | | 0.0 | |
| D14 | 54.083 | | 19.61 | 2.067 | | | 10.250 | 0.0064 | 0.066 | Vel = 1.87 |
| D14 | 54.083 | | 19.66 | 2 | | | 10.000 | 100 | 13.153 | |
| to | | | | | | | | | 0.0 | |
| D15 | 54.083 | | 39.27 | 2.067 | | | 10.000 | 0.0233 | 0.233 | Vel = 3.75 |
| D15 | 54.083 | | 19.83 | 2 | | | 9.000 | 100 | 13.386 | |
| to | | | | | | | | | 0.0 | |
| D16 | 54.083 | | 59.1 | 2.067 | | | 9.000 | 0.0498 | 0.448 | Vel = 5.65 |
| D16 | 54.083 | | 20.16 | 2 | | | 10.000 | 100 | 13.834 | |
| to | | | | | | | | | 0.0 | |
| D17 | 54.083 | | 79.26 | 2.067 | | | 10.000 | 0.0857 | 0.857 | Vel = 7.58 |
| D17 | 54.083 | | 20.77 | 2 | | | 9.000 | 100 | 14.691 | |
| to | | | | | | | | | 0.0 | |
| D18 | 54.083 | | 100.03 | 2.067 | | | 9.000 | 0.1317 | 1.185 | Vel = 9.56 |
| D18 | 54.083 | | 21.59 | 2 | X | 6.066 | 80.583 | 100 | 15.876 | |
| to | | | | | T | 7.137 | 13.203 | | 2.670 | |
| DM3 | 47.917 | | 121.62 | 2.067 | | | 93.786 | 0.1891 | 17.735 | Vel = 11.63 |
| | | | 0.0 | | | | | | | |
| DM3 | | | 121.62 | | | | | | 36.281 | K Factor = 20.19 |
| *LINE4 | | | | | | | | | | |
| D19 | 54.083 | | 29.69 | 2 | | | 9.000 | 100 | 30.018 | |
| to | | | | | | | | | 0.0 | |
| D20 | 54.083 | | 29.69 | 2.067 | | | 9.000 | 0.0140 | 0.126 | Vel = 2.84 |
| D20 | 54.083 | | 29.76 | 2 | | | 80.583 | 100 | 30.144 | |
| to | | | | | | | | | 2.670 | |
| DM4 | 47.917 | | 59.45 | 2.067 | | | 80.583 | 0.0503 | 4.053 | Vel = 5.68 |
| | | | 0.0 | | | | | | | |
| DM4 | | | 59.45 | | | | | | 36.867 | K Factor = 9.79 |
| *MAIN | | | | | | | | | | |
| DM1 | 47.917 | | 120.95 | 4 | | | 10.500 | 100 | 35.929 | |
| to | | | | | | | | | 0.0 | |
| DM2 | 47.917 | | 120.95 | 4.026 | | | 10.500 | 0.0072 | 0.076 | Vel = 3.05 |
| DM2 | 47.917 | | 121.10 | 4 | | | 10.500 | 100 | 36.005 | |
| to | | | | | | | | | 0.0 | |
| DM3 | 47.917 | | 242.05 | 4.026 | | | 10.500 | 0.0263 | 0.276 | Vel = 6.10 |
| DM3 | 47.917 | | 121.62 | 4 | | | 10.500 | 100 | 36.281 | |
| to | | | | | | | | | 0.0 | |
| DM4 | 47.917 | | 363.67 | 4.026 | | | 10.500 | 0.0558 | 0.586 | Vel = 9.17 |
| DM4 | 47.917 | | 59.45 | 4 | 5V | 24.266 | 450.000 | 100 | 36.867 | |
| to | | | | | | | 24.266 | | 0.0 | |
| DTR | 47.917 | | 423.12 | 4.026 | | | 474.266 | 0.0739 | 35.025 | Vel = 10.66 |
| DTR | 47.917 | | 0.0 | 4 | T | 14.274 | 20.000 | 100 | 71.892 | |
| to | | | | | Eql | 23.409 | 37.683 | | 0.0 | |
| DBR | 47.917 | | 423.12 | 4.026 | | | 57.683 | 0.0739 | 4.260 | Vel = 10.66 |
| DBR | 47.917 | | 0.0 | 4 | 2V | 13.6 | 23.000 | 120 | 76.152 | |
| to | | | | | X | 16.0 | 61.600 | | 10.214 | |
| X4 | 24.333 | | 423.12 | 4.026 | T | 20.0 | 84.600 | 0.0527 | 4.459 | Vel = 10.66 |

PERMIT #2026 2513934 - CM 04 | RSN:1975523



| Node1 / to / Node2 | Elev1 / Elev2 | K Fact | Qa / Qt | Nom / Act | Fitting or Eqiv | Len | Pipe Ftngs Total | CFact Pf/Ft | Pt / Pe / Pf | ******* Notes ****** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | B | 12.0 | | | | |
| X4 | | | 0.0<br>423.12 | | | | | | 90.825 | K Factor = 44.40 |
| X3<br>to<br>X4 | 24.333<br>24.333 | | -191.67<br>-191.67 | 6<br>6.357 | | | 8.750<br>8.750 | 120<br>-0.0013 | 90.836<br>0.0<br>-0.011 | Vel = 1.94 |
| X4<br>to<br>X5 | 24.333<br>24 | | 423.12<br>231.45 | 6<br>6.357 | X<br>V | 31.433<br>12.573 | 999.000<br>44.006<br>1043.006 | 120<br>0.0019 | 90.825<br>0.144<br>1.947 | Vel = 2.34 |
| X5 | | | 0.0<br>231.45 | | | | | | 92.916 | K Factor = 24.01 |
| X3<br>to<br>X1 | 24.333<br>24.333 | | 191.67<br>191.67 | 6<br>6.357 | 2X<br>2V | 62.867<br>25.147 | 150.000<br>88.014<br>238.014 | 120<br>0.0013 | 90.836<br>0.0<br>0.314 | Vel = 1.94 |
| X1<br>to<br>X5 | 24.333<br>24 | | 0.0<br>191.67 | 6<br>6.357 | 4V<br>X | 50.294<br>31.433 | 1150.000<br>81.727<br>1231.727 | 120<br>0.0013 | 91.150<br>0.144<br>1.622 | Vel = 1.94 |
| X5<br>to<br>XR1 | 24<br>24 | | 231.45<br>423.12 | 6<br>6.357 | 5V<br>2U | 62.867<br>12.573 | 215.000<br>75.440<br>290.440 | 120<br>0.0057 | 92.916<br>0.0<br>1.655 | Vel = 4.28 |
| XR1<br>to<br>XBR | 24<br>2 | | 0.0<br>423.12 | 6<br>6.357 | B<br>T | 12.573<br>37.72 | 21.167<br>50.293<br>71.460 | 120<br>0.0057 | 94.571<br>9.528<br>0.408 | Vel = 4.28 |
| XBR | | | 0.0<br>423.12 | | | | | | 104.507 | K Factor = 41.39 |
| *PUMP | | | | | | | | | | |
| XBR<br>to<br>DIS | 2<br>2 | | 423.12<br>423.12 | 8<br>8.249 | B<br>S | 14.094<br>52.853 | 8.250<br>66.947<br>75.197 | 120<br>0.0016 | 104.507<br>0.0<br>0.120 | Vel = 2.54 |
| DIS | | | 0.0<br>423.12 | | | | | | 104.627 | K Factor = 41.37 |
| System Demand Pressure<br>Safety Margin<br>Continuation Pressure | | | | | | | | | 104.627<br>54.964<br>159.591 | |
| Pressure @ Pump Outlet<br>Pressure From Pump Curve<br>Pressure @ Pump Inlet | | | | | | | | | 159.591<br>-103.493<br>56.098 | |
| SUC<br>to<br>SPG | 2<br>1 | | 0.0<br>423.12 | 8<br>8.249 | Zaf<br>E<br>G | 0.0<br>21.141<br>4.698 | 8.000<br>25.839<br>33.839 | 120<br>0.0016 | 56.098<br>5.318<br>0.054 | * * Fixed Loss = 4.884<br>Vel = 2.54 |
| SPG<br>to<br>IBP | 1<br>-5 | | 0.0<br>423.12 | 8<br>8.249 | E | 21.141 | 15.000<br>21.141<br>36.141 | 120<br>0.0016 | 61.470<br>2.599<br>0.058 | Vel = 2.54 |
| IBP<br>to<br>UG1 | -5<br>-5 | | 0.0<br>423.12 | 8<br>7.68 | F<br>T | 11.278<br>43.857 | 120.000<br>55.135<br>175.135 | 150<br>0.0015 | 64.127<br>0.0<br>0.263 | Vel = 2.93 |
| | | | 0.0 | | | | | | | |

PERMIT #2026 2513934 - CM 04 | RSN:1975523



| Node1 to Node2 | Elev1 Elev2 | K Fact | Qa Qt | Nom Act | Fitting or Eqiv | Len | Pipe Ftngs Total | CFact Pf/Ft | Pt Pe Pf | ******* | Notes | ****** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| UG1 | | | 423.12 | | | | | | 64.390 | K Factor = 52.73 | | |
| *UG2 | | | | | | | | | | | | |
| UG1 | -5 | H250 | 673.12 | 8 | F | 11.278 | 565.000 | 150 | 64.390 | | | |
| to | | | | | T | 43.857 | 55.135 | | -3.032 | | | |
| TEST | 2 | | 673.12 | 7.68 | | | 620.135 | 0.0035 | 2.198 | Vel = 4.66 | | |
| | | | 0.0 | | | | | | | | | |
| TEST | | | 673.12 | | | | | | 63.556 | K Factor = 84.43 | | |


SHEET 87 of 403

EXCELLENCE IN FIRE PROTECTION DESIGN

Shambaugh & Son L.P.
5460 Desert Point Drive
Las Vegas, NV 89118

. . . Fire Protection by Computer Design

Hydratec Incorporated
64 Haverhill Road
Route 111
Windham, NH 03087
603-434-0502

I certify to the best of my knowledge, information, and belief that the design of this system complies with all applicable provisions of NFPA standards and local fire codes.

Dennis T. Scherr

Dennis T. Scherr
NICET Level IV
Water-Based Systems Layout
Cert. # 113016 Exp. 3/1/2029

| | | |
|---|---|---|
| Job Name | : | 227317 QTS DC2 - CALC 6 SYS W 2-09 |
| Drawing | : | FP4 |
| Location | : | 1140 N GUN CLUB RD |
| System | : | CALC 6 SYS W 2-09 |
| Contract | : | 227317 |
| Data File | : | 227317 QTS DC2 - CALC6 - SYS W 2-09.wxtmp |



Computer Programs by Hydratec Inc. Revision: 50.5520.727

***HYDRAULIC CALCULATIONS***
***for***

***JOB NAME*** QTS DC2
***Location*** 1140 N GUN CLUB RD
***Drawing #*** FP4
***Contract #*** 227317
***Date*** 03.25.26

***DESIGN***

***Remote area #*** CALC 6 SYS W 2-09
***Remote area location*** CALC 6 SYS W 2-09
***Occupancy classification*** ORDINARY HAZ GRP- 2
***Density*** .2 - Gpm/SqFt
***Area of application*** 1,618 - SqFt
***Coverage/sprinkler*** 130 - SqFt
***Type of sprinkler calculated*** 5.6K
***# Sprinklers calculated*** 17
***In-rack demand*** N/A - GPM
***Hose streams*** 250 - GPM
***Total water required (including hose streams)*** 746.54 - GPM @ 28.7137 - Psi
***Type of system*** Wet Pipe
***Volume of system (dry or pre-action)*** N/A - Gal

***WATER SUPPLY INFORMATION***

***Test date*** 7.16.2025
***Location*** 1140 N GUN CLUB RD
***Source of info*** ONSITE FIRE HYD #05U-08

***CONTRACTOR INFO*** Shambaugh & Son
***Address*** 6445 W. Sunset Rd
***Phone #*** 702-832-4547
***Name of designer*** E.Velasco
***Authority having jurisdiction*** AURORA, CO
***NOTES:*** Saftey Margin: 47.83 PSI
ACTUAL STATIC: 71
ACTUAL RESIDUAL: 58

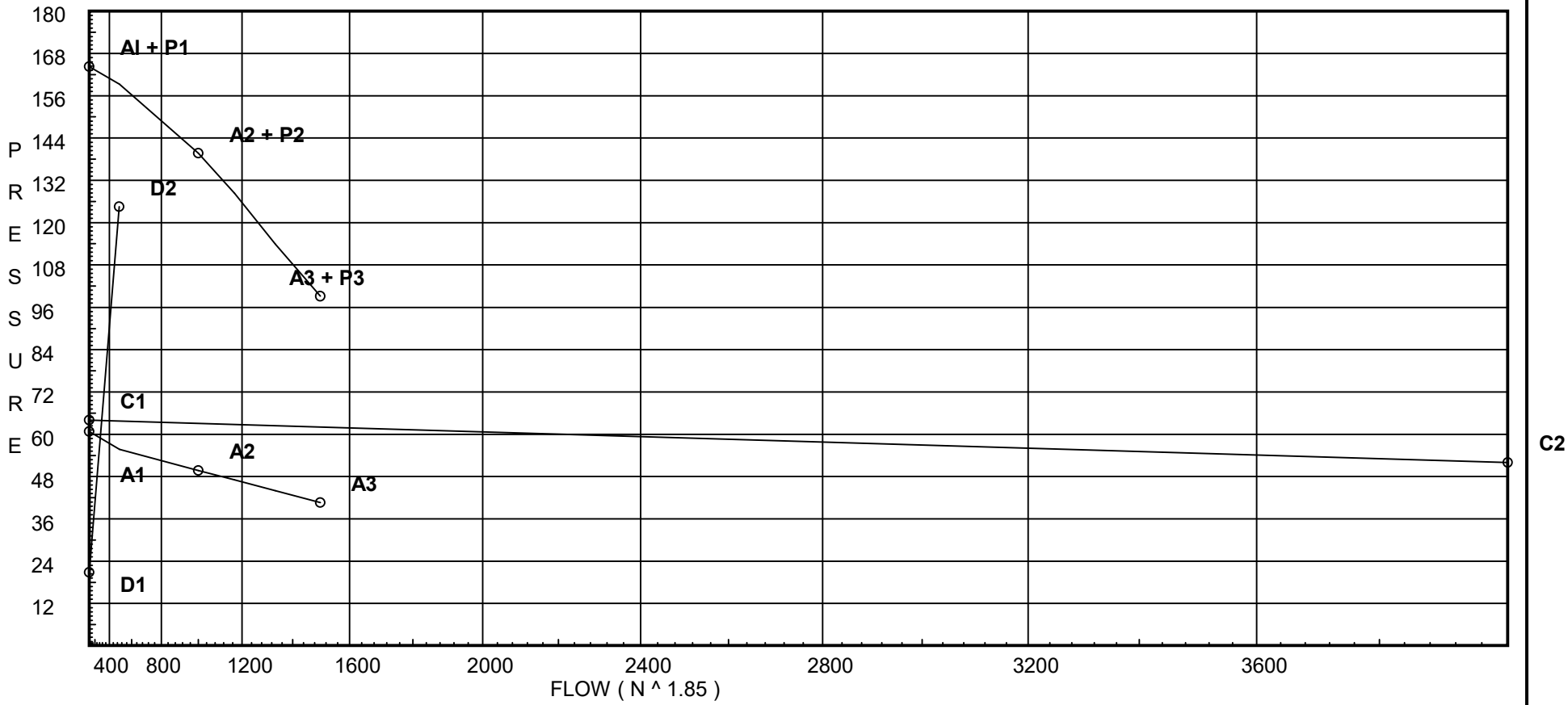
text1(35) - invisible

City Water Supply:
- C1 - Static Pressure : 64
- C2 - Residual Pressure: 52
- C2 - Residual Flow : 4000

City Water Adjusted to Pump Inlet for Pf - Elev - Hose Flow
- A1 - Adjusted Static: 60.777
- A2 - Adj Resid : 49.711 @ 1000
- A3 - Adj Resid : 40.625 @ 1500

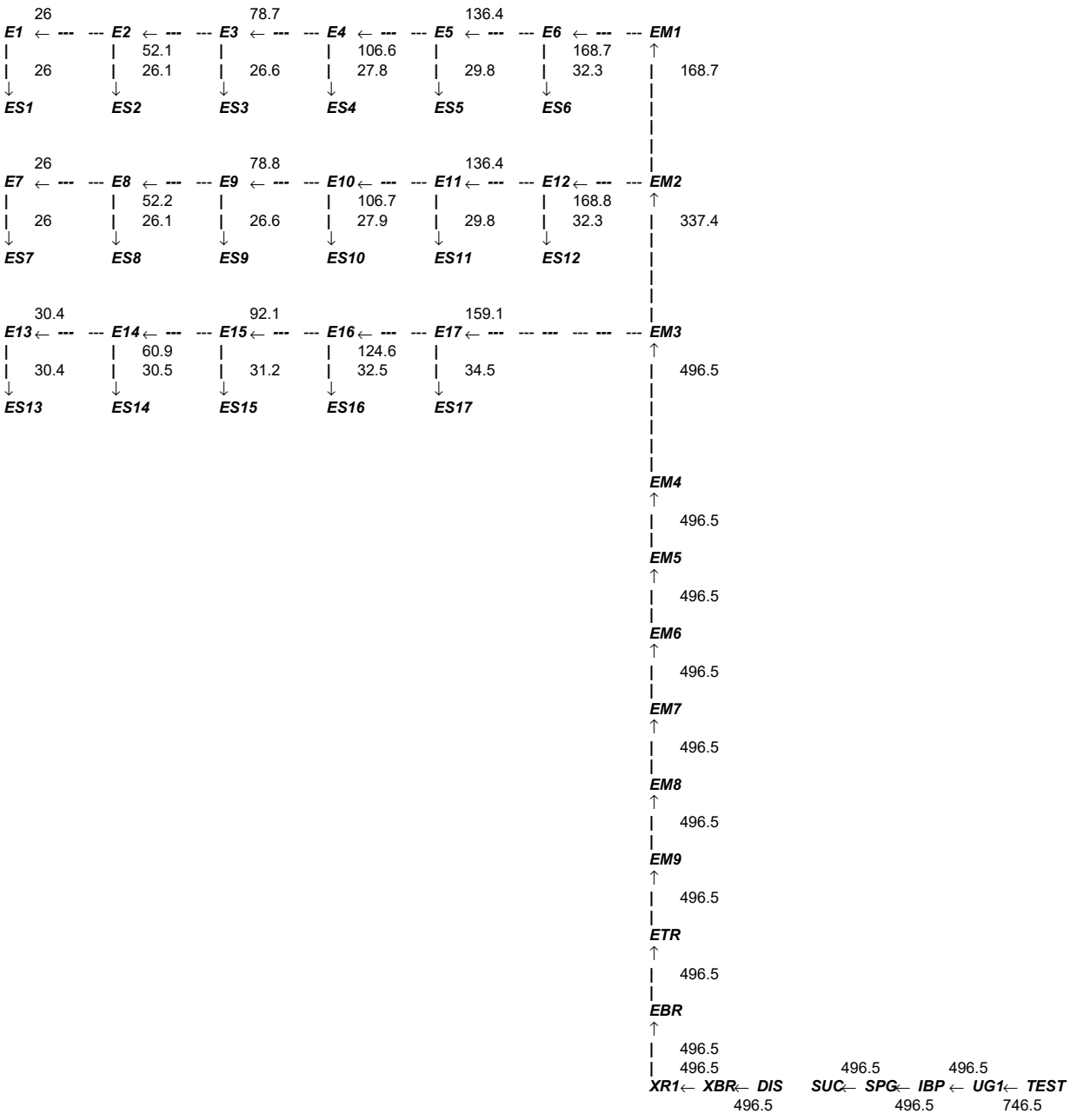
Pump Data:
- P1 - Pump Churn Pressure : 103.5
- P2 - Pump Rated Pressure : 90
- P2 - Pump Rated Flow : 1000
- P3 - Pump Pressure @ Max Flow : 58.5
- P3 - Pump Max Flow : 1500
- City Residual Flow @ 0 = 9886.27
- City Residual Flow @ 20 = 8073.68
- City Water @ 150% of Pump = 62.05

Demand:
- D1 - Elevation : 20.789
- D2 - System Flow : 496.54
- D2 - System Pressure : 124.520
- Hose ( Demand ) : _____
- D3 - System Demand : 496.54
- Hose ( Adj City ) : 250
- Safety Margin : 34.749






Computer Programs by Hydratec Inc. Revision: 50.5520.727


26
E1
52.1
26
26.1
ES1
ES2
78.7
E3
26.6
ES3
106.6
E4
27.8
ES4
136.4
E5
29.8
ES5
E6
168.7
32.3
ES6
EM1
168.7
26
E7
52.2
26
26.1
ES7
ES8
78.8
E9
26.6
ES9
E10
106.7
27.9
ES10
136.4
E11
29.8
ES11
E12
168.8
32.3
ES12
EM2
337.4
30.4
E13
60.9
30.4
30.5
ES13
ES14
92.1
E15
31.2
ES15
E16
124.6
32.5
ES16
159.1
E17
34.5
ES17
EM3
496.5
EM4
496.5
EM5
496.5
EM6
496.5
EM7
496.5
EM8
496.5
EM9
496.5
ETR
496.5
EBR
496.5
496.5
XR1
XBR
DIS
496.5
496.5
SUC
SPG
496.5
IBP
UG1
TEST
746.5

Fitting Legend

| Abbrev. | Name | ½ | ¾ | 1 | 1¼ | 1½ | 2 | 2½ | 3 | 3½ | 4 | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 24 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B | NFPA 13 Butterfly Valve | 0 | 0 | 0 | 0 | 0 | 6 | 7 | 10 | 0 | 12 | 9 | 10 | 12 | 19 | 21 | 23 | 25 | 0 | 0 | 0 |
| E | 90 - NFPA | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 10 | 12 | 14 | 18 | 22 | 27 | 35 | 40 | 45 | 50 | 61 |
| F | 45 - NFPA | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 4 | 5 | 7 | 9 | 11 | 13 | 17 | 19 | 21 | 24 | 28 |
| G | NFPA 13 Gate Valve | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 10 | 11 | 13 |
| S | Swing Check NFPA 13 | 0 | 0 | 5 | 7 | 9 | 11 | 14 | 16 | 19 | 22 | 27 | 32 | 45 | 55 | 65 | | | | | |
| T | TEE - NFPA | 3 | 4 | 5 | 6 | 8 | 10 | 12 | 15 | 17 | 20 | 25 | 30 | 35 | 50 | 60 | 71 | 81 | 91 | 101 | 121 |
| V | 90 - GROOVED | 0 | 0 | 1.7 | 2 | 2.6 | 3.5 | 4.3 | 5 | 0 | 6.8 | 8.5 | 10 | 13 | 17 | 20 | 24.5 | 28 | 31 | 34 | 42 |
| X | TEE - GROOVED | 0 | 0 | 4.2 | 7.5 | 6.63 | 8.5 | 10.8 | 13 | 0 | 16 | 21 | 25 | 33 | 41 | 50 | 70 | 80 | 90 | 100 | 120 |
| Zaf | Ames 3000SS | Fitting generates a Fixed Loss Based on Flow | | | | | | | | | | | | | | | | | | | |

Units Summary

| | |
|---|---|
| Diameter Units | Inches |
| Length Units | Feet |
| Flow Units | US Gallons per Minute |
| Pressure Units | Pounds per Square Inch |

Note: Fitting Legend provides equivalent pipe lengths for fittings types of various diameters. Equivalent lengths shown are standard for actual diameters of Sched 40 pipe and CFactors of 120 except as noted with *. The fittings marked with a * show equivalent lengths values supplied by manufacturers based on specific pipe diameters and CFactors and they require no adjustment. All values for fittings not marked with a * will be adjusted in the calculation for CFactors of other than 120 and diameters other than Sched 40 per NFPA.

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## SUPPLY ANALYSIS

| Node at Source | Static Pressure | Residual Pressure | Flow | Available Pressure | Total Demand | Required Pressure |
|---|---|---|---|---|---|---|
| DIS | See Information on Pump Curve | | | 159.269 | 496.54 | 124.52 |
| TEST | 64.0 | 52 | 4000.0 | 63.462 | 746.54 | 63.462 |

## NODE ANALYSIS

| Node Tag | Elevation | Node Type | Pressure at Node | Discharge at Node | Notes | |
|---|---|---|---|---|---|---|
| ES1 | 50.0 | 5.6 | 21.56 | 26.0 | 0.2 | 130 |
| ES2 | 50.0 | 5.6 | 21.75 | 26.12 | 0.2 | 130 |
| ES3 | 50.0 | 5.6 | 22.61 | 26.63 | 0.2 | 130 |
| ES4 | 50.0 | 5.6 | 24.73 | 27.85 | 0.2 | 130 |
| ES5 | 50.0 | 5.6 | 28.27 | 29.77 | 0.2 | 130 |
| ES6 | 50.0 | 5.6 | 33.28 | 32.31 | 0.2 | 130 |
| ES7 | 50.0 | 5.6 | 21.58 | 26.02 | 0.2 | 130 |
| ES8 | 50.0 | 5.6 | 21.78 | 26.14 | 0.2 | 130 |
| ES9 | 50.0 | 5.6 | 22.64 | 26.64 | 0.2 | 130 |
| ES10 | 50.0 | 5.6 | 24.76 | 27.86 | 0.2 | 130 |
| ES11 | 50.0 | 5.6 | 28.3 | 29.79 | 0.2 | 130 |
| ES12 | 50.0 | 5.6 | 33.32 | 32.33 | 0.2 | 130 |
| ES13 | 50.0 | 5.6 | 29.39 | 30.36 | 0.2 | 130 |
| ES14 | 50.0 | 5.6 | 29.7 | 30.52 | 0.2 | 130 |
| ES15 | 50.0 | 5.6 | 31.02 | 31.19 | 0.2 | 130 |
| ES16 | 50.0 | 5.6 | 33.72 | 32.52 | 0.2 | 130 |
| ES17 | 50.0 | 5.6 | 37.97 | 34.51 | 0.2 | 130 |
| E1 | 50.0 | | 22.93 | | | |
| E2 | 50.0 | | 23.14 | | | |
| E3 | 50.0 | | 24.04 | | | |
| E4 | 50.0 | | 26.29 | | | |
| E5 | 50.0 | | 30.04 | | | |
| E6 | 50.0 | | 35.34 | | | |
| E7 | 50.0 | | 22.96 | | | |
| E8 | 50.0 | | 23.17 | | | |
| E9 | 50.0 | | 24.07 | | | |
| E10 | 50.0 | | 26.32 | | | |
| E11 | 50.0 | | 30.07 | | | |
| E12 | 50.0 | | 35.38 | | | |
| E13 | 50.0 | | 31.22 | | | |
| E14 | 50.0 | | 31.55 | | | |
| E15 | 50.0 | | 32.94 | | | |
| E16 | 50.0 | | 35.8 | | | |
| E17 | 50.0 | | 40.29 | | | |
| EM1 | 45.167 | | 81.59 | | | |
| EM2 | 45.167 | | 81.68 | | | |
| EM3 | 45.167 | | 82.01 | | | |
| EM4 | 45.167 | | 85.86 | | | |
| EM5 | 45.167 | | 86.49 | | | |
| EM6 | 45.167 | | 87.11 | | | |
| EM7 | 45.167 | | 87.74 | | | |

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***NODE ANALYSIS (cont.)***

| *Node Tag* | *Elevation* | *Node Type* | *Pressure at Node* | *Discharge at Node* | *Notes* |
|---|---|---|---|---|---|
| EM8 | 45.167 | | 88.36 | | |
| EM9 | 45.167 | | 88.81 | | |
| ETR | 45.0 | | 103.85 | | |
| EBR | 22.667 | | 114.34 | | |
| XR1 | 2.167 | | 123.74 | | |
| XBR | 2.0 | | 124.36 | | |
| DIS | 2.0 | | 124.52 | | |
| SUC | 2.0 | | 55.78 | | |
| SPG | 1.0 | | 60.8 | | |
| IBP | -5.0 | | 63.48 | | |
| UG1 | -5.0 | | 63.83 | 250.0 | |
| TEST | 2.0 | | 63.46 | | |


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| Node1<br>to<br>Node2 | Elev1<br><br>Elev2 | K<br><br>Fact | Qa<br><br>Qt | Nom<br><br>Act | Fitting<br>or<br>Eqiv | Len | Pipe<br>Ftngs<br>Total | CFact<br><br>Pf/Ft | Pt<br>Pe<br>Pf | ******* Notes ****** |
|---|---|---|---|---|---|---|---|---|---|---|
| *HEADS | | | | | | | | | | |
| ES1 | 50 | 5.60 | 26.00 | 1 | T | 5.0 | 1.500 | 120 | 21.556 | |
| to | | | | | | | 5.000 | | 0.0 | |
| E1 | 50 | | 26.0 | 1.049 | | | 6.500 | 0.2114 | 1.374 | Vel = 9.65 |
| | | | 0.0 | | | | | | | |
| E1 | | | 26.00 | | | | | | 22.930 | K Factor = 5.43 |
| ES2 | 50 | 5.60 | 26.12 | 1 | T | 5.0 | 1.500 | 120 | 21.754 | |
| to | | | | | | | 5.000 | | 0.0 | |
| E2 | 50 | | 26.12 | 1.049 | | | 6.500 | 0.2132 | 1.386 | Vel = 9.70 |
| | | | 0.0 | | | | | | | |
| E2 | | | 26.12 | | | | | | 23.140 | K Factor = 5.43 |
| ES3 | 50 | 5.60 | 26.63 | 1 | T | 5.0 | 1.500 | 120 | 22.607 | |
| to | | | | | | | 5.000 | | 0.0 | |
| E3 | 50 | | 26.63 | 1.049 | | | 6.500 | 0.2209 | 1.436 | Vel = 9.89 |
| | | | 0.0 | | | | | | | |
| E3 | | | 26.63 | | | | | | 24.043 | K Factor = 5.43 |
| ES4 | 50 | 5.60 | 27.85 | 1 | T | 5.0 | 1.500 | 120 | 24.726 | |
| to | | | | | | | 5.000 | | 0.0 | |
| E4 | 50 | | 27.85 | 1.049 | | | 6.500 | 0.2400 | 1.560 | Vel = 10.34 |
| | | | 0.0 | | | | | | | |
| E4 | | | 27.85 | | | | | | 26.286 | K Factor = 5.43 |
| ES5 | 50 | 5.60 | 29.77 | 1 | T | 5.0 | 1.500 | 120 | 28.269 | |
| to | | | | | | | 5.000 | | 0.0 | |
| E5 | 50 | | 29.77 | 1.049 | | | 6.500 | 0.2717 | 1.766 | Vel = 11.05 |
| | | | 0.0 | | | | | | | |
| E5 | | | 29.77 | | | | | | 30.035 | K Factor = 5.43 |
| ES6 | 50 | 5.60 | 32.31 | 1 | T | 5.0 | 1.500 | 120 | 33.284 | |
| to | | | | | | | 5.000 | | 0.0 | |
| E6 | 50 | | 32.31 | 1.049 | | | 6.500 | 0.3160 | 2.054 | Vel = 11.99 |
| | | | 0.0 | | | | | | | |
| E6 | | | 32.31 | | | | | | 35.338 | K Factor = 5.44 |
| ES7 | 50 | 5.60 | 26.02 | 1 | T | 5.0 | 1.500 | 120 | 21.582 | |
| to | | | | | | | 5.000 | | 0.0 | |
| E7 | 50 | | 26.02 | 1.049 | | | 6.500 | 0.2117 | 1.376 | Vel = 9.66 |
| | | | 0.0 | | | | | | | |
| E7 | | | 26.02 | | | | | | 22.958 | K Factor = 5.43 |
| ES8 | 50 | 5.60 | 26.14 | 1 | T | 5.0 | 1.500 | 120 | 21.781 | |
| to | | | | | | | 5.000 | | 0.0 | |
| E8 | 50 | | 26.14 | 1.049 | | | 6.500 | 0.2135 | 1.388 | Vel = 9.70 |
| | | | 0.0 | | | | | | | |
| E8 | | | 26.14 | | | | | | 23.169 | K Factor = 5.43 |
| ES9 | 50 | 5.60 | 26.64 | 1 | T | 5.0 | 1.500 | 120 | 22.635 | |
| to | | | | | | | 5.000 | | 0.0 | |
| E9 | 50 | | 26.64 | 1.049 | | | 6.500 | 0.2211 | 1.437 | Vel = 9.89 |
| | | | 0.0 | | | | | | | |
| E9 | | | 26.64 | | | | | | 24.072 | K Factor = 5.43 |
| ES10 | 50 | 5.60 | 27.86 | 1 | T | 5.0 | 1.500 | 120 | 24.756 | |
| to | | | | | | | 5.000 | | 0.0 | |
| E10 | 50 | | 27.86 | 1.049 | | | 6.500 | 0.2403 | 1.562 | Vel = 10.34 |


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| Node1<br>to<br>Node2 | Elev1<br><br>Elev2 | K<br><br>Fact | Qa<br><br>Qt | Nom<br><br>Act | Fitting<br>or<br>Eqiv | Len | Pipe<br>Ftngs<br>Total | CFact<br><br>Pf/Ft | Pt<br>Pe<br>Pf | ******* Notes ****** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0.0 | | | | | | | |
| E10 | | | 27.86 | | | | | | 26.318 | K Factor = 5.43 |
| ES11 | 50 | 5.60 | 29.79 | 1 | T | 5.0 | 1.500 | 120 | 28.303 | |
| to | | | | | | | 5.000 | | 0.0 | |
| E11 | 50 | | 29.79 | 1.049 | | | 6.500 | 0.2720 | 1.768 | Vel = 11.06 |
| | | | 0.0 | | | | | | | |
| E11 | | | 29.79 | | | | | | 30.071 | K Factor = 5.43 |
| ES12 | 50 | 5.60 | 32.33 | 1 | T | 5.0 | 1.500 | 120 | 33.324 | |
| to | | | | | | | 5.000 | | 0.0 | |
| E12 | 50 | | 32.33 | 1.049 | | | 6.500 | 0.3163 | 2.056 | Vel = 12.00 |
| | | | 0.0 | | | | | | | |
| E12 | | | 32.33 | | | | | | 35.380 | K Factor = 5.44 |
| ES13 | 50 | 5.60 | 30.36 | 1 | T | 5.0 | 1.500 | 120 | 29.386 | |
| to | | | | | | | 5.000 | | 0.0 | |
| E13 | 50 | | 30.36 | 1.049 | | | 6.500 | 0.2817 | 1.831 | Vel = 11.27 |
| | | | 0.0 | | | | | | | |
| E13 | | | 30.36 | | | | | | 31.217 | K Factor = 5.43 |
| ES14 | 50 | 5.60 | 30.52 | 1 | T | 5.0 | 1.500 | 120 | 29.700 | |
| to | | | | | | | 5.000 | | 0.0 | |
| E14 | 50 | | 30.52 | 1.049 | | | 6.500 | 0.2845 | 1.849 | Vel = 11.33 |
| | | | 0.0 | | | | | | | |
| E14 | | | 30.52 | | | | | | 31.549 | K Factor = 5.43 |
| ES15 | 50 | 5.60 | 31.19 | 1 | T | 5.0 | 1.500 | 120 | 31.018 | |
| to | | | | | | | 5.000 | | 0.0 | |
| E15 | 50 | | 31.19 | 1.049 | | | 6.500 | 0.2960 | 1.924 | Vel = 11.58 |
| | | | 0.0 | | | | | | | |
| E15 | | | 31.19 | | | | | | 32.942 | K Factor = 5.43 |
| ES16 | 50 | 5.60 | 32.52 | 1 | T | 5.0 | 1.500 | 120 | 33.722 | |
| to | | | | | | | 5.000 | | 0.0 | |
| E16 | 50 | | 32.52 | 1.049 | | | 6.500 | 0.3198 | 2.079 | Vel = 12.07 |
| | | | 0.0 | | | | | | | |
| E16 | | | 32.52 | | | | | | 35.801 | K Factor = 5.44 |
| ES17 | 50 | 5.60 | 34.51 | 1 | T | 5.0 | 1.500 | 120 | 37.968 | |
| to | | | | | | | 5.000 | | 0.0 | |
| E17 | 50 | | 34.51 | 1.049 | | | 6.500 | 0.3569 | 2.320 | Vel = 12.81 |
| | | | 0.0 | | | | | | | |
| E17 | | | 34.51 | | | | | | 40.288 | K Factor = 5.44 |
| *LINE1 | | | | | | | | | | |
| E1 | 50 | | 26.00 | 1.5 | | | 8.000 | 120 | 22.930 | |
| to | | | | | | | | | 0.0 | |
| E2 | 50 | | 26.0 | 1.61 | | | 8.000 | 0.0262 | 0.210 | Vel = 4.10 |
| E2 | 50 | | 26.12 | 1.5 | | | 9.500 | 120 | 23.140 | |
| to | | | | | | | | | 0.0 | |
| E3 | 50 | | 52.12 | 1.61 | | | 9.500 | 0.0951 | 0.903 | Vel = 8.21 |
| E3 | 50 | | 26.63 | 1.5 | | | 11.000 | 120 | 24.043 | |
| to | | | | | | | | | 0.0 | |
| E4 | 50 | | 78.75 | 1.61 | | | 11.000 | 0.2039 | 2.243 | Vel = 12.41 |


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| Node1 to Node2 | Elev1 Elev2 | K Fact | Qa Qt | Nom Act | Fitting or Eqiv | Len | Pipe Ftngs Total | CFact Pf/Ft | Pt Pe Pf | ******* Notes ****** |
|---|---|---|---|---|---|---|---|---|---|---|
| E4 | 50 | | 27.84 | 1.5 | | | 10.500 | 120 | 26.286 | |
| to | | | | | | | | | 0.0 | |
| E5 | 50 | | 106.59 | 1.61 | | | 10.500 | 0.3570 | 3.749 | Vel = 16.80 |
| E5 | 50 | | 29.78 | 1.5 | | | 9.417 | 120 | 30.035 | |
| to | | | | | | | | | 0.0 | |
| E6 | 50 | | 136.37 | 1.61 | | | 9.417 | 0.5631 | 5.303 | Vel = 21.49 |
| E6 | 50 | | 32.30 | 1.5 | 2V | 5.2 | 33.083 | 120 | 35.338 | |
| to | | | | | X | 6.63 | 19.830 | | 2.093 | |
| EM1 | 45.167 | | 168.67 | 1.61 | T | 8.0 | 52.913 | 0.8345 | 44.158 | Vel = 26.58 |
| | | | 0.0 | | | | | | | |
| EM1 | | | 168.67 | | | | | | 81.589 | K Factor = 18.67 |
| *LINE2 | | | | | | | | | | |
| E7 | 50 | | 26.02 | 1.5 | | | 8.000 | 120 | 22.958 | |
| to | | | | | | | | | 0.0 | |
| E8 | 50 | | 26.02 | 1.61 | | | 8.000 | 0.0264 | 0.211 | Vel = 4.10 |
| E8 | 50 | | 26.13 | 1.5 | | | 9.500 | 120 | 23.169 | |
| to | | | | | | | | | 0.0 | |
| E9 | 50 | | 52.15 | 1.61 | | | 9.500 | 0.0951 | 0.903 | Vel = 8.22 |
| E9 | 50 | | 26.64 | 1.5 | | | 11.000 | 120 | 24.072 | |
| to | | | | | | | | | 0.0 | |
| E10 | 50 | | 78.79 | 1.61 | | | 11.000 | 0.2042 | 2.246 | Vel = 12.42 |
| E10 | 50 | | 27.87 | 1.5 | | | 10.500 | 120 | 26.318 | |
| to | | | | | | | | | 0.0 | |
| E11 | 50 | | 106.66 | 1.61 | | | 10.500 | 0.3574 | 3.753 | Vel = 16.81 |
| E11 | 50 | | 29.79 | 1.5 | | | 9.417 | 120 | 30.071 | |
| to | | | | | | | | | 0.0 | |
| E12 | 50 | | 136.45 | 1.61 | | | 9.417 | 0.5638 | 5.309 | Vel = 21.50 |
| E12 | 50 | | 32.33 | 1.5 | 2V | 5.2 | 33.083 | 120 | 35.380 | |
| to | | | | | X | 6.63 | 19.830 | | 2.093 | |
| EM2 | 45.167 | | 168.78 | 1.61 | T | 8.0 | 52.913 | 0.8355 | 44.208 | Vel = 26.60 |
| | | | 0.0 | | | | | | | |
| EM2 | | | 168.78 | | | | | | 81.681 | K Factor = 18.67 |
| *LINE3 | | | | | | | | | | |
| E13 | 50 | | 30.36 | 1.5 | | | 9.500 | 120 | 31.217 | |
| to | | | | | | | | | 0.0 | |
| E14 | 50 | | 30.36 | 1.61 | | | 9.500 | 0.0349 | 0.332 | Vel = 4.78 |
| E14 | 50 | | 30.52 | 1.5 | | | 11.000 | 120 | 31.549 | |
| to | | | | | | | | | 0.0 | |
| E15 | 50 | | 60.88 | 1.61 | | | 11.000 | 0.1266 | 1.393 | Vel = 9.59 |
| E15 | 50 | | 31.18 | 1.5 | | | 10.500 | 120 | 32.942 | |
| to | | | | | | | | | 0.0 | |
| E16 | 50 | | 92.06 | 1.61 | | | 10.500 | 0.2723 | 2.859 | Vel = 14.51 |
| E16 | 50 | | 32.52 | 1.5 | | | 9.417 | 120 | 35.801 | |
| to | | | | | | | | | 0.0 | |
| E17 | 50 | | 124.58 | 1.61 | | | 9.417 | 0.4765 | 4.487 | Vel = 19.63 |
| E17 | 50 | | 34.51 | 1.5 | 2V | 5.2 | 33.083 | 120 | 40.288 | |
| to | | | | | X | 6.63 | 19.830 | | 2.093 | |
| EM3 | 45.167 | | 159.09 | 1.61 | T | 8.0 | 52.913 | 0.7489 | 39.629 | Vel = 25.07 |


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| Node1 to Node2 | Elev1 Elev2 | K Fact | Qa Qt | Nom Act | Fitting or Eqiv | Len | Pipe Ftngs Total | CFact Pf/Ft | Pt Pe Pf | ******* Notes ****** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0.0 | | | | | | | |
| EM3 | | | 159.09 | | | | | | 82.010 | K Factor = 17.57 |
| *MAIN | | | | | | | | | | |
| EM1 | 45.167 | | 168.67 | 4 | | | 9.500 | 120 | 81.589 | |
| to | | | | | | | | | 0.0 | |
| EM2 | 45.167 | | 168.67 | 4.026 | | | 9.500 | 0.0097 | 0.092 | Vel = 4.25 |
| EM2 | 45.167 | | 168.78 | 4 | | | 9.500 | 120 | 81.681 | |
| to | | | | | | | | | 0.0 | |
| EM3 | 45.167 | | 337.45 | 4.026 | | | 9.500 | 0.0346 | 0.329 | Vel = 8.50 |
| EM3 | 45.167 | | 159.09 | 4 | | | 54.333 | 120 | 82.010 | |
| to | | | | | | | | | 0.0 | |
| EM4 | 45.167 | | 496.54 | 4.026 | | | 54.333 | 0.0709 | 3.850 | Vel = 12.51 |
| EM4 | 45.167 | | 0.0 | 4 | | | 8.833 | 120 | 85.860 | |
| to | | | | | | | | | 0.0 | |
| EM5 | 45.167 | | 496.54 | 4.026 | | | 8.833 | 0.0709 | 0.626 | Vel = 12.51 |
| EM5 | 45.167 | | 0.0 | 4 | | | 8.833 | 120 | 86.486 | |
| to | | | | | | | | | 0.0 | |
| EM6 | 45.167 | | 496.54 | 4.026 | | | 8.833 | 0.0709 | 0.626 | Vel = 12.51 |
| EM6 | 45.167 | | 0.0 | 4 | | | 8.833 | 120 | 87.112 | |
| to | | | | | | | | | 0.0 | |
| EM7 | 45.167 | | 496.54 | 4.026 | | | 8.833 | 0.0709 | 0.626 | Vel = 12.51 |
| EM7 | 45.167 | | 0.0 | 4 | | | 8.833 | 120 | 87.738 | |
| to | | | | | | | | | 0.0 | |
| EM8 | 45.167 | | 496.54 | 4.026 | | | 8.833 | 0.0709 | 0.626 | Vel = 12.51 |
| EM8 | 45.167 | | 0.0 | 4 | | | 6.333 | 120 | 88.364 | |
| to | | | | | | | | | 0.0 | |
| EM9 | 45.167 | | 496.54 | 4.026 | | | 6.333 | 0.0709 | 0.449 | Vel = 12.51 |
| EM9 | 45.167 | | 0.0 | 4 | 4V | 27.2 | 168.000 | 120 | 88.813 | |
| to | | | | | X | 16.0 | 43.200 | | 0.072 | |
| ETR | 45 | | 496.54 | 4.026 | | | 211.200 | 0.0709 | 14.967 | Vel = 12.51 |
| ETR | 45 | | 0.0 | 6 | S | 40.235 | 15.667 | 120 | 103.852 | |
| to | | | | | B | 12.573 | 90.528 | | 9.672 | |
| EBR | 22.667 | | 496.54 | 6.357 | T | 37.72 | 106.195 | 0.0077 | 0.814 | Vel = 5.02 |
| EBR | 22.667 | | 0.0 | 6 | 2V | 25.147 | 11.417 | 120 | 114.338 | |
| to | | | | | X | 31.433 | 56.580 | | 8.879 | |
| XR1 | 2.167 | | 496.54 | 6.357 | | | 67.997 | 0.0077 | 0.521 | Vel = 5.02 |
| XR1 | 2.167 | | 0.0 | 6 | B | 12.573 | 21.167 | 120 | 123.738 | |
| to | | | | | T | 37.72 | 50.293 | | 0.072 | |
| XBR | 2 | | 496.54 | 6.357 | | | 71.460 | 0.0077 | 0.548 | Vel = 5.02 |
| | | | 0.0 | | | | | | | |
| XBR | | | 496.54 | | | | | | 124.358 | K Factor = 44.53 |
| *PUMP | | | | | | | | | | |
| XBR | 2 | | 496.54 | 8 | B | 14.094 | 8.250 | 120 | 124.358 | |
| to | | | | | S | 52.853 | 66.947 | | 0.0 | |
| DIS | 2 | | 496.54 | 8.249 | | | 75.197 | 0.0022 | 0.162 | Vel = 2.98 |
| | | | 0.0 | | | | | | | |
| DIS | | | 496.54 | | | | | | 124.520 | K Factor = 44.50 |

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| Node1 to Node2 | Elev1 Elev2 | K Fact | Qa Qt | Nom Act | Fitting or Eqiv | Len | Pipe Ftngs Total | CFact Pf/Ft | Pt Pe Pf | ******* | Notes | ****** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| System Demand Pressure | | | | | | | | | 124.520 | | | |
| Safety Margin | | | | | | | | | 34.749 | | | |
| Continuation Pressure | | | | | | | | | 159.269 | | | |
| Pressure @ Pump Outlet | | | | | | | | | 159.269 | | | |
| Pressure From Pump Curve | | | | | | | | | -103.490 | | | |
| Pressure @ Pump Inlet | | | | | | | | | 55.779 | | | |
| SUC | 2 | | 0.0 | 8 | Zaf | 0.0 | 8.000 | 120 | 55.779 | | | |
| to | | | | | E | 21.141 | 25.839 | | 4.950 | * * Fixed Loss = 4.517 | | |
| SPG | 1 | | 496.54 | 8.249 | G | 4.698 | 33.839 | 0.0022 | 0.073 | Vel = 2.98 | | |
| SPG | 1 | | 0.0 | 8 | E | 21.141 | 15.000 | 120 | 60.802 | | | |
| to | | | | | | | 21.141 | | 2.599 | | | |
| IBP | -5 | | 496.54 | 8.249 | | | 36.141 | 0.0021 | 0.077 | Vel = 2.98 | | |
| IBP | -5 | | 0.0 | 8 | F | 11.278 | 120.000 | 150 | 63.478 | | | |
| to | | | | | T | 43.857 | 55.135 | | 0.0 | | | |
| UG1 | -5 | | 496.54 | 7.68 | | | 175.135 | 0.0020 | 0.354 | Vel = 3.44 | | |
| | | | 0.0 | | | | | | | | | |
| UG1 | | | 496.54 | | | | | | 63.832 | K Factor = 62.15 | | |
| *UG2 | | | | | | | | | | | | |
| UG1 | -5 | H250 | 746.54 | 8 | F | 11.278 | 565.000 | 150 | 63.832 | | | |
| to | | | | | T | 43.857 | 55.135 | | -3.032 | | | |
| TEST | 2 | | 746.54 | 7.68 | | | 620.135 | 0.0043 | 2.663 | Vel = 5.17 | | |
| | | | 0.0 | | | | | | | | | |
| TEST | | | 746.54 | | | | | | 63.463 | K Factor = 93.71 | | |


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EXCELLENCE IN FIRE PROTECTION DESIGN

Shambaugh & Son L.P.
5460 Desert Point Drive
Las Vegas, NV 89118

. . . Fire Protection by Computer Design

Hydratec Incorporated
64 Haverhill Road
Route 111
Windham, NH 03087
603-434-0502

I certify to the best of my knowledge, information, and belief that the design of this system complies with all applicable provisions of NFPA standards and local fire codes.

*Dennis T. Scherr*

Dennis T. Scherr
NICET Level IV
Water-Based Systems Layout
Cert. # 113016 Exp. 3/1/2029

| | | |
|---|---|---|
| Job Name | : | 227317 QTS DC2 - CALC 7 SYS W 2-09 |
| Drawing | : | FP4 |
| Location | : | 1140 N GUN CLUB RD |
| System | : | CALC 7 SYS W 2-09 |
| Contract | : | 227317 |
| Data File | : | 227317 QTS DC2 - CALC7 - SYS W 2-09.wxtmp |



Computer Programs by Hydratec Inc. Revision: 50.5520.727

***HYDRAULIC CALCULATIONS***
***for***

***JOB NAME*** QTS DC2
***Location*** 1140 N GUN CLUB RD
***Drawing #*** FP4
***Contract #*** 227317
***Date*** 03.25.26

***DESIGN***

***Remote area #*** CALC 7 SYS W 2-09
***Remote area location*** CALC 7 SYS W 2-09
***Occupancy classification*** LIGHT HAZARD/ OH GRP-2
***Density*** .1/.2 - Gpm/SqFt
***Area of application*** 1,599 - SqFt
***Coverage/sprinkler*** VARY - SqFt
***Type of sprinkler calculated*** 5.6K
***# Sprinklers calculated*** 15
***In-rack demand*** N/A - GPM
***Hose streams*** 250 - GPM
***Total water required (including hose streams)*** 727.447 - GPM @ -10.4563 - Psi
***Type of system*** Wet Pipe
***Volume of system (dry or pre-action)*** N/A - Gal

***WATER SUPPLY INFORMATION***

***Test date*** 7.16.2025
***Location*** 1140 N GUN CLUB RD
***Source of info*** ONSITE FIRE HYD #05U-08

***CONTRACTOR INFO*** Shambaugh & Son
***Address*** 6445 W. Sunset Rd
***Phone #*** 702-832-4547
***Name of designer*** E.Velasco
***Authority having jurisdiction*** AURORA, CO
***NOTES:*** Saftey Margin: 73.94 PSI
ACTUAL STATIC: 71
ACTUAL RESIDUAL: 58

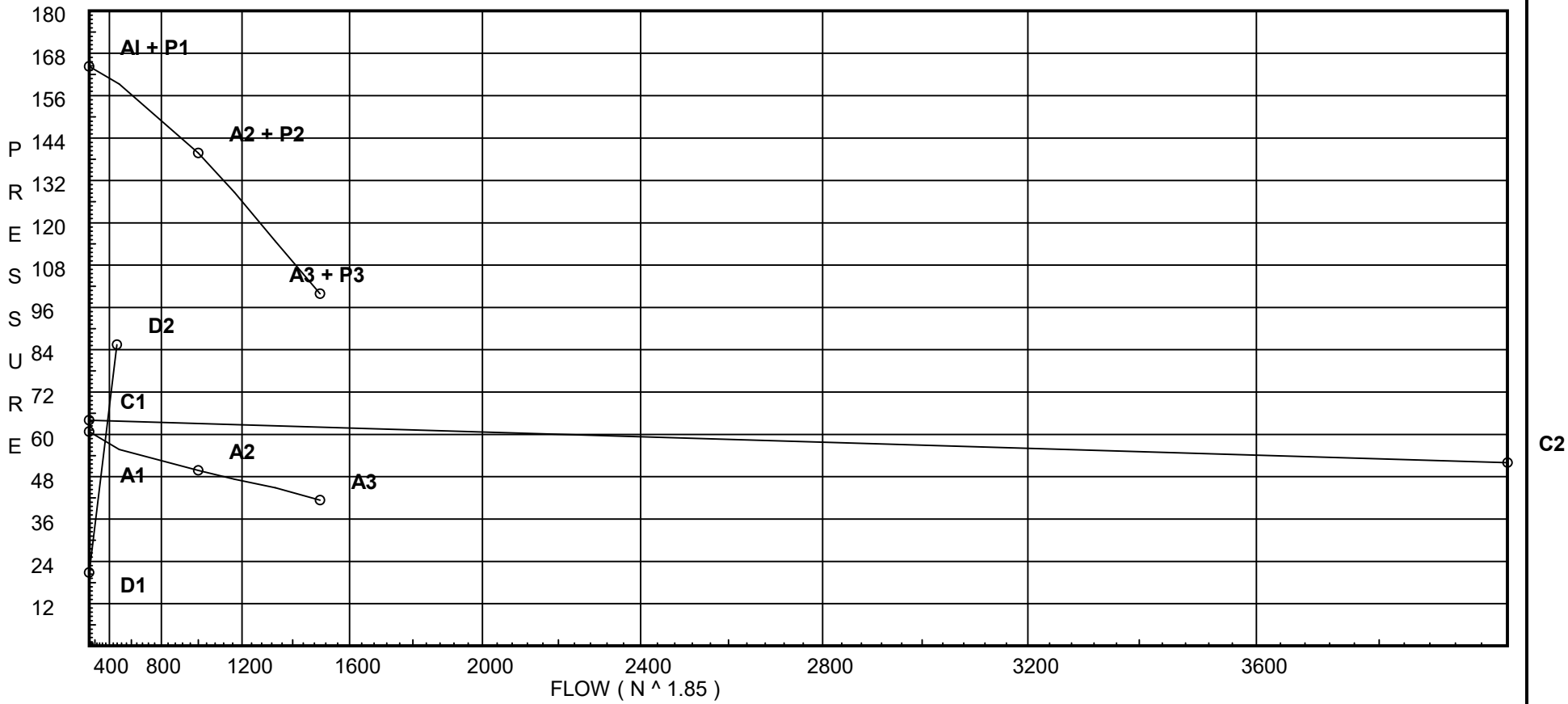
text1(35) - invisible

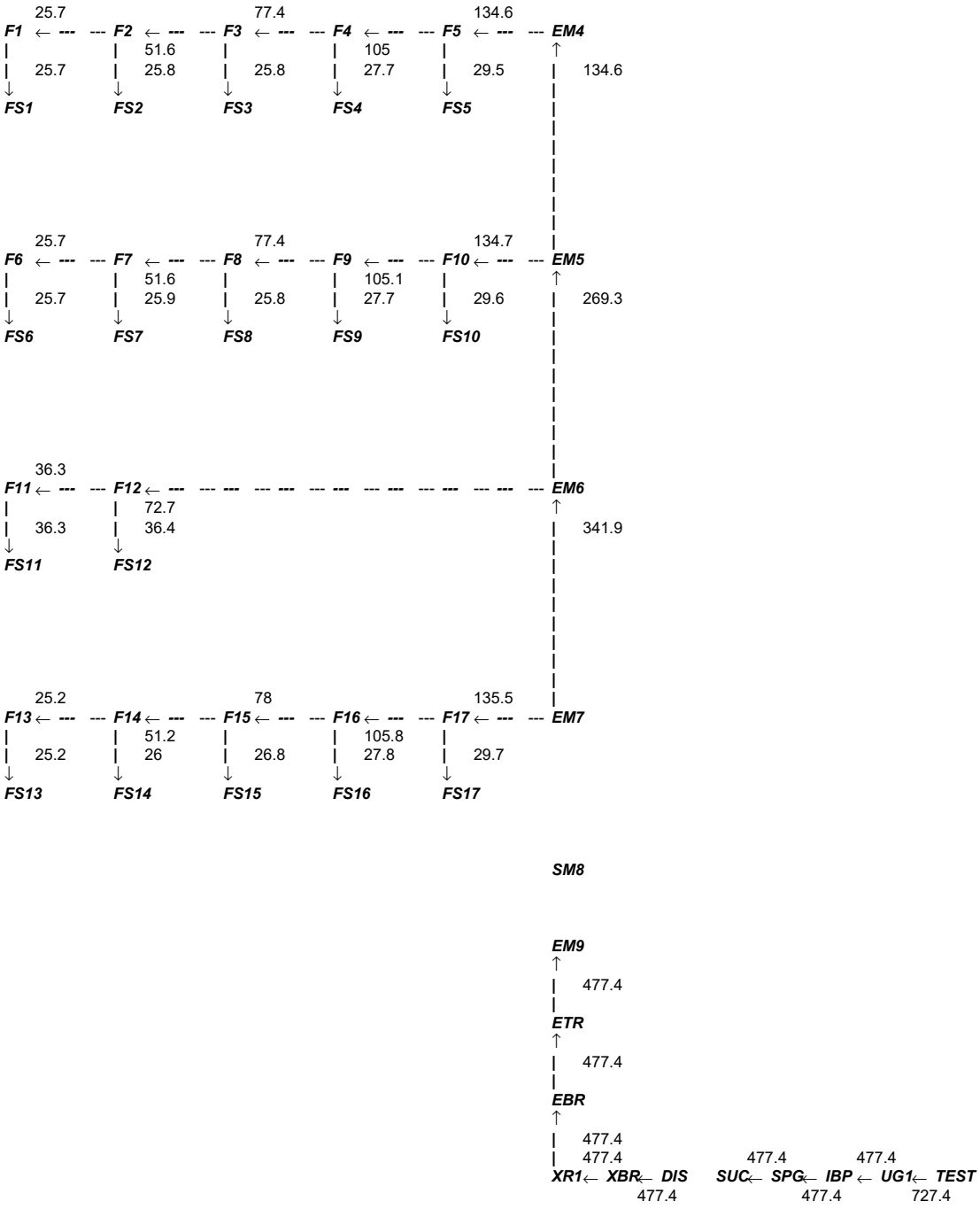
City Water Supply:
- C1 - Static Pressure : 64
- C2 - Residual Pressure: 52
- C2 - Residual Flow : 4000

City Water Adjusted to Pump Inlet for Pf - Elev - Hose Flow
- A1 - Adjusted Static: 60.777
- A2 - Adj Resid : 49.77 @ 1000
- A3 - Adj Resid : 41.347 @ 1500

Pump Data:
- P1 - Pump Churn Pressure : 103.5
- P2 - Pump Rated Pressure : 90
- P2 - Pump Rated Flow : 1000
- P3 - Pump Pressure @ Max Flow : 58.5
- P3 - Pump Max Flow : 1500
- City Residual Flow @ 0 = 9886.27
- City Residual Flow @ 20 = 8073.68
- City Water @ 150% of Pump = 62.05

Demand:
- D1 - Elevation : 20.789
- D2 - System Flow : 477.447
- D2 - System Pressure : 85.415
- Hose ( Demand ) : _____
- D3 - System Demand : 477.447
- Hose ( Adj City ) : 250
- Safety Margin : 73.944




25.7
F1
FS1
F2
51.6
25.8
FS2
77.4
F3
25.8
FS3
F4
105
27.7
FS4
134.6
F5
29.5
FS5
EM4
134.6
25.7
F6
FS6
F7
51.6
25.9
FS7
F8
25.8
FS8
F9
105.1
27.7
FS9
134.7
F10
29.6
FS10
EM5
269.3
36.3
F11
FS11
F12
72.7
36.4
FS12
EM6
341.9
25.2
F13
FS13
F14
51.2
26
FS14
78
F15
26.8
FS15
F16
105.8
27.8
FS16
135.5
F17
29.7
FS17
EM7
SM8
EM9
477.4
ETR
477.4
EBR
477.4
477.4
XR1
XBR
DIS
477.4
477.4
SUC
SPG
477.4
IBP
477.4
UG1
727.4
TEST

Fitting Legend

| Abbrev. | Name | ½ | ¾ | 1 | 1¼ | 1½ | 2 | 2½ | 3 | 3½ | 4 | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 24 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B | NFPA 13 Butterfly Valve | 0 | 0 | 0 | 0 | 0 | 6 | 7 | 10 | 0 | 12 | 9 | 10 | 12 | 19 | 21 | 23 | 25 | 0 | 0 | 0 |
| E | 90 - NFPA | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 10 | 12 | 14 | 18 | 22 | 27 | 35 | 40 | 45 | 50 | 61 |
| F | 45 - NFPA | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 4 | 5 | 7 | 9 | 11 | 13 | 17 | 19 | 21 | 24 | 28 |
| G | NFPA 13 Gate Valve | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 10 | 11 | 13 |
| S | Swing Check NFPA 13 | 0 | 0 | 5 | 7 | 9 | 11 | 14 | 16 | 19 | 22 | 27 | 32 | 45 | 55 | 65 | | | | | |
| T | TEE - NFPA | 3 | 4 | 5 | 6 | 8 | 10 | 12 | 15 | 17 | 20 | 25 | 30 | 35 | 50 | 60 | 71 | 81 | 91 | 101 | 121 |
| V | 90 - GROOVED | 0 | 0 | 1.7 | 2 | 2.6 | 3.5 | 4.3 | 5 | 0 | 6.8 | 8.5 | 10 | 13 | 17 | 20 | 24.5 | 28 | 31 | 34 | 42 |
| Vcfc * | ½ in VicFlex AH2 - 48 in Long | 0 | 0 | 23.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| X | TEE - GROOVED | 0 | 0 | 4.2 | 7.5 | 6.63 | 8.5 | 10.8 | 13 | 0 | 16 | 21 | 25 | 33 | 41 | 50 | 70 | 80 | 90 | 100 | 120 |
| Zaf | Ames 3000SS | Fitting generates a Fixed Loss Based on Flow | | | | | | | | | | | | | | | | | | | |

Units Summary

| | |
|---|---|
| Diameter Units | Inches |
| Length Units | Feet |
| Flow Units | US Gallons per Minute |
| Pressure Units | Pounds per Square Inch |

Note: Fitting Legend provides equivalent pipe lengths for fittings types of various diameters. Equivalent lengths shown are standard for actual diameters of Sched 40 pipe and CFactors of 120 except as noted with *. The fittings marked with a * show equivalent lengths values supplied by manufacturers based on specific pipe diameters and CFactors and they require no adjustment. All values for fittings not marked with a * will be adjusted in the calculation for CFactors of other than 120 and diameters other than Sched 40 per NFPA.

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## SUPPLY ANALYSIS

| Node at Source | Static Pressure | Residual Pressure | Flow | Available Pressure | Total Demand | Required Pressure |
|---|---|---|---|---|---|---|
| DIS | See Information on Pump Curve | | | 159.359 | 477.45 | 85.415 |
| TEST | 64.0 | 52 | 4000.0 | 63.487 | 727.45 | 63.488 |

## NODE ANALYSIS

| Node Tag | Elevation | Node Type | Pressure at Node | Discharge at Node | Notes | |
|---|---|---|---|---|---|---|
| FS1 | 50.0 | 5.6 | 21.1 | 25.73 | 0.1 | 225 |
| FS2 | 50.0 | 5.6 | 21.29 | 25.84 | 0.1 | 225 |
| FS3 | 37.0 | 5.6 | 21.26 | 25.82 | 0.1 | 225 |
| FS4 | 50.0 | 5.6 | 24.39 | 27.65 | 0.2 | 130 |
| FS5 | 50.0 | 5.6 | 27.83 | 29.54 | 0.2 | 130 |
| FS6 | 50.0 | 5.6 | 21.13 | 25.74 | 0.1 | 225 |
| FS7 | 50.0 | 5.6 | 21.32 | 25.86 | 0.1 | 225 |
| FS8 | 37.0 | 5.6 | 21.28 | 25.84 | 0.1 | 225 |
| FS9 | 50.0 | 5.6 | 24.42 | 27.67 | 0.2 | 130 |
| FS10 | 50.0 | 5.6 | 27.87 | 29.56 | 0.2 | 130 |
| FS11 | 50.0 | 5.6 | 41.91 | 36.25 | 0.2 | 130 |
| FS12 | 50.0 | 5.6 | 42.26 | 36.4 | 0.1 | 225 |
| FS13 | 37.0 | 5.6 | 20.29 | 25.23 | 0.1 | 225 |
| FS14 | 50.0 | 5.6 | 21.56 | 26.0 | 0.2 | 130 |
| FS15 | 50.0 | 5.6 | 22.88 | 26.78 | 0.2 | 130 |
| FS16 | 50.0 | 5.6 | 24.66 | 27.81 | 0.2 | 130 |
| FS17 | 50.0 | 5.6 | 28.16 | 29.71 | 0.2 | 130 |
| F1 | 50.0 | | 22.45 | | | |
| F2 | 50.0 | | 22.65 | | | |
| F3 | 50.0 | | 24.07 | | | |
| F4 | 50.0 | | 25.93 | | | |
| F5 | 50.0 | | 29.58 | | | |
| F6 | 50.0 | | 22.48 | | | |
| F7 | 50.0 | | 22.68 | | | |
| F8 | 50.0 | | 24.1 | | | |
| F9 | 50.0 | | 25.96 | | | |
| F10 | 50.0 | | 29.61 | | | |
| F11 | 50.0 | | 44.45 | | | |
| F12 | 50.0 | | 44.82 | | | |
| F13 | 50.0 | | 22.74 | | | |
| F14 | 50.0 | | 22.93 | | | |
| F15 | 50.0 | | 24.33 | | | |
| F16 | 50.0 | | 26.22 | | | |
| F17 | 50.0 | | 29.92 | | | |
| EM4 | 45.167 | | 49.33 | | | |
| EM5 | 45.167 | | 49.38 | | | |
| EM6 | 45.167 | | 49.58 | | | |
| EM7 | 45.167 | | 49.9 | | | |
| EM8 | 45.167 | | 50.48 | | | |
| EM9 | 45.167 | | 50.9 | | | |
| ETR | 45.0 | | 64.89 | | | |

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***NODE ANALYSIS (cont.)***

| *Node Tag* | *Elevation* | *Node Type* | *Pressure at Node* | *Discharge at Node* | *Notes* |
|---|---|---|---|---|---|
| EBR | 22.667 | | 75.32 | | |
| XR1 | 2.167 | | 84.68 | | |
| XBR | 2.0 | | 85.26 | | |
| DIS | 2.0 | | 85.42 | | |
| SUC | 2.0 | | 55.87 | | |
| SPG | 1.0 | | 60.98 | | |
| IBP | -5.0 | | 63.65 | | |
| UG1 | -5.0 | | 63.98 | 250.0 | |
| TEST | 2.0 | | 63.49 | | |


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| Node1<br>to<br>Node2 | Elev1<br><br>Elev2 | K<br><br>Fact | Qa<br><br>Qt | Nom<br><br>Act | Fitting<br>or<br>Eqiv | Len | Pipe<br>Ftngs<br>Total | CFact<br><br>Pf/Ft | Pt<br>Pe<br>Pf | ******* Notes ****** |
|---|---|---|---|---|---|---|---|---|---|---|
| *HEADS | | | | | | | | | | |
| FS1 | 50 | 5.60 | 25.73 | 1 | T | 5.0 | 1.500 | 120 | 21.105 | |
| to | | | | | | | 5.000 | | 0.0 | |
| F1 | 50 | | 25.73 | 1.049 | | | 6.500 | 0.2074 | 1.348 | Vel = 9.55 |
| | | | 0.0 | | | | | | | |
| F1 | | | 25.73 | | | | | | 22.453 | K Factor = 5.43 |
| FS2 | 50 | 5.60 | 25.84 | 1 | T | 5.0 | 1.500 | 120 | 21.292 | |
| to | | | | | | | 5.000 | | 0.0 | |
| F2 | 50 | | 25.84 | 1.049 | | | 6.500 | 0.2089 | 1.358 | Vel = 9.59 |
| | | | 0.0 | | | | | | | |
| F2 | | | 25.84 | | | | | | 22.650 | K Factor = 5.43 |
| FS3 | 37 | 5.60 | 25.82 | 1 | T | 5.0 | 10.000 | 120 | 21.263 | |
| to | | | | | Vcfc | 23.4 | 30.400 | | -5.630 | |
| F3 | 50 | | 25.82 | 1.049 | E | 2.0 | 40.400 | 0.2088 | 8.434 | Vel = 9.59 |
| | | | 0.0 | | | | | | | |
| F3 | | | 25.82 | | | | | | 24.067 | K Factor = 5.26 |
| FS4 | 50 | 5.60 | 27.65 | 1 | T | 5.0 | 1.500 | 120 | 24.386 | |
| to | | | | | | | 5.000 | | 0.0 | |
| F4 | 50 | | 27.65 | 1.049 | | | 6.500 | 0.2369 | 1.540 | Vel = 10.26 |
| | | | 0.0 | | | | | | | |
| F4 | | | 27.65 | | | | | | 25.926 | K Factor = 5.43 |
| FS5 | 50 | 5.60 | 29.54 | 1 | T | 5.0 | 1.500 | 120 | 27.834 | |
| to | | | | | | | 5.000 | | 0.0 | |
| F5 | 50 | | 29.54 | 1.049 | | | 6.500 | 0.2678 | 1.741 | Vel = 10.97 |
| | | | 0.0 | | | | | | | |
| F5 | | | 29.54 | | | | | | 29.575 | K Factor = 5.43 |
| FS6 | 50 | 5.60 | 25.74 | 1 | T | 5.0 | 1.500 | 120 | 21.132 | |
| to | | | | | | | 5.000 | | 0.0 | |
| F6 | 50 | | 25.74 | 1.049 | | | 6.500 | 0.2075 | 1.349 | Vel = 9.56 |
| | | | 0.0 | | | | | | | |
| F6 | | | 25.74 | | | | | | 22.481 | K Factor = 5.43 |
| FS7 | 50 | 5.60 | 25.86 | 1 | T | 5.0 | 1.500 | 120 | 21.318 | |
| to | | | | | | | 5.000 | | 0.0 | |
| F7 | 50 | | 25.86 | 1.049 | | | 6.500 | 0.2094 | 1.361 | Vel = 9.60 |
| | | | 0.0 | | | | | | | |
| F7 | | | 25.86 | | | | | | 22.679 | K Factor = 5.43 |
| FS8 | 37 | 5.60 | 25.84 | 1 | T | 5.0 | 10.000 | 120 | 21.285 | |
| to | | | | | Vcfc | 23.4 | 30.400 | | -5.630 | |
| F8 | 50 | | 25.84 | 1.049 | E | 2.0 | 40.400 | 0.2090 | 8.442 | Vel = 9.59 |
| | | | 0.0 | | | | | | | |
| F8 | | | 25.84 | | | | | | 24.097 | K Factor = 5.26 |
| FS9 | 50 | 5.60 | 27.67 | 1 | T | 5.0 | 1.500 | 120 | 24.416 | |
| to | | | | | | | 5.000 | | 0.0 | |
| F9 | 50 | | 27.67 | 1.049 | | | 6.500 | 0.2372 | 1.542 | Vel = 10.27 |
| | | | 0.0 | | | | | | | |
| F9 | | | 27.67 | | | | | | 25.958 | K Factor = 5.43 |
| FS10 | 50 | 5.60 | 29.56 | 1 | T | 5.0 | 1.500 | 120 | 27.868 | |
| to | | | | | | | 5.000 | | 0.0 | |
| F10 | 50 | | 29.56 | 1.049 | | | 6.500 | 0.2682 | 1.743 | Vel = 10.97 |

PERMIT #2026 2513934 - CM 04 | RSN:1975523



| Node1<br>to<br>Node2 | Elev1<br><br>Elev2 | K<br><br>Fact | Qa<br><br>Qt | Nom<br><br>Act | Fitting<br>or<br>Eqiv | Len | Pipe<br>Ftngs<br>Total | CFact<br><br>Pf/Ft | Pt<br>Pe<br>Pf | ******* Notes ****** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0.0 | | | | | | | |
| F10 | | | 29.56 | | | | | | 29.611 | K Factor = 5.43 |
| FS11 | 50 | 5.60 | 36.25 | 1 | T | 5.0 | 1.500 | 120 | 41.907 | |
| to | | | | | | | 5.000 | | 0.0 | |
| F11 | 50 | | 36.25 | 1.049 | | | 6.500 | 0.3911 | 2.542 | Vel = 13.46 |
| | | | 0.0 | | | | | | | |
| F11 | | | 36.25 | | | | | | 44.449 | K Factor = 5.44 |
| FS12 | 50 | 5.60 | 36.40 | 1 | T | 5.0 | 1.500 | 120 | 42.260 | |
| to | | | | | | | 5.000 | | 0.0 | |
| F12 | 50 | | 36.4 | 1.049 | | | 6.500 | 0.3940 | 2.561 | Vel = 13.51 |
| | | | 0.0 | | | | | | | |
| F12 | | | 36.40 | | | | | | 44.821 | K Factor = 5.44 |
| FS13 | 37 | 5.60 | 25.23 | 1 | T | 5.0 | 10.000 | 120 | 20.293 | |
| to | | | | | Vcfc | 23.4 | 30.400 | | -5.630 | |
| F13 | 50 | | 25.23 | 1.049 | E | 2.0 | 40.400 | 0.1999 | 8.077 | Vel = 9.37 |
| | | | 0.0 | | | | | | | |
| F13 | | | 25.23 | | | | | | 22.740 | K Factor = 5.29 |
| FS14 | 50 | 5.60 | 26.00 | 1 | T | 5.0 | 1.500 | 120 | 21.556 | |
| to | | | | | | | 5.000 | | 0.0 | |
| F14 | 50 | | 26.0 | 1.049 | | | 6.500 | 0.2114 | 1.374 | Vel = 9.65 |
| | | | 0.0 | | | | | | | |
| F14 | | | 26.00 | | | | | | 22.930 | K Factor = 5.43 |
| FS15 | 50 | 5.60 | 26.78 | 1 | T | 5.0 | 1.500 | 120 | 22.877 | |
| to | | | | | | | 5.000 | | 0.0 | |
| F15 | 50 | | 26.78 | 1.049 | | | 6.500 | 0.2235 | 1.453 | Vel = 9.94 |
| | | | 0.0 | | | | | | | |
| F15 | | | 26.78 | | | | | | 24.330 | K Factor = 5.43 |
| FS16 | 50 | 5.60 | 27.81 | 1 | T | 5.0 | 1.500 | 120 | 24.660 | |
| to | | | | | | | 5.000 | | 0.0 | |
| F16 | 50 | | 27.81 | 1.049 | | | 6.500 | 0.2395 | 1.557 | Vel = 10.32 |
| | | | 0.0 | | | | | | | |
| F16 | | | 27.81 | | | | | | 26.217 | K Factor = 5.43 |
| FS17 | 50 | 5.60 | 29.72 | 1 | T | 5.0 | 1.500 | 120 | 28.156 | |
| to | | | | | | | 5.000 | | 0.0 | |
| F17 | 50 | | 29.72 | 1.049 | | | 6.500 | 0.2706 | 1.759 | Vel = 11.03 |
| | | | 0.0 | | | | | | | |
| F17 | | | 29.72 | | | | | | 29.915 | K Factor = 5.43 |
| *LINE1 | | | | | | | | | | |
| F1 | 50 | | 25.73 | 1.5 | | | 7.667 | 120 | 22.453 | |
| to | | | | | | | | | 0.0 | |
| F2 | 50 | | 25.73 | 1.61 | | | 7.667 | 0.0257 | 0.197 | Vel = 4.05 |
| F2 | 50 | | 25.84 | 1.5 | 2V | 5.2 | 10.000 | 120 | 22.650 | |
| to | | | | | | | 5.200 | | 0.0 | |
| F3 | 50 | | 51.57 | 1.61 | | | 15.200 | 0.0932 | 1.417 | Vel = 8.13 |
| F3 | 50 | | 25.82 | 1.5 | | | 9.417 | 120 | 24.067 | |
| to | | | | | | | | | 0.0 | |
| F4 | 50 | | 77.39 | 1.61 | | | 9.417 | 0.1974 | 1.859 | Vel = 12.20 |


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PERMIT #2026 2513934 - CM 04 | RSN:1975523



| Node1<br>to<br>Node2 | Elev1<br><br>Elev2 | K<br><br>Fact | Qa<br><br>Qt | Nom<br><br>Act | Fitting<br>or<br>Eqiv | Len | Pipe<br>Ftngs<br>Total | CFact<br><br>Pf/Ft | Pt<br>Pe<br>Pf | ******* Notes ****** |
|---|---|---|---|---|---|---|---|---|---|---|
| F4 | 50 | | 27.65 | 1.5 | | | 10.500 | 120 | 25.926 | |
| to | | | | | | | | | 0.0 | |
| F5 | 50 | | 105.04 | 1.61 | | | 10.500 | 0.3475 | 3.649 | Vel = 16.55 |
| F5 | 50 | | 29.55 | 1.5 | X | 6.63 | 17.500 | 120 | 29.575 | |
| to | | | | | T | 8.0 | 14.630 | | 2.093 | |
| EM4 | 45.167 | | 134.59 | 1.61 | | | 32.130 | 0.5496 | 17.659 | Vel = 21.21 |
| | | | 0.0 | | | | | | | |
| EM4 | | | 134.59 | | | | | | 49.327 | K Factor = 19.16 |
| *LINE2 | | | | | | | | | | |
| F6 | 50 | | 25.74 | 1.5 | | | 7.667 | 120 | 22.481 | |
| to | | | | | | | | | 0.0 | |
| F7 | 50 | | 25.74 | 1.61 | | | 7.667 | 0.0258 | 0.198 | Vel = 4.06 |
| F7 | 50 | | 25.86 | 1.5 | 2V | 5.2 | 10.000 | 120 | 22.679 | |
| to | | | | | | | 5.200 | | 0.0 | |
| F8 | 50 | | 51.6 | 1.61 | | | 15.200 | 0.0933 | 1.418 | Vel = 8.13 |
| F8 | 50 | | 25.84 | 1.5 | | | 9.417 | 120 | 24.097 | |
| to | | | | | | | | | 0.0 | |
| F9 | 50 | | 77.44 | 1.61 | | | 9.417 | 0.1976 | 1.861 | Vel = 12.20 |
| F9 | 50 | | 27.67 | 1.5 | | | 10.500 | 120 | 25.958 | |
| to | | | | | | | | | 0.0 | |
| F10 | 50 | | 105.11 | 1.61 | | | 10.500 | 0.3479 | 3.653 | Vel = 16.56 |
| F10 | 50 | | 29.56 | 1.5 | X | 6.63 | 17.500 | 120 | 29.611 | |
| to | | | | | T | 8.0 | 14.630 | | 2.093 | |
| EM5 | 45.167 | | 134.67 | 1.61 | | | 32.130 | 0.5502 | 17.679 | Vel = 21.22 |
| | | | 0.0 | | | | | | | |
| EM5 | | | 134.67 | | | | | | 49.383 | K Factor = 19.16 |
| *LINE3 | | | | | | | | | | |
| F11 | 50 | | 36.25 | 1.5 | | | 7.667 | 120 | 44.449 | |
| to | | | | | | | | | 0.0 | |
| F12 | 50 | | 36.25 | 1.61 | | | 7.667 | 0.0485 | 0.372 | Vel = 5.71 |
| F12 | 50 | | 36.41 | 1.5 | 2V | 5.2 | 10.000 | 120 | 44.821 | |
| to | | | | | | | 5.200 | | 2.093 | |
| EM6 | 45.167 | | 72.66 | 1.61 | | | 15.200 | 0.1757 | 2.671 | Vel = 11.45 |
| | | | 0.0 | | | | | | | |
| EM6 | | | 72.66 | | | | | | 49.585 | K Factor = 10.32 |
| *LINE 4 | | | | | | | | | | |
| F13 | 50 | | 25.23 | 1.5 | | | 7.667 | 120 | 22.740 | |
| to | | | | | | | | | 0.0 | |
| F14 | 50 | | 25.23 | 1.61 | | | 7.667 | 0.0248 | 0.190 | Vel = 3.98 |
| F14 | 50 | | 26.00 | 1.5 | 2V | 5.2 | 10.000 | 120 | 22.930 | |
| to | | | | | | | 5.200 | | 0.0 | |
| F15 | 50 | | 51.23 | 1.61 | | | 15.200 | 0.0921 | 1.400 | Vel = 8.07 |
| F15 | 50 | | 26.78 | 1.5 | | | 9.417 | 120 | 24.330 | |
| to | | | | | | | | | 0.0 | |
| F16 | 50 | | 78.01 | 1.61 | | | 9.417 | 0.2004 | 1.887 | Vel = 12.29 |
| F16 | 50 | | 27.81 | 1.5 | | | 10.500 | 120 | 26.217 | |
| to | | | | | | | | | 0.0 | |
| F17 | 50 | | 105.82 | 1.61 | | | 10.500 | 0.3522 | 3.698 | Vel = 16.68 |


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PERMIT #2026 2513934 - CM 04 | RSN:1975523



| Node1 to Node2 | Elev1 Elev2 | K Fact | Qa Qt | Nom Act | Fitting or Eqiv | Len | Pipe Ftngs Total | CFact Pf/Ft | Pt Pe Pf | ******* Notes ****** |
|---|---|---|---|---|---|---|---|---|---|---|
| F17 | 50 | | 29.72 | 1.5 | X | 6.63 | 17.500 | 120 | 29.915 | |
| to | | | | | T | 8.0 | 14.630 | | 2.093 | |
| EM7 | 45.167 | | 135.54 | 1.61 | | | 32.130 | 0.5568 | 17.891 | Vel = 21.36 |
| | | | 0.0 | | | | | | | |
| EM7 | | | 135.54 | | | | | | 49.899 | K Factor = 19.19 |
| *MAIN | | | | | | | | | | |
| EM4 | 45.167 | | 134.59 | 4 | | | 8.833 | 120 | 49.327 | |
| to | | | | | | | | | 0.0 | |
| EM5 | 45.167 | | 134.59 | 4.026 | | | 8.833 | 0.0063 | 0.056 | Vel = 3.39 |
| EM5 | 45.167 | | 134.67 | 4 | | | 8.833 | 120 | 49.383 | |
| to | | | | | | | | | 0.0 | |
| EM6 | 45.167 | | 269.26 | 4.026 | | | 8.833 | 0.0229 | 0.202 | Vel = 6.79 |
| EM6 | 45.167 | | 72.65 | 4 | | | 8.833 | 120 | 49.585 | |
| to | | | | | | | | | 0.0 | |
| EM7 | 45.167 | | 341.91 | 4.026 | | | 8.833 | 0.0355 | 0.314 | Vel = 8.62 |
| EM7 | 45.167 | | 135.54 | 4 | | | 8.833 | 120 | 49.899 | |
| to | | | | | | | | | 0.0 | |
| EM8 | 45.167 | | 477.45 | 4.026 | | | 8.833 | 0.0659 | 0.582 | Vel = 12.03 |
| EM8 | 45.167 | | 0.0 | 4 | | | 6.333 | 120 | 50.481 | |
| to | | | | | | | | | 0.0 | |
| EM9 | 45.167 | | 477.45 | 4.026 | | | 6.333 | 0.0658 | 0.417 | Vel = 12.03 |
| EM9 | 45.167 | | 0.0 | 4 | 4V | 27.2 | 168.000 | 120 | 50.898 | |
| to | | | | | X | 16.0 | 43.200 | | 0.072 | |
| ETR | 45 | | 477.45 | 4.026 | | | 211.200 | 0.0659 | 13.920 | Vel = 12.03 |
| ETR | 45 | | 0.0 | 6 | S | 40.235 | 15.667 | 120 | 64.890 | |
| to | | | | | B | 12.573 | 90.528 | | 9.672 | |
| EBR | 22.667 | | 477.45 | 6.357 | T | 37.72 | 106.195 | 0.0071 | 0.757 | Vel = 4.83 |
| EBR | 22.667 | | 0.0 | 6 | 2V | 25.147 | 11.417 | 120 | 75.319 | |
| to | | | | | X | 31.433 | 56.580 | | 8.879 | |
| XR1 | 2.167 | | 477.45 | 6.357 | | | 67.997 | 0.0071 | 0.484 | Vel = 4.83 |
| XR1 | 2.167 | | 0.0 | 6 | B | 12.573 | 21.167 | 120 | 84.682 | |
| to | | | | | T | 37.72 | 50.293 | | 0.072 | |
| XBR | 2 | | 477.45 | 6.357 | | | 71.460 | 0.0071 | 0.510 | Vel = 4.83 |
| | | | 0.0 | | | | | | | |
| XBR | | | 477.45 | | | | | | 85.264 | K Factor = 51.71 |
| *PUMP | | | | | | | | | | |
| XBR | 2 | | 477.45 | 8 | B | 14.094 | 8.250 | 120 | 85.264 | |
| to | | | | | S | 52.853 | 66.947 | | 0.0 | |
| DIS | 2 | | 477.45 | 8.249 | | | 75.197 | 0.0020 | 0.151 | Vel = 2.87 |
| | | | 0.0 | | | | | | | |
| DIS | | | 477.45 | | | | | | 85.415 | K Factor = 51.66 |
| System Demand Pressure | | | | | | | | | 85.415 | |
| Safety Margin | | | | | | | | | 73.944 | |
| Continuation Pressure | | | | | | | | | 159.359 | |
| Pressure @ Pump Outlet | | | | | | | | | 159.359 | |
| Pressure From Pump Curve | | | | | | | | | -103.491 | |
| Pressure @ Pump Inlet | | | | | | | | | 55.868 | |


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PERMIT #2026 2513934 - CM 04 | RSN:1975523



| Node1 to Node2 | Elev1 Elev2 | K Fact | Qa Qt | Nom Act | Fitting or Eqiv | Len | Pipe Ftngs Total | CFact Pf/Ft | Pt Pe Pf | ******* Notes ****** |
|---|---|---|---|---|---|---|---|---|---|---|
| SUC | 2 | | 0.0 | 8 | Zaf | 0.0 | 8.000 | 120 | 55.868 | |
| to | | | | | E | 21.141 | 25.839 | | 5.046 | * * Fixed Loss = 4.613 |
| SPG | 1 | | 477.45 | 8.249 | G | 4.698 | 33.839 | 0.0020 | 0.068 | Vel = 2.87 |
| SPG | 1 | | 0.0 | 8 | E | 21.141 | 15.000 | 120 | 60.982 | |
| to | | | | | | | 21.141 | | 2.599 | |
| IBP | -5 | | 477.45 | 8.249 | | | 36.141 | 0.0020 | 0.072 | Vel = 2.87 |
| IBP | -5 | | 0.0 | 8 | F | 11.278 | 120.000 | 150 | 63.653 | |
| to | | | | | T | 43.857 | 55.135 | | 0.0 | |
| UG1 | -5 | | 477.45 | 7.68 | | | 175.135 | 0.0019 | 0.328 | Vel = 3.31 |
| | | | 0.0 | | | | | | | |
| UG1 | | | 477.45 | | | | | | 63.981 | K Factor = 59.69 |
| *UG2 | | | | | | | | | | |
| UG1 | -5 | H250 | 727.45 | 8 | F | 11.278 | 565.000 | 150 | 63.981 | |
| to | | | | | T | 43.857 | 55.135 | | -3.032 | |
| TEST | 2 | | 727.45 | 7.68 | | | 620.135 | 0.0041 | 2.539 | Vel = 5.04 |
| | | | 0.0 | | | | | | | |
| TEST | | | 727.45 | | | | | | 63.488 | K Factor = 91.30 |


SHEET 111 of 403

EXCELLENCE IN FIRE PROTECTION DESIGN

Shambaugh & Son L.P.
5460 Desert Point Drive
Las Vegas, NV 89118

. . . Fire Protection by Computer Design

Hydratec Incorporated
64 Haverhill Road
Route 111
Windham, NH 03087
603-434-0502

I certify to the best of my knowledge, information, and belief that the design of this system complies with all applicable provisions of NFPA standards and local fire codes.

*Dennis T. Scherr*

Dennis T. Scherr
NICET Level IV
Water-Based Systems Layout
Cert. # 113016 Exp. 3/1/2029

| | | |
|---|---|---|
| Job Name | : | 227317 QTS DC2 - CALC 8 SYS W 2-09 |
| Drawing | : | FP4 |
| Location | : | 1140 N GUN CLUB RD |
| System | : | CALC 8 SYS W 2-09 |
| Contract | : | 227317 |
| Data File | : | 227317 QTS DC2 - CALC8 - SYS W 2-09.wxtmp |

***HYDRAULIC CALCULATIONS***
***for***

***JOB NAME*** QTS DC2
***Location*** 1140 N GUN CLUB RD
***Drawing #*** FP4
***Contract #*** 227317
***Date*** 03.25.26

***DESIGN***

***Remote area #*** CALC 8 SYS W 2-09
***Remote area location*** CALC 8 SYS W 2-09
***Occupancy classification*** LIGHT HAZARD
***Density*** .1 - Gpm/SqFt
***Area of application*** 7 HEADS - SqFt
***Coverage/sprinkler*** 225 - SqFt
***Type of sprinkler calculated*** 5.6K
***# Sprinklers calculated*** 7
***In-rack demand*** N/A - GPM
***Hose streams*** 100 - GPM
***Total water required (including hose streams)*** 272.946 - GPM @ -27.1558 - Psi
***Type of system*** Wet System
***Volume of system (dry or pre-action)*** N/A - Gal

***WATER SUPPLY INFORMATION***

***Test date*** 7.16.2025
***Location*** 1140 N GUN CLUB RD
***Source of info*** ONSITE FIRE HYD #05U-08

***CONTRACTOR INFO*** Shambaugh & Son
***Address*** 6445 W. Sunset Rd
***Phone #*** 702-832-4547
***Name of designer*** E.Velasco
***Authority having jurisdiction*** AURORA, CO
***NOTES:*** Saftey Margin: 88.51 PSI
ACTUAL STATIC: 71
ACTUAL RESIDUAL: 58

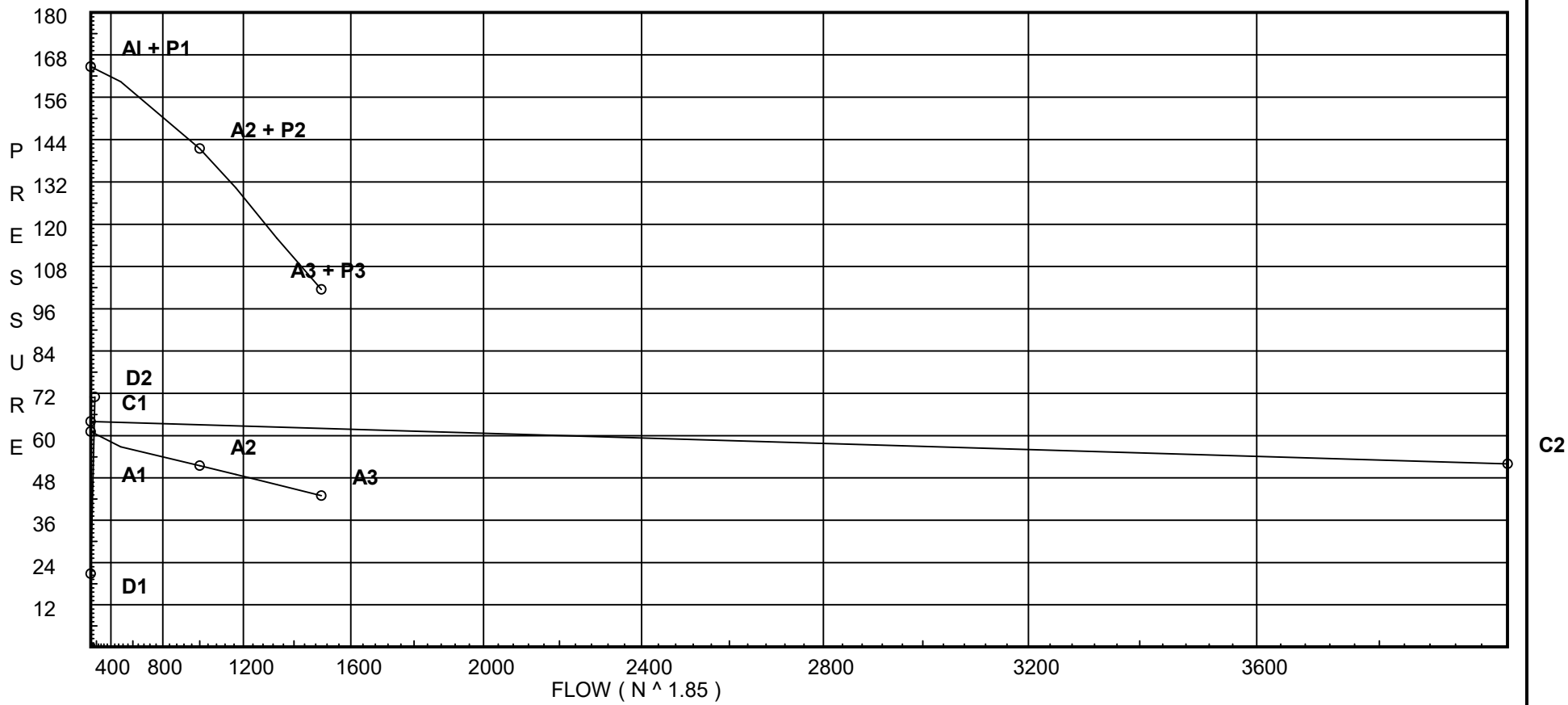
text1(35) - invisible

City Water Supply:
- C1 - Static Pressure : 64
- C2 - Residual Pressure: 52
- C2 - Residual Flow : 4000

City Water Adjusted to Pump Inlet for Pf - Elev - Hose Flow
- A1 - Adjusted Static: 61.122
- A2 - Adj Resid : 51.46 @ 1000
- A3 - Adj Resid : 42.989 @ 1500

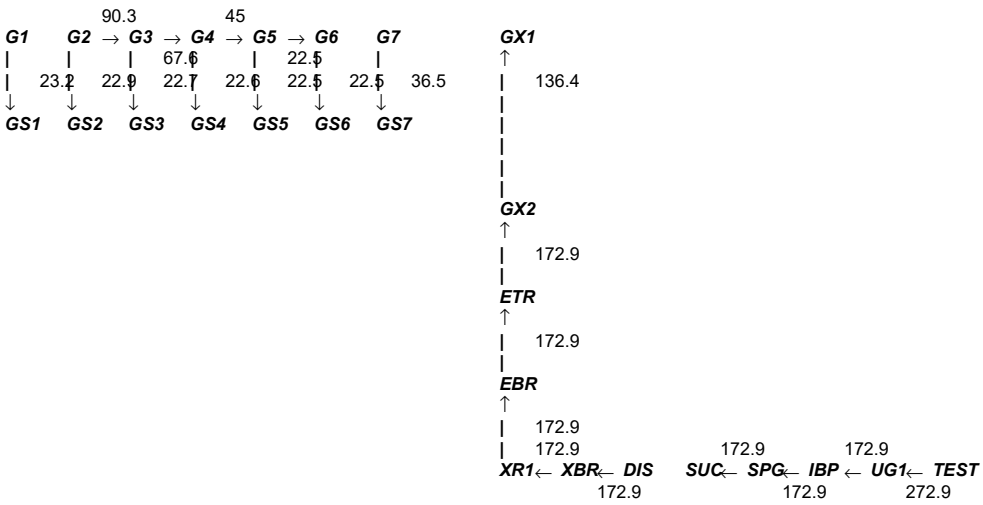
Pump Data:
- P1 - Pump Churn Pressure : 103.5
- P2 - Pump Rated Pressure : 90
- P2 - Pump Rated Flow : 1000
- P3 - Pump Pressure @ Max Flow : 58.5
- P3 - Pump Max Flow : 1500
- City Residual Flow @ 0 = 9886.27
- City Residual Flow @ 20 = 8073.68
- City Water @ 150% of Pump = 62.05

Demand:
- D1 - Elevation : 20.789
- D2 - System Flow : 172.946
- D2 - System Pressure : 71.016
- Hose ( Demand ) :
- D3 - System Demand : 172.946
- Hose ( Adj City ) : 100
- Safety Margin : 91.072






Computer Programs by Hydratec Inc. Revision: 50.5520.727


G1
G2
G3
G4
G5
G6
G7
90.3
45
67.6
22.5
23.2
22.9
22.7
22.6
22.5
22.5
36.5
GS1
GS2
GS3
GS4
GS5
GS6
GS7
GX1
136.4
GX2
172.9
ETR
172.9
EBR
172.9
172.9
XR1
XBR
DIS
172.9
SUC
SPG
IBP
UG1
TEST
172.9
172.9
172.9
272.9

Fitting Legend

| Abbrev. | Name | ½ | ¾ | 1 | 1¼ | 1½ | 2 | 2½ | 3 | 3½ | 4 | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 24 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B | NFPA 13 Butterfly Valve | 0 | 0 | 0 | 0 | 0 | 6 | 7 | 10 | 0 | 12 | 9 | 10 | 12 | 19 | 21 | 23 | 25 | 0 | 0 | 0 |
| E | 90 - NFPA | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 10 | 12 | 14 | 18 | 22 | 27 | 35 | 40 | 45 | 50 | 61 |
| F | 45 - NFPA | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 4 | 5 | 7 | 9 | 11 | 13 | 17 | 19 | 21 | 24 | 28 |
| G | NFPA 13 Gate Valve | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 10 | 11 | 13 |
| S | Swing Check NFPA 13 | 0 | 0 | 5 | 7 | 9 | 11 | 14 | 16 | 19 | 22 | 27 | 32 | 45 | 55 | 65 | | | | | |
| T | TEE - NFPA | 3 | 4 | 5 | 6 | 8 | 10 | 12 | 15 | 17 | 20 | 25 | 30 | 35 | 50 | 60 | 71 | 81 | 91 | 101 | 121 |
| U | 45 - GROOVED | 0 | 0 | 0.8 | 2.13 | 2.75 | 1.8 | 2.2 | 2.6 | 0 | 3.4 | 4.2 | 5 | 6.5 | 8.3 | 10.0 | 18.5 | 21 | 23.5 | 25.5 | 29.5 |
| V | 90 - GROOVED | 0 | 0 | 1.7 | 2 | 2.6 | 3.5 | 4.3 | 5 | 0 | 6.8 | 8.5 | 10 | 13 | 17 | 20 | 24.5 | 28 | 31 | 34 | 42 |
| X | TEE - GROOVED | 0 | 0 | 4.2 | 7.5 | 6.63 | 8.5 | 10.8 | 13 | 0 | 16 | 21 | 25 | 33 | 41 | 50 | 70 | 80 | 90 | 100 | 120 |
| Zaf | Ames 3000SS | Fitting generates a Fixed Loss Based on Flow | | | | | | | | | | | | | | | | | | | |

Units Summary

| | |
|---|---|
| Diameter Units | Inches |
| Length Units | Feet |
| Flow Units | US Gallons per Minute |
| Pressure Units | Pounds per Square Inch |

Note: Fitting Legend provides equivalent pipe lengths for fittings types of various diameters. Equivalent lengths shown are standard for actual diameters of Sched 40 pipe and CFactors of 120 except as noted with *. The fittings marked with a * show equivalent lengths values supplied by manufacturers based on specific pipe diameters and CFactors and they require no adjustment. All values for fittings not marked with a * will be adjusted in the calculation for CFactors of other than 120 and diameters other than Sched 40 per NFPA.

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## SUPPLY ANALYSIS

| Node at Source | Static Pressure | Residual Pressure | Flow | Available Pressure | Total Demand | Required Pressure |
|---|---|---|---|---|---|---|
| DIS | See Information on Pump Curve | | | 162.088 | 172.95 | 71.016 |
| TEST | 64.0 | 52 | 4000.0 | 63.916 | 272.95 | 63.916 |

## NODE ANALYSIS

| Node Tag | Elevation | Node Type | Pressure at Node | Discharge at Node | Notes | |
|---|---|---|---|---|---|---|
| GS1 | 50.0 | 5.6 | 17.2 | 23.23 | 0.1 | 225 |
| GS2 | 50.0 | 5.6 | 16.75 | 22.92 | 0.1 | 225 |
| GS3 | 50.0 | 5.6 | 16.44 | 22.7 | 0.1 | 225 |
| GS4 | 50.0 | 5.6 | 16.25 | 22.58 | 0.1 | 225 |
| GS5 | 50.0 | 5.6 | 16.17 | 22.52 | 0.1 | 225 |
| GS6 | 50.0 | 5.6 | 16.14 | 22.5 | 0.1 | 225 |
| GS7 | 50.0 | 5.6 | 42.48 | 36.5 | 0.1 | 225 |
| G1 | 50.0 | | 18.32 | | | |
| GX1 | 50.0 | | 18.35 | | | |
| G2 | 50.0 | | 17.84 | | | |
| G3 | 50.0 | | 17.51 | | | |
| G4 | 50.0 | | 17.31 | | | |
| G5 | 50.0 | | 17.22 | | | |
| G7 | 50.0 | | 45.05 | | | |
| GX2 | 45.167 | | 48.99 | | | |
| ETR | 45.0 | | 52.1 | | | |
| EBR | 22.667 | | 61.89 | | | |
| XR1 | 2.167 | | 70.84 | | | |
| XBR | 2.0 | | 70.99 | | | |
| DIS | 2.0 | | 71.02 | | | |
| SUC | 2.0 | | 58.59 | | | |
| SPG | 1.0 | | 63.87 | | | |
| IBP | -5.0 | | 66.48 | | | |
| UG1 | -5.0 | | 66.53 | 100.0 | | |
| TEST | 2.0 | | 63.92 | | | |

PERMIT #2026 2513934 - CM 04 | RSN:1975523



| Node1<br>to<br>Node2 | Elev1<br><br>Elev2 | K<br><br>Fact | Qa<br><br>Qt | Nom<br><br>Act | Fitting<br>or<br>Eqiv | Len | Pipe<br>Ftngs<br>Total | CFact<br><br>Pf/Ft | Pt<br>Pe<br>Pf | ******* Notes ****** |
|---|---|---|---|---|---|---|---|---|---|---|
| *HEADS | | | | | | | | | | |
| GS1 | 50 | 5.60 | 23.23 | 1 | T | 5.0 | 1.500 | 120 | 17.203 | |
| to | | | | | | | 5.000 | | 0.0 | |
| G1 | 50 | | 23.23 | 1.049 | | | 6.500 | 0.1717 | 1.116 | Vel = 8.62 |
| | | | 0.0 | | | | | | | |
| G1 | | | 23.23 | | | | | | 18.319 | K Factor = 5.43 |
| GS2 | 50 | 5.60 | 22.92 | 1 | T | 5.0 | 1.500 | 120 | 16.753 | |
| to | | | | | | | 5.000 | | 0.0 | |
| G2 | 50 | | 22.92 | 1.049 | | | 6.500 | 0.1675 | 1.089 | Vel = 8.51 |
| | | | 0.0 | | | | | | | |
| G2 | | | 22.92 | | | | | | 17.842 | K Factor = 5.43 |
| GS3 | 50 | 5.60 | 22.70 | 1 | T | 5.0 | 1.500 | 120 | 16.438 | |
| to | | | | | | | 5.000 | | 0.0 | |
| G3 | 50 | | 22.7 | 1.049 | | | 6.500 | 0.1646 | 1.070 | Vel = 8.43 |
| | | | 0.0 | | | | | | | |
| G3 | | | 22.70 | | | | | | 17.508 | K Factor = 5.43 |
| GS4 | 50 | 5.60 | 22.58 | 1 | T | 5.0 | 1.500 | 120 | 16.254 | |
| to | | | | | | | 5.000 | | 0.0 | |
| G4 | 50 | | 22.58 | 1.049 | | | 6.500 | 0.1629 | 1.059 | Vel = 8.38 |
| | | | 0.0 | | | | | | | |
| G4 | | | 22.58 | | | | | | 17.313 | K Factor = 5.43 |
| GS5 | 50 | 5.60 | 22.52 | 1 | T | 5.0 | 1.500 | 120 | 16.167 | |
| to | | | | | | | 5.000 | | 0.0 | |
| G5 | 50 | | 22.52 | 1.049 | | | 6.500 | 0.1620 | 1.053 | Vel = 8.36 |
| | | | 0.0 | | | | | | | |
| G5 | | | 22.52 | | | | | | 17.220 | K Factor = 5.43 |
| GS6 | 50 | 5.60 | 22.50 | 1 | T | 5.0 | 1.500 | 120 | 16.143 | |
| to | | | | | | | 5.000 | | 21.330 | |
| G6 | 0 | | 22.5 | 1.049 | | | 6.500 | 0.1618 | 1.052 | Vel = 8.35 |
| | | | 0.0 | | | | | | | |
| G6 | | | 22.50 | | | | | | 38.525 | K Factor = 3.63 |
| GS7 | 50 | 5.60 | 36.50 | 1 | T | 5.0 | 1.500 | 120 | 42.480 | |
| to | | | | | | | 5.000 | | 0.0 | |
| G7 | 50 | | 36.5 | 1.049 | | | 6.500 | 0.3960 | 2.574 | Vel = 13.55 |
| | | | 0.0 | | | | | | | |
| G7 | | | 36.50 | | | | | | 45.054 | K Factor = 5.44 |
| *LINE1 | | | | | | | | | | |
| G1 | 50 | | 23.23 | 2.5 | X | 14.827 | 1.000 | 120 | 18.319 | |
| to | | | | | | | 14.827 | | 0.0 | |
| GX1 | 50 | | 23.23 | 2.635 | | | 15.827 | 0.0019 | 0.030 | Vel = 1.37 |
| GX1 | 50 | | -136.45 | 2.5 | | | 14.000 | 120 | 18.349 | |
| to | | | | | | | | | 0.0 | |
| G2 | 50 | | -113.22 | 2.635 | | | 14.000 | -0.0362 | -0.507 | Vel = 6.66 |
| G2 | 50 | | 22.92 | 2.5 | | | 14.000 | 120 | 17.842 | |
| to | | | | | | | | | 0.0 | |
| G3 | 50 | | -90.3 | 2.635 | | | 14.000 | -0.0239 | -0.334 | Vel = 5.31 |
| G3 | 50 | | 22.71 | 2.5 | | | 14.000 | 120 | 17.508 | |
| to | | | | | | | | | 0.0 | |
| G4 | 50 | | -67.59 | 2.635 | | | 14.000 | -0.0139 | -0.195 | Vel = 3.98 |

PERMIT #2026 2513934 - CM 04 | RSN:1975523

Hydratec Incorporated
227317 QTS DC2 - CALC 8 SYS W 2-09



| Node1 to Node2 | Elev1 Elev2 | K Fact | Qa Qt | Nom Act | Fitting or Eqiv | Len | Pipe Ftngs Total | CFact Pf/Ft | Pt Pe Pf | ******* Notes ****** |
|---|---|---|---|---|---|---|---|---|---|---|
| G4 | 50 | | 22.57 | 2.5 | | | 14.000 | 120 | 17.313 | |
| to | | | | | | | | | 0.0 | |
| G5 | 50 | | -45.02 | 2.635 | | | 14.000 | -0.0066 | -0.093 | Vel = 2.65 |
| G5 | 50 | | 22.52 | 2.5 | | | 14.000 | 120 | 17.220 | |
| to | | | | | | | | | 21.330 | |
| G6 | 0 | | -22.5 | 2.635 | | | 14.000 | -0.0018 | -0.025 | Vel = 1.32 |
| | | | 0.0 | | | | | | | |
| G6 | | | -22.50 | | | | | | 38.525 | K Factor = -3.63 |
| G7 | 50 | | 36.50 | 2.5 | 2X | 29.654 | 366.000 | 120 | 45.054 | |
| to | | | | | 3V | 17.71 | 47.364 | | 2.093 | |
| GX2 | 45.167 | | 36.5 | 2.635 | | | 413.364 | 0.0045 | 1.845 | Vel = 2.15 |
| | | | 0.0 | | | | | | | |
| GX2 | | | 36.50 | | | | | | 48.992 | K Factor = 5.21 |
| GX1 | 50 | | 136.45 | 2.5 | 9V | 53.129 | 475.000 | 120 | 18.349 | |
| to | | | | | 2X | 29.654 | 82.783 | | 2.093 | |
| GX2 | 45.167 | | 136.45 | 2.635 | | | 557.783 | 0.0512 | 28.550 | Vel = 8.03 |
| | | | 0.0 | | | | | | | |
| GX2 | | | 136.45 | | | | | | 48.992 | K Factor = 19.49 |
| *MAIN | | | | | | | | | | |
| GX2 | 45.167 | | 172.95 | 4 | 6V | 40.8 | 225.500 | 120 | 48.992 | |
| to | | | | | 2X | 32.0 | 76.200 | | 0.072 | |
| ETR | 45 | | 172.95 | 4.026 | U | 3.4 | 301.700 | 0.0101 | 3.039 | Vel = 4.36 |
| ETR | 45 | | 0.0 | 6 | S | 40.235 | 15.667 | 120 | 52.103 | |
| to | | | | | B | 12.573 | 90.528 | | 9.672 | |
| EBR | 22.667 | | 172.95 | 6.357 | T | 37.72 | 106.195 | 0.0011 | 0.116 | Vel = 1.75 |
| EBR | 22.667 | | 0.0 | 6 | 2V | 25.147 | 11.417 | 120 | 61.891 | |
| to | | | | | X | 31.433 | 56.580 | | 8.879 | |
| XR1 | 2.167 | | 172.95 | 6.357 | | | 67.997 | 0.0011 | 0.073 | Vel = 1.75 |
| XR1 | 2.167 | | 0.0 | 6 | B | 12.573 | 21.167 | 120 | 70.843 | |
| to | | | | | T | 37.72 | 50.293 | | 0.072 | |
| XBR | 2 | | 172.95 | 6.357 | | | 71.460 | 0.0011 | 0.078 | Vel = 1.75 |
| | | | 0.0 | | | | | | | |
| XBR | | | 172.95 | | | | | | 70.993 | K Factor = 20.53 |
| *PUMP | | | | | | | | | | |
| XBR | 2 | | 172.95 | 8 | B | 14.094 | 8.250 | 120 | 70.993 | |
| to | | | | | S | 52.853 | 66.947 | | 0.0 | |
| DIS | 2 | | 172.95 | 8.249 | | | 75.197 | 0.0003 | 0.023 | Vel = 1.04 |
| | | | 0.0 | | | | | | | |
| DIS | | | 172.95 | | | | | | 71.016 | K Factor = 20.52 |
| System Demand Pressure | | | | | | | | | 71.016 | |
| Safety Margin | | | | | | | | | 91.072 | |
| Continuation Pressure | | | | | | | | | 162.088 | |
| Pressure @ Pump Outlet | | | | | | | | | 162.088 | |
| Pressure From Pump Curve | | | | | | | | | -103.498 | |
| Pressure @ Pump Inlet | | | | | | | | | 58.590 | |
| SUC | 2 | | 0.0 | 8 | Zaf | 0.0 | 8.000 | 120 | 58.590 | |
| to | | | | | E | 21.141 | 25.839 | | 5.274 | * * Fixed Loss = 4.841 |
| SPG | 1 | | 172.95 | 8.249 | G | 4.698 | 33.839 | 0.0003 | 0.010 | Vel = 1.04 |

PERMIT #2026 2513934 - CM 04 | RSN:1975523



| Node1 / to / Node2 | Elev1 / Elev2 | K Fact | Qa / Qt | Nom / Act | Fitting or Eqiv | Len | Pipe Ftngs Total | CFact Pf/Ft | Pt / Pe / Pf | ******* Notes ****** |
|---|---|---|---|---|---|---|---|---|---|---|
| SPG | 1 | | 0.0 | 8 | E | 21.141 | 15.000 | 120 | 63.874 | |
| to | | | | | | | 21.141 | | 2.599 | |
| IBP | -5 | | 172.95 | 8.249 | | | 36.141 | 0.0003 | 0.011 | Vel = 1.04 |
| IBP | -5 | | 0.0 | 8 | F | 11.278 | 120.000 | 150 | 66.484 | |
| to | | | | | T | 43.857 | 55.135 | | 0.0 | |
| UG1 | -5 | | 172.95 | 7.68 | | | 175.135 | 0.0003 | 0.050 | Vel = 1.20 |
| | | | 0.0 | | | | | | | |
| UG1 | | | 172.95 | | | | | | 66.534 | K Factor = 21.20 |
| *UG2 | | | | | | | | | | |
| UG1 | -5 | H100 | 272.95 | 8 | F | 11.278 | 565.000 | 150 | 66.534 | |
| to | | | | | T | 43.857 | 55.135 | | -3.032 | |
| TEST | 2 | | 272.95 | 7.68 | | | 620.135 | 0.0007 | 0.414 | Vel = 1.89 |
| | | | 0.0 | | | | | | | |
| TEST | | | 272.95 | | | | | | 63.916 | K Factor = 34.14 |


SHEET 120 of 403

EXCELLENCE IN FIRE PROTECTION DESIGN

Shambaugh & Son L.P.
5460 Desert Point Drive
Las Vegas, NV 89118

. . . Fire Protection by Computer Design

Hydratec Incorporated
64 Haverhill Road
Route 111
Windham, NH 03087
603-434-0502

I certify to the best of my knowledge, information, and belief that the design of this system complies with all applicable provisions of NFPA standards and local fire codes.

Dennis T. Scherr

Dennis T. Scherr
NICET Level IV
Water-Based Systems Layout
Cert. # 113016 Exp. 3/1/2029

| | | |
|---|---|---|
| Job Name | : | 227317 QTS DC2 - CALC 9 SYS W 1-11 |
| Drawing | : | FP4 |
| Location | : | 1140 N GUN CLUB RD |
| System | : | CALC9 SYS D 1.11 |
| Contract | : | 227317 |
| Data File | : | 227317 QTS DC2 - CALC9 - SYS D 1-11.wxtmp |

***HYDRAULIC CALCULATIONS***
***for***

***JOB NAME*** QTS DC2
***Location*** 1140 N GUN CLUB RD
***Drawing #*** FP4
***Contract #*** 227317
***Date*** 03.25.26

***DESIGN***

***Remote area #*** CALC9 SYS D 1.11
***Remote area location*** CALC9 SYS D 1.11
***Occupancy classification*** EXTRA HAZARD GRP-1
***Density*** .3 - Gpm/SqFt
***Area of application*** 3.302 - SqFt
***Coverage/sprinkler*** 100 - SqFt
***Type of sprinkler calculated*** 11.2K
***# Sprinklers calculated*** 28
***In-rack demand*** N/A - GPM
***Hose streams*** 500 - GPM
***Total water required (including hose streams)*** 1724.19 - GPM @ 34.9309 - Psi
***Type of system*** Dry Pipe
***Volume of system (dry or pre-action)*** N/A - Gal

***WATER SUPPLY INFORMATION***

***Test date*** 7.16.2025
***Location*** 1140 N GUN CLUB RD
***Source of info*** ONSITE FIRE HYD #05U-08

***CONTRACTOR INFO*** Shambaugh & Son
***Address*** 6445 W. Sunset Rd
***Phone #*** 702-832-4547
***Name of designer*** E.Velasco
***Authority having jurisdiction*** AURORA, CO
***NOTES:*** Saftey Margin: 24.62 PSI
ACTUAL STATIC: 71
ACTUAL RESIDUAL: 58

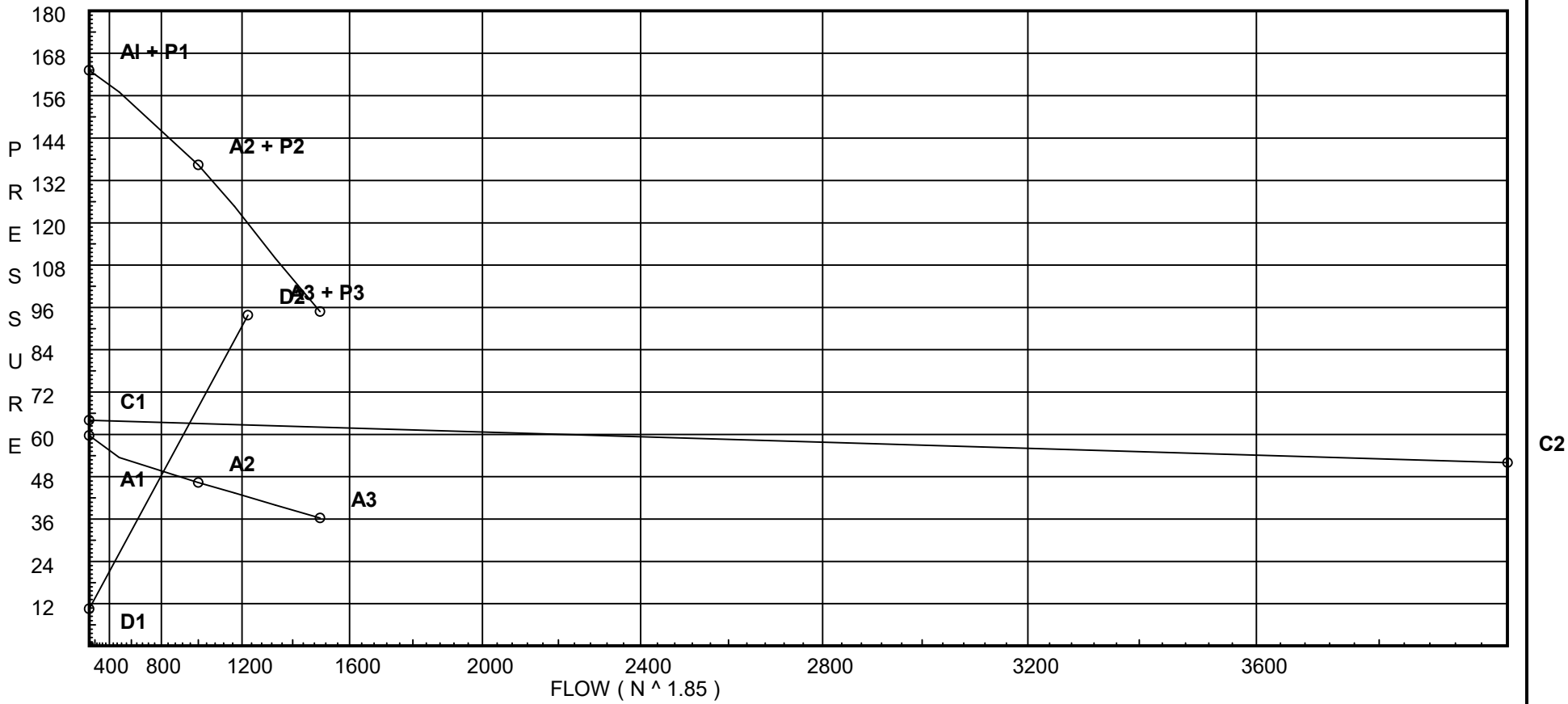
text1(35) - invisible

City Water Supply:
- C1 - Static Pressure : 64
- C2 - Residual Pressure: 52
- C2 - Residual Flow : 4000

City Water Adjusted to Pump Inlet for Pf - Elev - Hose Flow
- A1 - Adjusted Static: 59.676
- A2 - Adj Resid : 46.38 @ 1000
- A3 - Adj Resid : 36.288 @ 1500

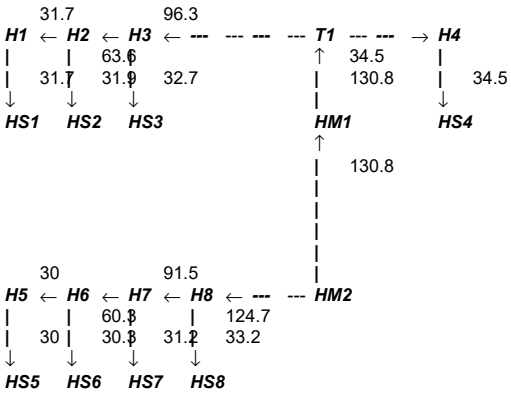
Pump Data:
- P1 - Pump Churn Pressure : 103.5
- P2 - Pump Rated Pressure : 90
- P2 - Pump Rated Flow : 1000
- P3 - Pump Pressure @ Max Flow : 58.5
- P3 - Pump Max Flow : 1500
- City Residual Flow @ 0 = 9886.27
- City Residual Flow @ 20 = 8073.68
- City Water @ 150% of Pump = 62.05

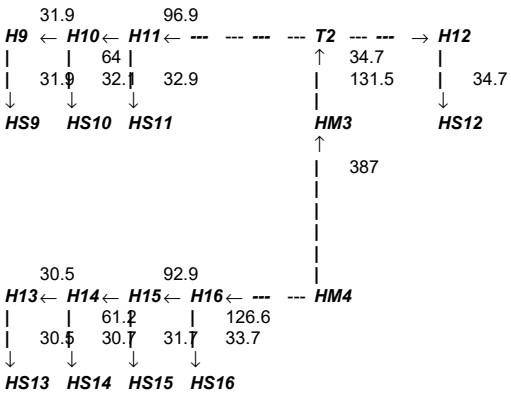
Demand:
- D1 - Elevation : 10.575
- D2 - System Flow : 1224.19
- D2 - System Pressure : 93.801
- Hose ( Demand ) : _____
- D3 - System Demand : 1224.19
- Hose ( Adj City ) : 500
- Safety Margin : 26.540

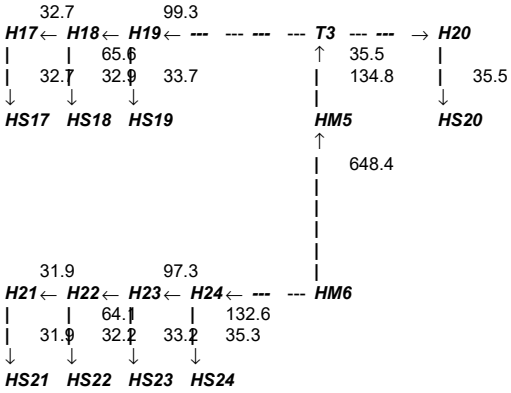


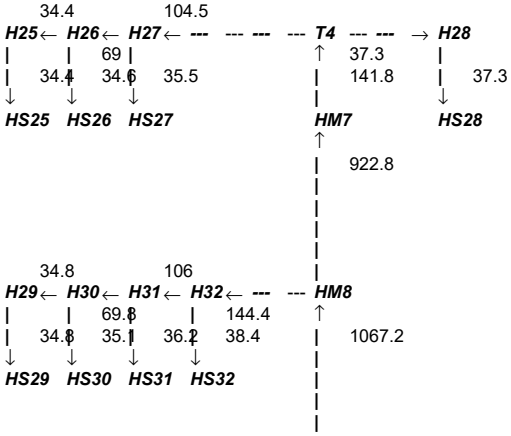


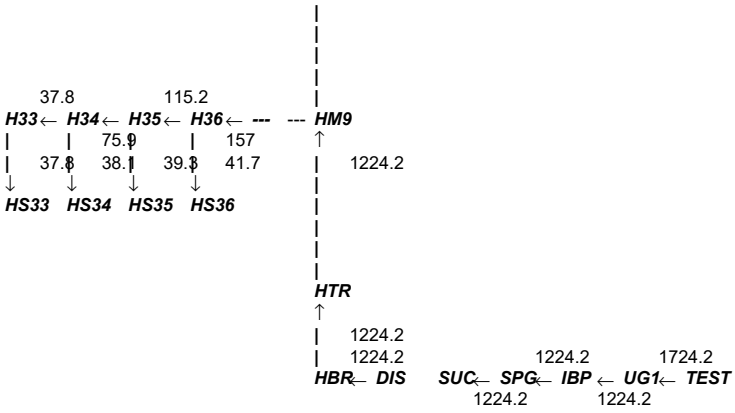

Computer Programs by Hydratec Inc. Revision: 50.5520.727


31.7
96.3
H1 ← H2 ← H3 ← --- --- --- --- T1 --- --- → H4
63.6
34.5
31.7 31.9 32.7
130.8
34.5
HS1 HS2 HS3
HM1 HS4
130.8
30
91.5
H5 ← H6 ← H7 ← H8 ← --- --- HM2
60.3
124.7
30 30.3 31.2 33.2
HS5 HS6 HS7 HS8


31.9
96.9
H9 ← H10 ← H11 ← --- --- --- --- T2 --- --- → H12
64
34.7
31.9 32.1 32.9
131.5
34.7
HS9 HS10 HS11
HM3 HS12
387
30.5
92.9
H13 ← H14 ← H15 ← H16 ← --- --- HM4
61.2
126.6
30.5 30.7 31.7 33.7
HS13 HS14 HS15 HS16


32.7
99.3
H17 ← H18 ← H19 ← --- --- --- --- T3 --- --- → H20
65.6
35.5
32.7 32.9 33.7
134.8
35.5
HS17 HS18 HS19
HM5 HS20
648.4
31.9
97.3
H21 ← H22 ← H23 ← H24 ← --- --- HM6
64.1
132.6
31.9 32.2 33.2 35.3
HS21 HS22 HS23 HS24


34.4
104.5
H25 ← H26 ← H27 ← --- --- --- --- T4 --- --- → H28
69
37.3
34.4 34.6 35.5
141.8
37.3
HS25 HS26 HS27
HM7 HS28
922.8
34.8
106
H29 ← H30 ← H31 ← H32 ← --- --- HM8
69.8
144.4
34.8 35.1 36.2 38.4
1067.2
HS29 HS30 HS31 HS32


37.8
115.2
H33
H34
H35
H36
---
---
HM9
75.9
157
37.8
38.1
39.3
41.7
1224.2
HS33
HS34
HS35
HS36
HTR
1224.2
1224.2
1224.2
1724.2
HBR
DIS
SUC
SPG
IBP
UG1
TEST
1224.2
1224.2

Fitting Legend

| Abbrev. | Name | ½ | ¾ | 1 | 1¼ | 1½ | 2 | 2½ | 3 | 3½ | 4 | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 24 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B | NFPA 13 Butterfly Valve | 0 | 0 | 0 | 0 | 0 | 6 | 7 | 10 | 0 | 12 | 9 | 10 | 12 | 19 | 21 | 23 | 25 | 0 | 0 | 0 |
| Dvc | Dry Vic 768 NXT | | | | | 3 | 9 | 8 | 17 | | 21 | | 22 | 50 | | | | | | | |
| E | 90 - NFPA | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 10 | 12 | 14 | 18 | 22 | 27 | 35 | 40 | 45 | 50 | 61 |
| F | 45 - NFPA | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 4 | 5 | 7 | 9 | 11 | 13 | 17 | 19 | 21 | 24 | 28 |
| G | NFPA 13 Gate Valve | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 10 | 11 | 13 |
| S | Swing Check NFPA 13 | 0 | 0 | 5 | 7 | 9 | 11 | 14 | 16 | 19 | 22 | 27 | 32 | 45 | 55 | 65 | | | | | |
| T | TEE - NFPA | 3 | 4 | 5 | 6 | 8 | 10 | 12 | 15 | 17 | 20 | 25 | 30 | 35 | 50 | 60 | 71 | 81 | 91 | 101 | 121 |
| V | 90 - GROOVED | 0 | 0 | 1.7 | 2 | 2.6 | 3.5 | 4.3 | 5 | 0 | 6.8 | 8.5 | 10 | 13 | 17 | 20 | 24.5 | 28 | 31 | 34 | 42 |
| X | TEE - GROOVED | 0 | 0 | 4.2 | 7.5 | 6.63 | 8.5 | 10.8 | 13 | 0 | 16 | 21 | 25 | 33 | 41 | 50 | 70 | 80 | 90 | 100 | 120 |
| Zaf | Ames 3000SS | Fitting generates a Fixed Loss Based on Flow | | | | | | | | | | | | | | | | | | | |

Units Summary

| | |
|---|---|
| Diameter Units | Inches |
| Length Units | Feet |
| Flow Units | US Gallons per Minute |
| Pressure Units | Pounds per Square Inch |

Note: Fitting Legend provides equivalent pipe lengths for fittings types of various diameters. Equivalent lengths shown are standard for actual diameters of Sched 40 pipe and CFactors of 120 except as noted with *. The fittings marked with a * show equivalent lengths values supplied by manufacturers based on specific pipe diameters and CFactors and they require no adjustment. All values for fittings not marked with a * will be adjusted in the calculation for CFactors of other than 120 and diameters other than Sched 40 per NFPA.

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## SUPPLY ANALYSIS

| Node at Source | Static Pressure | Residual Pressure | Flow | Available Pressure | Total Demand | Required Pressure |
|---|---|---|---|---|---|---|
| DIS | See Information on Pump Curve | | | 120.34 | 1224.19 | 93.801 |
| TEST | 64.0 | 52 | 4000.0 | 61.47 | 1724.19 | 61.47 |

## NODE ANALYSIS

| Node Tag | Elevation | Node Type | Pressure at Node | Discharge at Node | Notes | |
|---|---|---|---|---|---|---|
| HS1 | 26.417 | 11.2 | 8.0 | 31.68 | 0.3 | 100 |
| HS2 | 26.417 | 11.2 | 8.12 | 31.91 | 0.3 | 100 |
| HS3 | 26.417 | 11.2 | 8.53 | 32.71 | 0.3 | 100 |
| HS4 | 26.417 | 11.2 | 9.46 | 34.45 | 0.3 | 100 |
| HS5 | 26.417 | 11.2 | 7.18 | 30.0 | 0.3 | 100 |
| HS6 | 26.417 | 11.2 | 7.3 | 30.27 | 0.3 | 100 |
| HS7 | 26.417 | 11.2 | 7.78 | 31.23 | 0.3 | 100 |
| HS8 | 26.417 | 11.2 | 8.8 | 33.22 | 0.3 | 100 |
| HS9 | 26.417 | 11.2 | 8.1 | 31.87 | 0.3 | 100 |
| HS10 | 26.417 | 11.2 | 8.21 | 32.1 | 0.3 | 100 |
| HS11 | 26.417 | 11.2 | 8.63 | 32.91 | 0.3 | 100 |
| HS12 | 26.417 | 11.2 | 9.57 | 34.65 | 0.3 | 100 |
| HS13 | 26.417 | 11.2 | 7.4 | 30.46 | 0.3 | 100 |
| HS14 | 26.417 | 11.2 | 7.53 | 30.73 | 0.3 | 100 |
| HS15 | 26.417 | 11.2 | 8.01 | 31.7 | 0.3 | 100 |
| HS16 | 26.417 | 11.2 | 9.06 | 33.71 | 0.3 | 100 |
| HS17 | 26.417 | 11.2 | 8.51 | 32.67 | 0.3 | 100 |
| HS18 | 26.417 | 11.2 | 8.63 | 32.9 | 0.3 | 100 |
| HS19 | 26.417 | 11.2 | 9.07 | 33.73 | 0.3 | 100 |
| HS20 | 26.417 | 11.2 | 10.06 | 35.51 | 0.3 | 100 |
| HS21 | 26.417 | 11.2 | 8.12 | 31.91 | 0.3 | 100 |
| HS22 | 26.417 | 11.2 | 8.26 | 32.2 | 0.3 | 100 |
| HS23 | 26.417 | 11.2 | 8.79 | 33.21 | 0.3 | 100 |
| HS24 | 26.417 | 11.2 | 9.94 | 35.3 | 0.3 | 100 |
| HS25 | 26.417 | 11.2 | 9.42 | 34.37 | 0.3 | 100 |
| HS26 | 26.417 | 11.2 | 9.55 | 34.61 | 0.3 | 100 |
| HS27 | 26.417 | 11.2 | 10.03 | 35.48 | 0.3 | 100 |
| HS28 | 26.417 | 11.2 | 11.12 | 37.35 | 0.3 | 100 |
| HS29 | 26.417 | 11.2 | 9.63 | 34.75 | 0.3 | 100 |
| HS30 | 26.417 | 11.2 | 9.8 | 35.06 | 0.3 | 100 |
| HS31 | 26.417 | 11.2 | 10.42 | 36.15 | 0.3 | 100 |
| HS32 | 26.417 | 11.2 | 11.76 | 38.4 | 0.3 | 100 |
| HS33 | 26.417 | 11.2 | 11.39 | 37.8 | 0.3 | 100 |
| HS34 | 26.417 | 11.2 | 11.59 | 38.13 | 0.3 | 100 |
| HS35 | 26.417 | 11.2 | 12.32 | 39.3 | 0.3 | 100 |
| HS36 | 26.417 | 11.2 | 13.88 | 41.73 | 0.3 | 100 |
| H1 | 26.417 | | 10.63 | | | |
| H2 | 26.417 | | 10.78 | | | |
| H3 | 26.417 | | 11.32 | | | |
| H4 | 26.417 | | 12.53 | | | |
| T1 | 26.417 | | 12.72 | | | |

***NODE ANALYSIS (cont.)***

| *Node Tag* | *Elevation* | *Node Type* | *Pressure at Node* | *Discharge at Node* | *Notes* |
|---|---|---|---|---|---|
| H5 | 26.417 | | 7.68 | | |
| H6 | 26.417 | | 7.82 | | |
| H7 | 26.417 | | 8.32 | | |
| H8 | 26.417 | | 9.41 | | |
| H9 | 26.417 | | 10.75 | | |
| H10 | 26.417 | | 10.9 | | |
| H11 | 26.417 | | 11.45 | | |
| H12 | 26.417 | | 12.67 | | |
| T2 | 26.417 | | 12.87 | | |
| H13 | 26.417 | | 7.95 | | |
| H14 | 26.417 | | 8.09 | | |
| H15 | 26.417 | | 8.61 | | |
| H16 | 26.417 | | 9.73 | | |
| H17 | 26.417 | | 11.29 | | |
| H18 | 26.417 | | 11.44 | | |
| H19 | 26.417 | | 12.02 | | |
| H20 | 26.417 | | 13.3 | | |
| T3 | 26.417 | | 13.5 | | |
| H21 | 26.417 | | 8.72 | | |
| H22 | 26.417 | | 8.88 | | |
| H23 | 26.417 | | 9.44 | | |
| H24 | 26.417 | | 10.66 | | |
| H25 | 26.417 | | 12.47 | | |
| H26 | 26.417 | | 12.64 | | |
| H27 | 26.417 | | 13.27 | | |
| H28 | 26.417 | | 14.68 | | |
| T4 | 26.417 | | 14.9 | | |
| H29 | 26.417 | | 10.33 | | |
| H30 | 26.417 | | 10.52 | | |
| H31 | 26.417 | | 11.18 | | |
| H32 | 26.417 | | 12.6 | | |
| H33 | 26.417 | | 12.22 | | |
| H34 | 26.417 | | 12.43 | | |
| H35 | 26.417 | | 13.2 | | |
| H36 | 26.417 | | 14.87 | | |
| HM1 | 26.417 | | 14.48 | | |
| HM2 | 26.417 | | 14.49 | | |
| HM3 | 26.417 | | 14.64 | | |
| HM4 | 26.417 | | 14.95 | | |
| HM5 | 26.417 | | 15.36 | | |
| HM6 | 26.417 | | 16.35 | | |
| HM7 | 26.417 | | 16.94 | | |
| HM8 | 26.417 | | 19.26 | | |
| HM9 | 26.417 | | 25.77 | | |
| HTR | 26.417 | | 51.06 | | |
| HBR | 2.0 | | 92.94 | | |
| DIS | 2.0 | | 93.8 | | |
| SUC | 2.0 | | 42.27 | | |
| SPG | 1.0 | | 47.09 | | |
| IBP | -5.0 | | 50.1 | | |
| UG1 | -5.0 | | 51.98 | 500.0 | |

PERMIT #2026 2513934 - CM 04 | RSN:1975523



***NODE ANALYSIS (cont.)***

| *Node Tag* | *Elevation* | *Node Type* | *Pressure at Node* | *Discharge at Node* | *Notes* |
|---|---|---|---|---|---|
| TEST | 2.0 | | 61.47 | | |

PERMIT #2026 2513934 - CM 04 | RSN:1975523



| Node1<br>to<br>Node2 | Elev1<br><br>Elev2 | K<br><br>Fact | Qa<br><br>Qt | Nom<br><br>Act | Fitting<br>or<br>Eqiv | Len | Pipe<br>Ftngs<br>Total | CFact<br><br>Pf/Ft | Pt<br>Pe<br>Pf | ******* Notes ****** |
|---|---|---|---|---|---|---|---|---|---|---|
| *HEADS | | | | | | | | | | |
| HS1 | 26.417 | 11.20 | 31.68 | 1 | T | 3.568 | 2.583 | 100 | 8.001 | |
| to | | | | | | | 3.568 | | 0.0 | |
| H1 | 26.417 | | 31.68 | 1.049 | | | 6.151 | 0.4271 | 2.627 | Vel = 11.76 |
| | | | 0.0 | | | | | | | |
| H1 | | | 31.68 | | | | | | 10.628 | K Factor = 9.72 |
| HS2 | 26.417 | 11.20 | 31.91 | 1 | T | 3.568 | 2.583 | 100 | 8.116 | |
| to | | | | | | | 3.568 | | 0.0 | |
| H2 | 26.417 | | 31.91 | 1.049 | | | 6.151 | 0.4326 | 2.661 | Vel = 11.85 |
| | | | 0.0 | | | | | | | |
| H2 | | | 31.91 | | | | | | 10.777 | K Factor = 9.72 |
| HS3 | 26.417 | 11.20 | 32.71 | 1 | T | 3.568 | 2.583 | 100 | 8.531 | |
| to | | | | | | | 3.568 | | 0.0 | |
| H3 | 26.417 | | 32.71 | 1.049 | | | 6.151 | 0.4531 | 2.787 | Vel = 12.14 |
| | | | 0.0 | | | | | | | |
| H3 | | | 32.71 | | | | | | 11.318 | K Factor = 9.72 |
| HS4 | 26.417 | 11.20 | 34.45 | 1 | T | 3.568 | 2.583 | 100 | 9.462 | |
| to | | | | | | | 3.568 | | 0.0 | |
| H4 | 26.417 | | 34.45 | 1.049 | | | 6.151 | 0.4986 | 3.067 | Vel = 12.79 |
| | | | 0.0 | | | | | | | |
| H4 | | | 34.45 | | | | | | 12.529 | K Factor = 9.73 |
| HS5 | 26.417 | 11.20 | 30.00 | 1.25 | T | 6.0 | 1.000 | 120 | 7.175 | |
| to | | | | | | | 6.000 | | 0.0 | |
| H5 | 26.417 | | 30.0 | 1.38 | | | 7.000 | 0.0724 | 0.507 | Vel = 6.44 |
| | | | 0.0 | | | | | | | |
| H5 | | | 30.00 | | | | | | 7.682 | K Factor = 10.82 |
| HS6 | 26.417 | 11.20 | 30.27 | 1.25 | T | 6.0 | 1.000 | 120 | 7.305 | |
| to | | | | | | | 6.000 | | 0.0 | |
| H6 | 26.417 | | 30.27 | 1.38 | | | 7.000 | 0.0736 | 0.515 | Vel = 6.49 |
| | | | 0.0 | | | | | | | |
| H6 | | | 30.27 | | | | | | 7.820 | K Factor = 10.82 |
| HS7 | 26.417 | 11.20 | 31.23 | 1.25 | T | 6.0 | 1.000 | 120 | 7.777 | |
| to | | | | | | | 6.000 | | 0.0 | |
| H7 | 26.417 | | 31.23 | 1.38 | | | 7.000 | 0.0780 | 0.546 | Vel = 6.70 |
| | | | 0.0 | | | | | | | |
| H7 | | | 31.23 | | | | | | 8.323 | K Factor = 10.83 |
| HS8 | 26.417 | 11.20 | 33.22 | 1.25 | T | 6.0 | 1.000 | 120 | 8.800 | |
| to | | | | | | | 6.000 | | 0.0 | |
| H8 | 26.417 | | 33.22 | 1.38 | | | 7.000 | 0.0876 | 0.613 | Vel = 7.13 |
| | | | 0.0 | | | | | | | |
| H8 | | | 33.22 | | | | | | 9.413 | K Factor = 10.83 |
| HS9 | 26.417 | 11.20 | 31.87 | 1 | T | 3.568 | 2.583 | 100 | 8.097 | |
| to | | | | | | | 3.568 | | 0.0 | |
| H9 | 26.417 | | 31.87 | 1.049 | | | 6.151 | 0.4318 | 2.656 | Vel = 11.83 |
| | | | 0.0 | | | | | | | |
| H9 | | | 31.87 | | | | | | 10.753 | K Factor = 9.72 |
| HS10 | 26.417 | 11.20 | 32.10 | 1 | T | 3.568 | 2.583 | 100 | 8.213 | |
| to | | | | | | | 3.568 | | 0.0 | |
| H10 | 26.417 | | 32.1 | 1.049 | | | 6.151 | 0.4373 | 2.690 | Vel = 11.92 |


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| Node1 to Node2 | Elev1 Elev2 | K Fact | Qa Qt | Nom Act | Fitting or Eqiv | Len | Pipe Ftngs Total | CFact Pf/Ft | Pt Pe Pf | ******* | Notes | ****** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0.0 | | | | | | | | | |
| H10 | | | 32.10 | | | | | | 10.903 | K Factor = 9.72 | | |
| HS11 | 26.417 | 11.20 | 32.91 | 1 | T | 3.568 | 2.583 | 100 | 8.633 | | | |
| to | | | | | | | 3.568 | | 0.0 | | | |
| H11 | 26.417 | | 32.91 | 1.049 | | | 6.151 | 0.4581 | 2.818 | Vel = 12.22 | | |
| | | | 0.0 | | | | | | | | | |
| H11 | | | 32.91 | | | | | | 11.451 | K Factor = 9.73 | | |
| HS12 | 26.417 | 11.20 | 34.65 | 1 | T | 3.568 | 2.583 | 100 | 9.574 | | | |
| to | | | | | | | 3.568 | | 0.0 | | | |
| H12 | 26.417 | | 34.65 | 1.049 | | | 6.151 | 0.5040 | 3.100 | Vel = 12.86 | | |
| | | | 0.0 | | | | | | | | | |
| H12 | | | 34.65 | | | | | | 12.674 | K Factor = 9.73 | | |
| HS13 | 26.417 | 11.20 | 30.46 | 1.25 | T | 4.282 | 1.000 | 100 | 7.395 | | | |
| to | | | | | | | 4.282 | | 0.0 | | | |
| H13 | 26.417 | | 30.46 | 1.38 | | | 5.282 | 0.1043 | 0.551 | Vel = 6.53 | | |
| | | | 0.0 | | | | | | | | | |
| H13 | | | 30.46 | | | | | | 7.946 | K Factor = 10.81 | | |
| HS14 | 26.417 | 11.20 | 30.73 | 1.25 | T | 4.282 | 1.000 | 100 | 7.528 | | | |
| to | | | | | | | 4.282 | | 0.0 | | | |
| H14 | 26.417 | | 30.73 | 1.38 | | | 5.282 | 0.1062 | 0.561 | Vel = 6.59 | | |
| | | | 0.0 | | | | | | | | | |
| H14 | | | 30.73 | | | | | | 8.089 | K Factor = 10.80 | | |
| HS15 | 26.417 | 11.20 | 31.70 | 1.25 | T | 4.282 | 1.000 | 100 | 8.012 | | | |
| to | | | | | | | 4.282 | | 0.0 | | | |
| H15 | 26.417 | | 31.7 | 1.38 | | | 5.282 | 0.1125 | 0.594 | Vel = 6.80 | | |
| | | | 0.0 | | | | | | | | | |
| H15 | | | 31.70 | | | | | | 8.606 | K Factor = 10.81 | | |
| HS16 | 26.417 | 11.20 | 33.71 | 1.25 | T | 4.282 | 1.000 | 100 | 9.060 | | | |
| to | | | | | | | 4.282 | | 0.0 | | | |
| H16 | 26.417 | | 33.71 | 1.38 | | | 5.282 | 0.1261 | 0.666 | Vel = 7.23 | | |
| | | | 0.0 | | | | | | | | | |
| H16 | | | 33.71 | | | | | | 9.726 | K Factor = 10.81 | | |
| HS17 | 26.417 | 11.20 | 32.67 | 1 | T | 3.568 | 2.583 | 100 | 8.508 | | | |
| to | | | | | | | 3.568 | | 0.0 | | | |
| H17 | 26.417 | | 32.67 | 1.049 | | | 6.151 | 0.4520 | 2.780 | Vel = 12.13 | | |
| | | | 0.0 | | | | | | | | | |
| H17 | | | 32.67 | | | | | | 11.288 | K Factor = 9.72 | | |
| HS18 | 26.417 | 11.20 | 32.90 | 1 | T | 3.568 | 2.583 | 100 | 8.629 | | | |
| to | | | | | | | 3.568 | | 0.0 | | | |
| H18 | 26.417 | | 32.9 | 1.049 | | | 6.151 | 0.4578 | 2.816 | Vel = 12.21 | | |
| | | | 0.0 | | | | | | | | | |
| H18 | | | 32.90 | | | | | | 11.445 | K Factor = 9.72 | | |
| HS19 | 26.417 | 11.20 | 33.73 | 1 | T | 3.568 | 2.583 | 100 | 9.069 | | | |
| to | | | | | | | 3.568 | | 0.0 | | | |
| H19 | 26.417 | | 33.73 | 1.049 | | | 6.151 | 0.4794 | 2.949 | Vel = 12.52 | | |
| | | | 0.0 | | | | | | | | | |
| H19 | | | 33.73 | | | | | | 12.018 | K Factor = 9.73 | | |


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PERMIT #2026 2513934 - CM 04 | RSN:1975523

Hydratec Incorporated
227317 QTS DC2 - CALC 9 SYS W 1-11



| Node1 to Node2 | Elev1 Elev2 | K Fact | Qa Qt | Nom Act | Fitting or Eqiv | Len | Pipe Ftngs Total | CFact Pf/Ft | Pt Pe Pf | ******* Notes ****** |
|---|---|---|---|---|---|---|---|---|---|---|
| HS20 | 26.417 | 11.20 | 35.51 | 1 | T | 3.568 | 2.583 | 100 | 10.055 | |
| to | | | | | | | 3.568 | | 0.0 | |
| H20 | 26.417 | | 35.51 | 1.049 | | | 6.151 | 0.5274 | 3.244 | Vel = 13.18 |
| | | | 0.0 | | | | | | | |
| H20 | | | 35.51 | | | | | | 13.299 | K Factor = 9.74 |
| HS21 | 26.417 | 11.20 | 31.91 | 1.25 | T | 4.282 | 1.000 | 100 | 8.119 | |
| to | | | | | | | 4.282 | | 0.0 | |
| H21 | 26.417 | | 31.91 | 1.38 | | | 5.282 | 0.1140 | 0.602 | Vel = 6.84 |
| | | | 0.0 | | | | | | | |
| H21 | | | 31.91 | | | | | | 8.721 | K Factor = 10.81 |
| HS22 | 26.417 | 11.20 | 32.20 | 1.25 | T | 4.282 | 1.000 | 100 | 8.264 | |
| to | | | | | | | 4.282 | | 0.0 | |
| H22 | 26.417 | | 32.2 | 1.38 | | | 5.282 | 0.1159 | 0.612 | Vel = 6.91 |
| | | | 0.0 | | | | | | | |
| H22 | | | 32.20 | | | | | | 8.876 | K Factor = 10.81 |
| HS23 | 26.417 | 11.20 | 33.21 | 1.25 | T | 4.282 | 1.000 | 100 | 8.792 | |
| to | | | | | | | 4.282 | | 0.0 | |
| H23 | 26.417 | | 33.21 | 1.38 | | | 5.282 | 0.1227 | 0.648 | Vel = 7.12 |
| | | | 0.0 | | | | | | | |
| H23 | | | 33.21 | | | | | | 9.440 | K Factor = 10.81 |
| HS24 | 26.417 | 11.20 | 35.30 | 1.25 | T | 4.282 | 1.000 | 100 | 9.936 | |
| to | | | | | | | 4.282 | | 0.0 | |
| H24 | 26.417 | | 35.3 | 1.38 | | | 5.282 | 0.1371 | 0.724 | Vel = 7.57 |
| | | | 0.0 | | | | | | | |
| H24 | | | 35.30 | | | | | | 10.660 | K Factor = 10.81 |
| HS25 | 26.417 | 11.20 | 34.37 | 1 | T | 3.568 | 2.583 | 100 | 9.416 | |
| to | | | | | | | 3.568 | | 0.0 | |
| H25 | 26.417 | | 34.37 | 1.049 | | | 6.151 | 0.4965 | 3.054 | Vel = 12.76 |
| | | | 0.0 | | | | | | | |
| H25 | | | 34.37 | | | | | | 12.470 | K Factor = 9.73 |
| HS26 | 26.417 | 11.20 | 34.61 | 1 | T | 3.568 | 2.583 | 100 | 9.550 | |
| to | | | | | | | 3.568 | | 0.0 | |
| H26 | 26.417 | | 34.61 | 1.049 | | | 6.151 | 0.5028 | 3.093 | Vel = 12.85 |
| | | | 0.0 | | | | | | | |
| H26 | | | 34.61 | | | | | | 12.643 | K Factor = 9.73 |
| HS27 | 26.417 | 11.20 | 35.48 | 1 | T | 3.568 | 2.583 | 100 | 10.034 | |
| to | | | | | | | 3.568 | | 0.0 | |
| H27 | 26.417 | | 35.48 | 1.049 | | | 6.151 | 0.5264 | 3.238 | Vel = 13.17 |
| | | | 0.0 | | | | | | | |
| H27 | | | 35.48 | | | | | | 13.272 | K Factor = 9.74 |
| HS28 | 26.417 | 11.20 | 37.35 | 1 | T | 3.568 | 2.583 | 100 | 11.119 | |
| to | | | | | | | 3.568 | | 0.0 | |
| H28 | 26.417 | | 37.35 | 1.049 | | | 6.151 | 0.5789 | 3.561 | Vel = 13.87 |
| | | | 0.0 | | | | | | | |
| H28 | | | 37.35 | | | | | | 14.680 | K Factor = 9.75 |
| HS29 | 26.417 | 11.20 | 34.76 | 1.25 | T | 4.282 | 1.000 | 100 | 9.629 | |
| to | | | | | | | 4.282 | | 0.0 | |
| H29 | 26.417 | | 34.76 | 1.38 | | | 5.282 | 0.1333 | 0.704 | Vel = 7.46 |


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PERMIT #2026 2513934 - CM 04 | RSN:1975523



| Node1<br>to<br>Node2 | Elev1<br><br>Elev2 | K<br><br>Fact | Qa<br><br>Qt | Nom<br><br>Act | Fitting<br>or<br>Eqiv | Len | Pipe<br>Ftngs<br>Total | CFact<br><br>Pf/Ft | Pt<br>Pe<br>Pf | ******* Notes ****** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0.0 | | | | | | | |
| H29 | | | 34.76 | | | | | | 10.333 | K Factor = 10.81 |
| HS30 | 26.417 | 11.20 | 35.06 | 1.25 | T | 4.282 | 1.000 | 100 | 9.800 | |
| to | | | | | | | 4.282 | | 0.0 | |
| H30 | 26.417 | | 35.06 | 1.38 | | | 5.282 | 0.1354 | 0.715 | Vel = 7.52 |
| | | | 0.0 | | | | | | | |
| H30 | | | 35.06 | | | | | | 10.515 | K Factor = 10.81 |
| HS31 | 26.417 | 11.20 | 36.15 | 1.25 | T | 4.282 | 1.000 | 100 | 10.418 | |
| to | | | | | | | 4.282 | | 0.0 | |
| H31 | 26.417 | | 36.15 | 1.38 | | | 5.282 | 0.1433 | 0.757 | Vel = 7.75 |
| | | | 0.0 | | | | | | | |
| H31 | | | 36.15 | | | | | | 11.175 | K Factor = 10.81 |
| HS32 | 26.417 | 11.20 | 38.40 | 1.25 | T | 4.282 | 1.000 | 100 | 11.757 | |
| to | | | | | | | 4.282 | | 0.0 | |
| H32 | 26.417 | | 38.4 | 1.38 | | | 5.282 | 0.1604 | 0.847 | Vel = 8.24 |
| | | | 0.0 | | | | | | | |
| H32 | | | 38.40 | | | | | | 12.604 | K Factor = 10.82 |
| HS33 | 26.417 | 11.20 | 37.80 | 1.25 | T | 4.282 | 1.000 | 100 | 11.393 | |
| to | | | | | | | 4.282 | | 0.0 | |
| H33 | 26.417 | | 37.8 | 1.38 | | | 5.282 | 0.1556 | 0.822 | Vel = 8.11 |
| | | | 0.0 | | | | | | | |
| H33 | | | 37.80 | | | | | | 12.215 | K Factor = 10.82 |
| HS34 | 26.417 | 11.20 | 38.13 | 1.25 | T | 4.282 | 1.000 | 100 | 11.592 | |
| to | | | | | | | 4.282 | | 0.0 | |
| H34 | 26.417 | | 38.13 | 1.38 | | | 5.282 | 0.1583 | 0.836 | Vel = 8.18 |
| | | | 0.0 | | | | | | | |
| H34 | | | 38.13 | | | | | | 12.428 | K Factor = 10.82 |
| HS35 | 26.417 | 11.20 | 39.30 | 1.25 | T | 4.282 | 1.000 | 100 | 12.315 | |
| to | | | | | | | 4.282 | | 0.0 | |
| H35 | 26.417 | | 39.3 | 1.38 | | | 5.282 | 0.1674 | 0.884 | Vel = 8.43 |
| | | | 0.0 | | | | | | | |
| H35 | | | 39.30 | | | | | | 13.199 | K Factor = 10.82 |
| HS36 | 26.417 | 11.20 | 41.73 | 1.25 | T | 4.282 | 1.000 | 100 | 13.880 | |
| to | | | | | | | 4.282 | | 0.0 | |
| H36 | 26.417 | | 41.73 | 1.38 | | | 5.282 | 0.1871 | 0.988 | Vel = 8.95 |
| | | | 0.0 | | | | | | | |
| H36 | | | 41.73 | | | | | | 14.868 | K Factor = 10.82 |
| *LINE1 | | | | | | | | | | |
| H1 | 26.417 | | 31.68 | 2 | | | 9.500 | 100 | 10.628 | |
| to | | | | | | | | | 0.0 | |
| H2 | 26.417 | | 31.68 | 2.067 | | | 9.500 | 0.0157 | 0.149 | Vel = 3.03 |
| H2 | 26.417 | | 31.91 | 2 | | | 9.500 | 100 | 10.777 | |
| to | | | | | | | | | 0.0 | |
| H3 | 26.417 | | 63.59 | 2.067 | | | 9.500 | 0.0569 | 0.541 | Vel = 6.08 |
| H3 | 26.417 | | 32.71 | 2 | X | 6.066 | 5.333 | 100 | 11.318 | |
| to | | | | | | | 6.066 | | 0.0 | |
| T1 | 26.417 | | 96.3 | 2.067 | | | 11.399 | 0.1228 | 1.400 | Vel = 9.21 |


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| Node1<br>to<br>Node2 | Elev1<br><br>Elev2 | K<br><br>Fact | Qa<br><br>Qt | Nom<br><br>Act | Fitting<br>or<br>Eqiv | Len | Pipe<br>Ftngs<br>Total | CFact<br><br>Pf/Ft | Pt<br>Pe<br>Pf | ******* Notes ****** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0.0 | | | | | | | |
| T1 | | | 96.30 | | | | | | 12.718 | K Factor = 27.00 |
| H4 | 26.417 | | 34.45 | 2 | X | 6.066 | 4.250 | 100 | 12.529 | |
| to | | | | | | | 6.066 | | 0.0 | |
| T1 | 26.417 | | 34.45 | 2.067 | | | 10.316 | 0.0183 | 0.189 | Vel = 3.29 |
| T1 | 26.417 | | 96.30 | 2 | T | 7.137 | 1.000 | 100 | 12.718 | |
| to | | | | | | | 7.137 | | 0.0 | |
| HM1 | 26.417 | | 130.75 | 2.067 | | | 8.137 | 0.2162 | 1.759 | Vel = 12.50 |
| | | | 0.0 | | | | | | | |
| HM1 | | | 130.75 | | | | | | 14.477 | K Factor = 34.36 |
| *LINE2 | | | | | | | | | | |
| H5 | 26.417 | | 30.00 | 2 | | | 9.750 | 100 | 7.682 | |
| to | | | | | | | | | 0.0 | |
| H6 | 26.417 | | 30.0 | 2.067 | | | 9.750 | 0.0142 | 0.138 | Vel = 2.87 |
| H6 | 26.417 | | 30.27 | 2 | | | 9.750 | 100 | 7.820 | |
| to | | | | | | | | | 0.0 | |
| H7 | 26.417 | | 60.27 | 2.067 | | | 9.750 | 0.0516 | 0.503 | Vel = 5.76 |
| H7 | 26.417 | | 31.23 | 2 | | | 9.750 | 100 | 8.323 | |
| to | | | | | | | | | 0.0 | |
| H8 | 26.417 | | 91.5 | 2.067 | | | 9.750 | 0.1118 | 1.090 | Vel = 8.75 |
| H8 | 26.417 | | 33.23 | 2 | V | 2.498 | 16.000 | 100 | 9.413 | |
| to | | | | | T | 7.137 | 9.635 | | 0.0 | |
| HM2 | 26.417 | | 124.73 | 2.067 | | | 25.635 | 0.1981 | 5.079 | Vel = 11.93 |
| | | | 0.0 | | | | | | | |
| HM2 | | | 124.73 | | | | | | 14.492 | K Factor = 32.76 |
| *LINE3 | | | | | | | | | | |
| H9 | 26.417 | | 31.87 | 2 | | | 9.500 | 100 | 10.753 | |
| to | | | | | | | | | 0.0 | |
| H10 | 26.417 | | 31.87 | 2.067 | | | 9.500 | 0.0158 | 0.150 | Vel = 3.05 |
| H10 | 26.417 | | 32.10 | 2 | | | 9.500 | 100 | 10.903 | |
| to | | | | | | | | | 0.0 | |
| H11 | 26.417 | | 63.97 | 2.067 | | | 9.500 | 0.0577 | 0.548 | Vel = 6.12 |
| H11 | 26.417 | | 32.90 | 2 | X | 6.066 | 5.333 | 100 | 11.451 | |
| to | | | | | | | 6.066 | | 0.0 | |
| T2 | 26.417 | | 96.87 | 2.067 | | | 11.399 | 0.1241 | 1.415 | Vel = 9.26 |
| | | | 0.0 | | | | | | | |
| T2 | | | 96.87 | | | | | | 12.866 | K Factor = 27.01 |
| H12 | 26.417 | | 34.65 | 2 | X | 6.066 | 4.250 | 100 | 12.674 | |
| to | | | | | | | 6.066 | | 0.0 | |
| T2 | 26.417 | | 34.65 | 2.067 | | | 10.316 | 0.0186 | 0.192 | Vel = 3.31 |
| T2 | 26.417 | | 96.88 | 2 | T | 7.137 | 1.000 | 100 | 12.866 | |
| to | | | | | | | 7.137 | | 0.0 | |
| HM3 | 26.417 | | 131.53 | 2.067 | | | 8.137 | 0.2185 | 1.778 | Vel = 12.58 |
| | | | 0.0 | | | | | | | |
| HM3 | | | 131.53 | | | | | | 14.644 | K Factor = 34.37 |
| *LINE4 | | | | | | | | | | |
| H13 | 26.417 | | 30.46 | 2 | | | 9.750 | 100 | 7.946 | |
| to | | | | | | | | | 0.0 | |
| H14 | 26.417 | | 30.46 | 2.067 | | | 9.750 | 0.0147 | 0.143 | Vel = 2.91 |

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| Node1<br>to<br>Node2 | Elev1<br><br>Elev2 | K<br><br>Fact | Qa<br><br>Qt | Nom<br><br>Act | Fitting<br>or<br>Eqiv | Len | Pipe<br>Ftngs<br>Total | CFact<br><br>Pf/Ft | Pt<br>Pe<br>Pf | ******* Notes ****** |
|---|---|---|---|---|---|---|---|---|---|---|
| H14 | 26.417 | | 30.73 | 2 | | | 9.750 | 100 | 8.089 | |
| to | | | | | | | | | 0.0 | |
| H15 | 26.417 | | 61.19 | 2.067 | | | 9.750 | 0.0530 | 0.517 | Vel = 5.85 |
| H15 | 26.417 | | 31.70 | 2 | | | 9.750 | 100 | 8.606 | |
| to | | | | | | | | | 0.0 | |
| H16 | 26.417 | | 92.89 | 2.067 | | | 9.750 | 0.1149 | 1.120 | Vel = 8.88 |
| H16 | 26.417 | | 33.71 | 2 | V | 2.498 | 16.000 | 100 | 9.726 | |
| to | | | | | T | 7.137 | 9.635 | | 0.0 | |
| HM4 | 26.417 | | 126.6 | 2.067 | | | 25.635 | 0.2037 | 5.221 | Vel = 12.10 |
| | | | 0.0 | | | | | | | |
| HM4 | | | 126.60 | | | | | | 14.947 | K Factor = 32.75 |
| *LINE5 | | | | | | | | | | |
| H17 | 26.417 | | 32.67 | 2 | | | 9.500 | 100 | 11.288 | |
| to | | | | | | | | | 0.0 | |
| H18 | 26.417 | | 32.67 | 2.067 | | | 9.500 | 0.0165 | 0.157 | Vel = 3.12 |
| H18 | 26.417 | | 32.90 | 2 | | | 9.500 | 100 | 11.445 | |
| to | | | | | | | | | 0.0 | |
| H19 | 26.417 | | 65.57 | 2.067 | | | 9.500 | 0.0603 | 0.573 | Vel = 6.27 |
| H19 | 26.417 | | 33.73 | 2 | X | 6.066 | 5.333 | 100 | 12.018 | |
| to | | | | | | | 6.066 | | 0.0 | |
| T3 | 26.417 | | 99.3 | 2.067 | | | 11.399 | 0.1299 | 1.481 | Vel = 9.49 |
| | | | 0.0 | | | | | | | |
| T3 | | | 99.30 | | | | | | 13.499 | K Factor = 27.03 |
| H20 | 26.417 | | 35.51 | 2 | X | 6.066 | 4.250 | 100 | 13.299 | |
| to | | | | | | | 6.066 | | 0.0 | |
| T3 | 26.417 | | 35.51 | 2.067 | | | 10.316 | 0.0194 | 0.200 | Vel = 3.40 |
| T3 | 26.417 | | 99.30 | 2 | T | 7.137 | 1.000 | 100 | 13.499 | |
| to | | | | | | | 7.137 | | 0.0 | |
| HM5 | 26.417 | | 134.81 | 2.067 | | | 8.137 | 0.2288 | 1.862 | Vel = 12.89 |
| | | | 0.0 | | | | | | | |
| HM5 | | | 134.81 | | | | | | 15.361 | K Factor = 34.40 |
| *LINE6 | | | | | | | | | | |
| H21 | 26.417 | | 31.91 | 2 | | | 9.750 | 100 | 8.721 | |
| to | | | | | | | | | 0.0 | |
| H22 | 26.417 | | 31.91 | 2.067 | | | 9.750 | 0.0159 | 0.155 | Vel = 3.05 |
| H22 | 26.417 | | 32.20 | 2 | | | 9.750 | 100 | 8.876 | |
| to | | | | | | | | | 0.0 | |
| H23 | 26.417 | | 64.11 | 2.067 | | | 9.750 | 0.0578 | 0.564 | Vel = 6.13 |
| H23 | 26.417 | | 33.21 | 2 | | | 9.750 | 100 | 9.440 | |
| to | | | | | | | | | 0.0 | |
| H24 | 26.417 | | 97.32 | 2.067 | | | 9.750 | 0.1251 | 1.220 | Vel = 9.30 |
| H24 | 26.417 | | 35.30 | 2 | V | 2.498 | 16.000 | 100 | 10.660 | |
| to | | | | | T | 7.137 | 9.635 | | 0.0 | |
| HM6 | 26.417 | | 132.62 | 2.067 | | | 25.635 | 0.2220 | 5.691 | Vel = 12.68 |
| | | | 0.0 | | | | | | | |
| HM6 | | | 132.62 | | | | | | 16.351 | K Factor = 32.80 |
| *LINE7 | | | | | | | | | | |


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| Node1 to Node2 | Elev1 Elev2 | K Fact | Qa Qt | Nom Act | Fitting or Eqiv | Len | Pipe Ftngs Total | CFact Pf/Ft | Pt Pe Pf | ******* | Notes | ****** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| H25 | 26.417 | | 34.37 | 2 | | | 9.500 | 100 | 12.470 | | | |
| to | | | | | | | | | 0.0 | | | |
| H26 | 26.417 | | 34.37 | 2.067 | | | 9.500 | 0.0182 | 0.173 | Vel = 3.29 | | |
| H26 | 26.417 | | 34.61 | 2 | | | 9.500 | 100 | 12.643 | | | |
| to | | | | | | | | | 0.0 | | | |
| H27 | 26.417 | | 68.98 | 2.067 | | | 9.500 | 0.0662 | 0.629 | Vel = 6.60 | | |
| H27 | 26.417 | | 35.48 | 2 | X | 6.066 | 5.333 | 100 | 13.272 | | | |
| to | | | | | | | 6.066 | | 0.0 | | | |
| T4 | 26.417 | | 104.46 | 2.067 | | | 11.399 | 0.1427 | 1.627 | Vel = 9.99 | | |
| | | | 0.0 | | | | | | | | | |
| T4 | | | 104.46 | | | | | | 14.899 | K Factor = 27.06 | | |
| H28 | 26.417 | | 37.35 | 2 | X | 6.066 | 4.250 | 100 | 14.680 | | | |
| to | | | | | | | 6.066 | | 0.0 | | | |
| T4 | 26.417 | | 37.35 | 2.067 | | | 10.316 | 0.0212 | 0.219 | Vel = 3.57 | | |
| T4 | 26.417 | | 104.45 | 2 | T | 7.137 | 1.000 | 100 | 14.899 | | | |
| to | | | | | | | 7.137 | | 0.0 | | | |
| HM7 | 26.417 | | 141.8 | 2.067 | | | 8.137 | 0.2513 | 2.045 | Vel = 13.56 | | |
| | | | 0.0 | | | | | | | | | |
| HM7 | | | 141.80 | | | | | | 16.944 | K Factor = 34.45 | | |
| *LINE8 | | | | | | | | | | | | |
| H29 | 26.417 | | 34.76 | 2 | | | 9.750 | 100 | 10.333 | | | |
| to | | | | | | | | | 0.0 | | | |
| H30 | 26.417 | | 34.76 | 2.067 | | | 9.750 | 0.0187 | 0.182 | Vel = 3.32 | | |
| H30 | 26.417 | | 35.06 | 2 | | | 9.750 | 100 | 10.515 | | | |
| to | | | | | | | | | 0.0 | | | |
| H31 | 26.417 | | 69.82 | 2.067 | | | 9.750 | 0.0677 | 0.660 | Vel = 6.68 | | |
| H31 | 26.417 | | 36.15 | 2 | | | 9.750 | 100 | 11.175 | | | |
| to | | | | | | | | | 0.0 | | | |
| H32 | 26.417 | | 105.97 | 2.067 | | | 9.750 | 0.1466 | 1.429 | Vel = 10.13 | | |
| H32 | 26.417 | | 38.40 | 2 | V | 2.498 | 16.000 | 100 | 12.604 | | | |
| to | | | | | T | 7.137 | 9.635 | | 0.0 | | | |
| HM8 | 26.417 | | 144.37 | 2.067 | | | 25.635 | 0.2597 | 6.658 | Vel = 13.80 | | |
| | | | 0.0 | | | | | | | | | |
| HM8 | | | 144.37 | | | | | | 19.262 | K Factor = 32.89 | | |
| *LINE9 | | | | | | | | | | | | |
| H33 | 26.417 | | 37.80 | 2 | | | 9.750 | 100 | 12.215 | | | |
| to | | | | | | | | | 0.0 | | | |
| H34 | 26.417 | | 37.8 | 2.067 | | | 9.750 | 0.0218 | 0.213 | Vel = 3.61 | | |
| H34 | 26.417 | | 38.14 | 2 | | | 9.750 | 100 | 12.428 | | | |
| to | | | | | | | | | 0.0 | | | |
| H35 | 26.417 | | 75.94 | 2.067 | | | 9.750 | 0.0791 | 0.771 | Vel = 7.26 | | |
| H35 | 26.417 | | 39.30 | 2 | | | 9.750 | 100 | 13.199 | | | |
| to | | | | | | | | | 0.0 | | | |
| H36 | 26.417 | | 115.24 | 2.067 | | | 9.750 | 0.1712 | 1.669 | Vel = 11.02 | | |
| H36 | 26.417 | | 41.73 | 2 | 3V | 7.494 | 21.333 | 100 | 14.868 | | | |
| to | | | | | T | 7.137 | 14.631 | | 0.0 | | | |
| HM9 | 26.417 | | 156.97 | 2.067 | | | 35.964 | 0.3032 | 10.903 | Vel = 15.01 | | |


SHEET 136 of 403

PERMIT #2026 2513934 - CM 04 | RSN:1975523



| Node1 to Node2 | Elev1 Elev2 | K Fact | Qa Qt | Nom Act | Fitting or Eqiv | Len | Pipe Ftngs Total | CFact Pf/Ft | Pt Pe Pf | ******* Notes ****** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0.0 | | | | | | | |
| HM9 | | | 156.97 | | | | | | 25.771 | K Factor = 30.92 |
| *MAIN | | | | | | | | | | |
| HM1 | 26.417 | | 130.75 | 4 | | | 1.750 | 100 | 14.477 | |
| to | | | | | | | | | 0.0 | |
| HM2 | 26.417 | | 130.75 | 4.026 | | | 1.750 | 0.0086 | 0.015 | Vel = 3.30 |
| HM2 | 26.417 | | 124.73 | 4 | | | 5.250 | 100 | 14.492 | |
| to | | | | | | | | | 0.0 | |
| HM3 | 26.417 | | 255.48 | 4.026 | | | 5.250 | 0.0290 | 0.152 | Vel = 6.44 |
| HM3 | 26.417 | | 131.53 | 4 | | | 4.833 | 100 | 14.644 | |
| to | | | | | | | | | 0.0 | |
| HM4 | 26.417 | | 387.01 | 4.026 | | | 4.833 | 0.0627 | 0.303 | Vel = 9.75 |
| HM4 | 26.417 | | 126.60 | 4 | | | 3.917 | 100 | 14.947 | |
| to | | | | | | | | | 0.0 | |
| HM5 | 26.417 | | 513.61 | 4.026 | | | 3.917 | 0.1057 | 0.414 | Vel = 12.94 |
| HM5 | 26.417 | | 134.81 | 4 | | | 6.083 | 100 | 15.361 | |
| to | | | | | | | | | 0.0 | |
| HM6 | 26.417 | | 648.42 | 4.026 | | | 6.083 | 0.1627 | 0.990 | Vel = 16.34 |
| HM6 | 26.417 | | 132.63 | 4 | | | 2.583 | 100 | 16.351 | |
| to | | | | | | | | | 0.0 | |
| HM7 | 26.417 | | 781.05 | 4.026 | | | 2.583 | 0.2296 | 0.593 | Vel = 19.68 |
| HM7 | 26.417 | | 141.80 | 4 | | | 7.417 | 100 | 16.944 | |
| to | | | | | | | | | 0.0 | |
| HM8 | 26.417 | | 922.85 | 4.026 | | | 7.417 | 0.3125 | 2.318 | Vel = 23.26 |
| HM8 | 26.417 | | 144.37 | 4 | | | 15.917 | 100 | 19.262 | |
| to | | | | | | | | | 0.0 | |
| HM9 | 26.417 | | 1067.22 | 4.026 | | | 15.917 | 0.4089 | 6.509 | Vel = 26.90 |
| HM9 | 26.417 | | 156.97 | 4 | 3V | 20.4 | 46.833 | 120 | 25.771 | |
| to | | | | | | | 20.400 | | 0.0 | |
| HTR | 26.417 | | 1224.19 | 4.026 | | | 67.233 | 0.3762 | 25.294 | Vel = 30.85 |
| HTR | 26.417 | | 0.0 | 4 | 2V | 9.706 | 20.417 | 100 | 51.065 | |
| to | | | | | Dvc | 14.988 | 38.968 | | 10.575 | |
| HBR | 2 | | 1224.19 | 4.026 | T | 14.274 | 59.385 | 0.5271 | 31.304 | Vel = 30.85 |
| HBR | 2 | | 0.0 | 8 | S | 52.853 | 8.000 | 120 | 92.944 | |
| to | | | | | B | 14.094 | 66.947 | | 0.0 | |
| DIS | 2 | | 1224.19 | 8.249 | | | 74.947 | 0.0114 | 0.857 | Vel = 7.35 |
| | | | 0.0 | | | | | | | |
| DIS | | | 1224.19 | | | | | | 93.801 | K Factor = 126.40 |
| System Demand Pressure | | | | | | | | | 93.801 | |
| Safety Margin | | | | | | | | | 26.540 | |
| Continuation Pressure | | | | | | | | | 120.340 | |
| Pressure @ Pump Outlet | | | | | | | | | 120.340 | |
| Pressure From Pump Curve | | | | | | | | | -78.074 | |
| Pressure @ Pump Inlet | | | | | | | | | 42.266 | |
| *PUMP | | | | | | | | | | |
| SUC | 2 | | 0.0 | 8 | Zaf | 0.0 | 8.000 | 120 | 42.266 | |
| to | | | | | E | 21.141 | 25.839 | | 4.433 | * * Fixed Loss = 4 |
| SPG | 1 | | 1224.19 | 8.249 | G | 4.698 | 33.839 | 0.0114 | 0.387 | Vel = 7.35 |

PERMIT #2026 2513934 - CM 04 | RSN:1975523



| Node1<br>to<br>Node2 | Elev1<br><br>Elev2 | K<br><br>Fact | Qa<br><br>Qt | Nom<br><br>Act | Fitting<br>or<br>Eqiv | Len | Pipe<br>Ftngs<br>Total | CFact<br><br>Pf/Ft | Pt<br>Pe<br>Pf | ******* Notes ****** |
|---|---|---|---|---|---|---|---|---|---|---|
| SPG | 1 | | 0.0 | 8 | E | 21.141 | 15.000 | 120 | 47.086 | |
| to | | | | | | | 21.141 | | 2.599 | |
| IBP | -5 | | 1224.19 | 8.249 | | | 36.141 | 0.0114 | 0.413 | Vel = 7.35 |
| IBP | -5 | | 0.0 | 8 | F | 11.278 | 120.000 | 150 | 50.098 | |
| to | | | | | T | 43.857 | 55.135 | | 0.0 | |
| UG1 | -5 | | 1224.19 | 7.68 | | | 175.135 | 0.0107 | 1.878 | Vel = 8.48 |
| | | | 0.0 | | | | | | | |
| UG1 | | | 1224.19 | | | | | | 51.976 | K Factor = 169.80 |
| *UG2 | | | | | | | | | | |
| UG1 | -5 | H500 | 1724.19 | 8 | F | 11.278 | 565.000 | 150 | 51.976 | |
| to | | | | | T | 43.857 | 55.135 | | -3.032 | |
| TEST | 2 | | 1724.19 | 7.68 | | | 620.135 | 0.0202 | 12.526 | Vel = 11.94 |
| | | | 0.0 | | | | | | | |
| TEST | | | 1724.19 | | | | | | 61.470 | K Factor = 219.91 |

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| Croker | 5713 2-1/2" Cap w/Chain | |
| **CHECK VALVE** | | |
| Reliable | Model G Check Valve | |
| **GATE VALVE** | | |
| Victaulic | 771F Grv x Grv OS&Y Gate Valve | |
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| Victaulic | 728 Firelock Ball Valve | With Tamper Switch |
| **GLOBE VALVE** | | |
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| Viking | Model F-1 4" Vertical Conventional Trim | |
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| Bull Moose | Black Sch. 40 | |
| Wheatland | Black Sch. 40 | |
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| ECS | PHGA-1 Gas Analyzer | |
| ECS | AVC-1 Vent Controller | |
| ECS | PAV-D/DQ | |
| ECS | COMP-5/7.5/10-2 Air Compressor | |

| | |
|---|---|
| ECS | AMD Air Maintenance |
| ECS | ILD-X In-Line Corrosion Detector |
| Victaulic | Firelock NXT Preaction Trim Series 768N |
| Reliable | DDX PrePak Bulletin 760 Double Interlock Preaction, Pneumatic/Pneumatic |

## EQUIPMENT IDENTIFICATION SIGNS

| | |
|---|---|
| Safety Signs | FDC SIGN |
| Safety Signs | FIRE PUMP ROOM SIGN |
| Safety Signs | NORMALLY CLOSED SIGN |
| Safety Signs | NORMALLY OPEN SIGN |
| Safety Signs | TEST HEADER SIGN |
| Safety Signs | MAIN DRAIN SIGN |
| Safety Signs | CONTROL VALVE SIGN |
| Kolbi | HYDRAULIC CALC PLATES |
| Kolbi | HEAD BOX SIGN |

FIRE DEPT. CONN.

POTTER ROEMER FIRE PRO™
Member of Morris Group International™

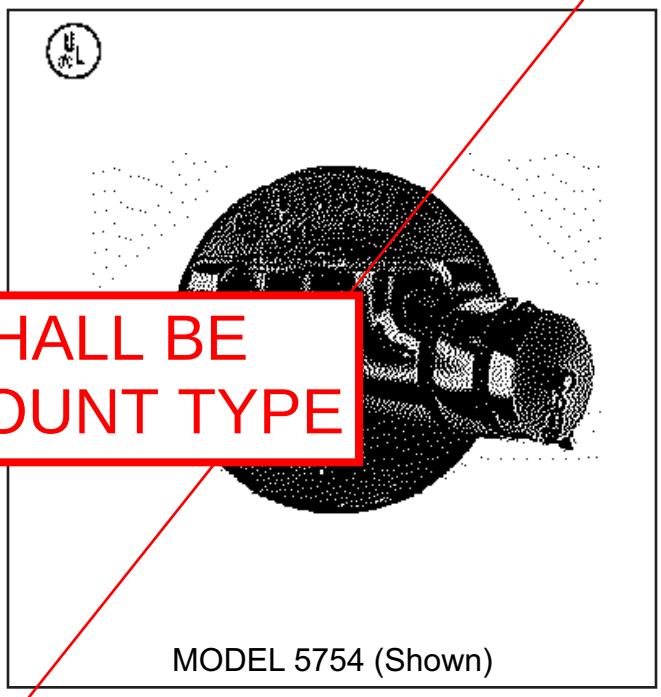
# CONNECTIONS (FDC)
## EXPOSED FIRE DEPT. INLET CONNECTIONS
## 2 WAY DOUBLE CLAPPER TYPE

Model/Series No.
**5750-5754 SERIES**

## SPECIFICATIONS

**TWO-WAY w/ DOUBLE CLAPPERS w/ PLATE & PLUGS**

Cast brass two-way inlet body with drop clappers, pin lug swivels and plugs and chains. Cast brass round wall plate with lettering as selected. Outlet and inlet size as selected by model number.



MODEL 5754 (Shown)

FDC SHALL BE FLUSH MOUNT TYPE

## MODEL SELECTION

- ❑ **5751** Back Outlet
- ❑ **5752** Back Outlet
- ❑ **5753** Back Outlet
- ❑ **5754** Back Outlet

## PRODUCT OPTIONS

**FINISHES:**

- ❑ -B Polished Brass
- ❑ -C Rough Chrome Plated
- ❑ -D Polished Chrome Plated

**VARIATIONS:**

- ❑ -F Sillcock Flange Plate with Sillcock

**THREADS:**

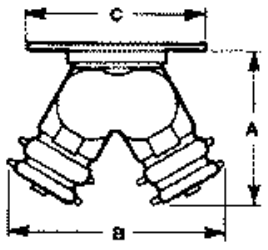
- ❑ N.S.T.
- ❑ Other _____

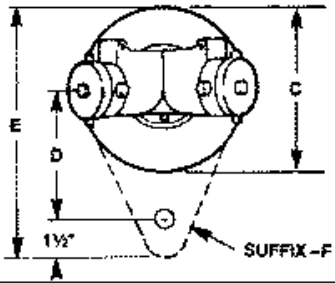
**LETTERING AVAILABLE:**

- ❑ STANDPIPE
- ❑ AUTO. SPKR.
- ❑ DRY STANDPIPE
- ❑ AUTO. SPKR. STANDPIPE

## MODEL DIMENSIONS

| Model No. | Size | A | B | C | D | E |
|---|---|---|---|---|---|---|
| **5751** | 4 x 2-1/2 x 2-1/2 | 8-1/2 | 12-1/2 | 9-3/4 | 8 | 14 |
| **5752** | 6 x 2-1/2 x 2-1/2 | 10-1/2 | 11-3/4 | 12 | 9 | 16-1/2 |
| **5753** | 4 x 3 x 3 | 10-1/2 | 12-1/2 | 9-3/4 | 8 | 14 |
| **5754** | 6 x 3 x 3 | 11 | 12-1/2 | 12 | 9 | 16-1/2 |




*Call Potter Roemer - Fire Pro for current listings and approvals. Dimensions are subject to manufacturer's tolerance and may change without notice. Potter Roemer-Fire Pro assumes no responsibility for use of void or superceded data. © Copyright Potter Roemer- Fire Pro, Member of Morris Group International ™ Please visit **potterroemer.com** for most current specifications.*

**5750-5754 SERIES** Date: 3/26/20

MEMBERSHIP

**POTTER ROEMER/FIRE PRO**
Headquarters:
P.O. Box 3527
City of Industry, CA
91744 U.S.A.
Los Angeles Area
800-366-3473
626-855-4890

Also in:
New York (800) 526-4592
Chicago (800) 547-3473
Atlanta (800) 762-0542
Miami (833) 744-3473
Dallas (866) 644-3473

***www.potterroemer.com***

⚠ WARNING: Cancer and Reproductive Harm - www.P65Warnings.ca.gov

# HOSE VALVE

PERMIT #2026 2513934 - CM 04 | RSN:1975525



## Description

Forged brass hose valve, angle pattern for the control of the flow of water from a pipe out to the valve and usually along a standpipe riser. Turning the handle of the hose valve allows the water to flow out from the valve, or shuts it off to prevent any more water from running out.
It is used with a Fire Hose Rack Assembly, or as a Fire Department outlet connection.
2 1/2" Groove inlet and 2 1/2" Female hose outlet (A55) or male hose thread outlet (A56). 300 lbs rated. With red handweel.

## Versions and product codes

| Series | Size | Type | Finishing |
|---|---|---|---|
| 5045 | 2 1/2" | Groove inlet x NPT outlet (F) | Rough BrasS |
| 5035 | 2 1/2" | Groove inlet x Hose thread outlet (M) | Rough Brass |

## Technical data

• Rated pressure: 300 PSI (20,6 bar)

**Materials**

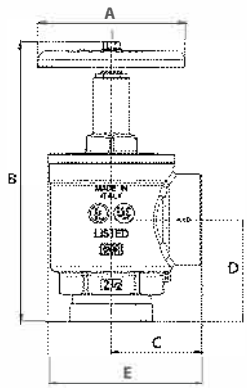
• Body: forged brass CuZn40Pb2 in accordance with European Standard EN 12165 CW617N, similar to American Standard ASTM B124 C37700
- Yield stress of the material in the shape of bar: 360 MPa
- Stress for permanent distortion R(0.2): 138 MPa
- Elongation: 10 %
• Shutter: forged brass CuZn40Pb2 in accordance with European Standard EN 12165 CW617N, similar to American Standard ASTM B124 C37700
• Stem: brass EN 12164 CW614N similar to American Standard ASTM B124 C37700
• Handwheel: red painted aluminum
• COO Italy - Meets "Buy American" Act under Trade Agreements Act 1979.

**Approvals: 5045-GRVG and 5035-GRV**

FM APPROVED · UL LISTED 618R · ULC 6158R

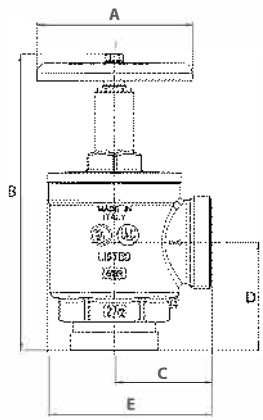
## Dimensions

5045-GRV - GROOVE x FEMALE NPT THREAD




| Size | A | B | C | D | E |
|---|---|---|---|---|---|
| 2 1/2" | 5 1/8" | 11 3/16" | 3 5/32" | 3 9/16" | 5 11/32" |

5035-GRV - GROOVE x MALE HOSE THREAD




| Size | A | B | C | D | E |
|---|---|---|---|---|---|
| 2 1/2" | 5 1/8" | 11 3/16" | 3 3/16" | 3 9/16" | 5 3/8" |

## Product specifications

**5045-GRV**

Angle hose valve, used with fire hose rack assembling or as Fire Department outlet connection with main feature as following:
- Forged brass body
- Forged brass shutter
- 2 1/2" groove inlet
- 2 1/2" female NPT outlet
- Aluminum red painted hand wheel
- Rated pressure 300 psi
- FM approved and UL-ULC listed

**5035-GRV**

Angle hose valve, used with fire hose rack assembling or as Fire Department outlet connection with main feature as following:
- Forged brass body
- Forged brass shutter
- 2 1/2" groove inlet
- 2 1/2" male hose thread outlet
- Aluminum red painted hand wheel
- Rated pressure 300 psi
- FM approved and UL-ULC listed

CROKER

SHEET 144 of 403

## PRESSURE RELIEF VALVE

For use on all closed systems to prevent damage in the event of a malfunction due to some foreign object or matter becoming lodged in an automatic regulating or control valve. Featuring a pop-type relief action for maximum performance.

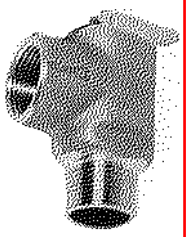
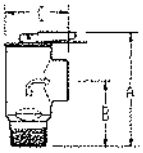


Figure No. 5660



| Figure No. | Press. Set (PSI) | Dimensional Data (Inches) Inlet | Outlet | A | B | C |
|---|---|---|---|---|---|---|
| 5660 | 15-175 | 3/4 | 3/4 | 3 | 3 | 1 |
| 5661 | 175 | 1/2 | 1/2 | 1 3/4 | 1 | 15/16 |

**3/4 Available with 3/4 Male or 3/4 female inlet with 3/4" Female Outlet**

## CAPS AND CHAINS

Used to cover and protect male outlet threads on valves and hydrants. Prevents entry of foreign matter.

CAST BRASS WITH CHAIN

| Fig. No. With Pin Lugs | Fig. No. With Rocker Lugs | Size |
|---|---|---|
| 5709 | 5710 | 1 1/2 |
| 5713 | 5714 | 2 1/2 |
| 5715 | 5716 | 3 |
| 5717 | 5718 | 4 |

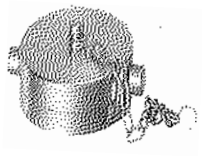


Figure No. 5709-5713

**OPTIONAL FINISHES:**

PB - Polished Brass
RC - Rough Chrome Plated
PC - Polished Chrome Plated

**SPECIFY THREAD**

| CAST HARDCOATED ALUMINUM CAP WITH CHAIN | | PLASTIC CAP WITH CHAIN | |
|---|---|---|---|
| Fig. No. | Size | Fig. No. | Size |
| 5720 | 2 1/2 | 5721 | 1 1/2 |
| | | 5722 | 2 1/2 |
| | | 5723 | 3 |

NY BSA/MEA Approved

## THREE WAY GAUGE VALVE

**For use with Sprinkler System gauges.**

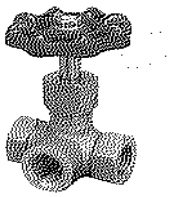


Figure No. 5662

**Standard Equipment:**
1/4" valve NPT Bronze three way globe valve with handwheel. Female inlets. 175 PSI.

| Figure No. | Size |
|---|---|
| 5662 | 1/4 |

## GLOBE VALVES RISING STEM

**For use with Sprinkler System gauges.**



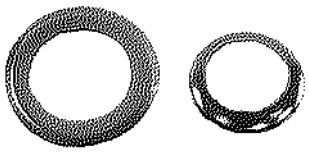
Figure No. 5663-5670

**Standard Equipment:**
Bronze with telfon seat. 125 WSP.

| Figure No. | Size |
|---|---|
| 5663 | 1/4 |
| 5664 | 3/8 |
| 5665 | 1/2 |
| 5666 | 3/4 |
| 5667 | 1 |
| 5668 | 1 1/4 |
| 5669 | 1 1/2 |
| 5670 | 2 |

**OPTIONAL FINISHES:**
RC - Rough Chrome Plated

## VALVE ESCUTCHEONS



Used to trim pipe into cabinet.

| Figure No. | Size | Material |
|---|---|---|
| 5730 | 1 1/2 | Stamped Steel Cadmium Plated |
| 5735 | 2 1/2 | Stamped Steel Cadmium Plated |

| Figure No. | Size | Material |
|---|---|---|
| 5750 | 1 1/2 | Cast Brass |
| 5755 | 2 1/2 | Cast Brass |

**OPTIONAL FINISHES:**
PB-- Polished brass
RC-- Rough Chrome Plated
PC-- Polished Chrome Plated

**SPECIFY FIGURE NO SIZE-FINISH**

# CHECK VALVE

PERMIT #2026 2513934 - CM 04 | RSN:1975523



Reliable®

# Model G Swing Check Valve

1-1/2”, 2”, 2-1/2”, 3”, 4”, 6”, 8”, & 10” Sizes

cULus Listed, FM Approved

## Features

- Grooved end connections.
- Compact, lightweight design.
- Non–slamming, spring loaded clapper to minimize water hammer.
- Approved for horizontal and vertical installation.
- Streamlined body design provides very low friction loss.

## Product Description

Reliable Model G Swing Check Valves are low friction loss check valves approved for use in fire protection systems. Typical applications include connections between public water supplies and private fire systems, at the discharge from fire pumps, at gravity tank connections and at fire department pumper connections. All Model G Check Valves are provided with ½” NPT (R½) supply side and discharge side connections (Item 12, Figure 1). Grooved end connections provide fast and easy installation using listed or approved mechanical grooved couplings. Rigid style grooved couplings can be used for positive clamping to resist flexural and torsional loads.

## Installation

The Model G Check Valve shall be installed in accordance with NFPA 13, “Standard for the Installation of Sprinkler Systems,” as well as the requirements of any authorities having jurisdiction. When installed vertically, the direction of flow shall be up through the valve (install with flow arrow pointed up). For horizontal installations, the hinge pin must be located to the top. Failure to follow installation instructions may void the warranty and listing of the valve. Verify compatibility of the Model G Check Valve materials with the water supply and the environment where the valve will be installed prior to installation. Do not apply lubricants, sealants, or other chemicals to the clapper seal or seat.



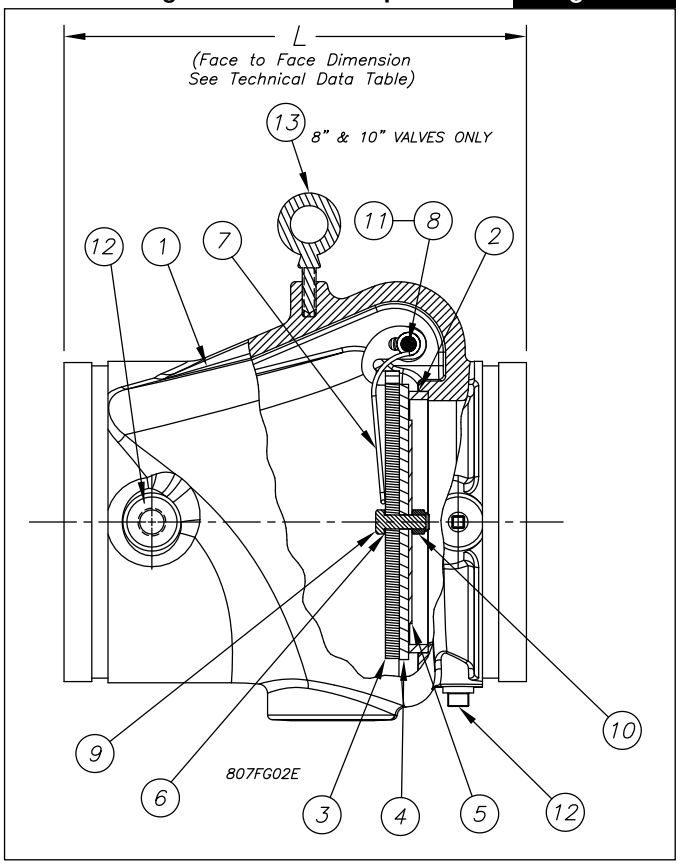

Reliable Model G Swing Check Valve (3”)

**Note:** Model G Check Valves may be damaged by excessively turbulent water flow. Model G Check Valves should be installed a reasonable distance from pipe transitions, such as pumps, elbows, expanders, reducers, or similar devices. Typical piping practices suggest a minimum distance of five times the pipe diameter for general use.

**Technical Data** **Table A**

| Valve Size | Pressure Rating | Face-to-Face Dimension | Eq. Length C = 120 | Eq. Length C = 100 | Cv Factor | Shipping Weight |
|---|---|---|---|---|---|---|
| 1-1/2” (40 mm) | 300 psi (20.7 bar) | 6-1/4 “ (159 mm) | 6.7’ (2.0 m) | 4.8’ (1.5 m) | 36 | 5 lbs (2.3 kg) |
| 2” (50 mm) | | 6-1/2” (165 mm) | 9.6’ (2.9 m) | 6.8’ (2.1 m) | 67 | 6 lbs (2.7 kg) |
| 2-1/2” (65 mm) | 250 psi (17.2 bar) | 7.12” (181 mm) | 6.0’ (1.8m) | 4.3’ (1.3m) | 212 | 9 lbs (4.1 kg) |
| 76 mm | | 7.12” (181 mm) | 6.0’ (1.8m) | 4.3’ (1.3m) | 212 | 9 lbs. (4.1 kg) |
| 3” (80 mm) | | 7.62” (194 mm) | 5.3’ (1.6m) | 3.8’ (1.2m) | 376 | 11 lbs. (5.0 kg) |
| 4” (100 mm) | | 8.44” (214 mm) | 7.1’ (2.2m) | 5.0’ (1.5m) | 656 | 17 lbs. (7.7 kg) |
| 6” (150 mm) | | 10.25” (260 mm) | 13.7’ (4.2m) | 9.8’ (3.0m) | 1395 | 38 lbs. (17.2 kg) |
| 165 mm | | 10.25” (260 mm) | 13.7’ (4.2m) | 9.8’ (3.0m) | 1395 | 38 lbs. (17.2 kg) |
| 8” (200 mm) | | 12.5” (318 mm) | 15.9’ (4.8m) | 11.3’ (3.4m) | 2818 | 63 lbs. (28.6 kg) |
| 10” (250 mm) | 300 psi (20.7 bar) | 14.5” (368 mm) | 28.8’ (8.8m) | 20.6’ (6.3m) | 3928 | 102 lbs. (46.3 kg) |

**Model G Swing Check Valve Components** **Figure 1**




**Valve Components (refer to Figure 1)** **Table B**

| Item No. | Part Name | Material |
|---|---|---|
| 1 | Valve Body | Gray Cast Iron Class 30 |
| 2 | Seat | Bronze C83600 or C93200 |
| 3 | Clapper | Stainless Steel 304 or 17-4 |
| 4 | Facing Seal * | EPDM Rubber |
| 5 | Clamping Ring | Stainless Steel 304 |
| 6 | Gasket * | EPDM Rubber or PTFE |
| 7 | Spring | Stainless Steel 302 |
| 8 | Hinge Pin | Stainless Steel 303 |
| 9 | Bolt | Stainless Steel 18-8 |
| 10 | Locknut * | Stainless Steel 18-8 |
| 11 | Plug, 1/8" NPT | Steel |
| 12 | Plug, ½" NPT | Steel |
| 13 | Shoulder Eye | Steel |

* Part of Replacement Seal Kit

**Replacement Seal Kit Part Numbers** **Table C**

| Part Number | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1-1/2" (40 mm) | 2" (50 mm) | 2½" (65 mm) | 76 mm | 3" (80 mm) | 4" (100 mm) | 6" (150 mm) | 165 mm | 8" (200 mm) | 10" (250 mm) |
| 6888000015 | 6888000020 | 6888040025 | 6888040025 | 6888040030 | 6888040040 | 6888040060 | 6888040060 | 6888040080 | 6888040090 |

## Maintenance

The owner is responsible for maintaining the fire protection system in proper operating condition. Any system maintenance or testing that involves placing a system out of service may eliminate the fire protection that is provided by the fire protection system. Notify any required authorities having jurisdiction and implement appropriate precautions prior to proceeding.

The Reliable Model G Check Valve shall periodically be given a thorough inspection and test. NFPA 25, "Inspection, Testing and Maintenance of Water Based Fire Protection Systems," provides minimum maintenance requirements. Inspect the interior of the valve and all components for corrosion, damage, and wear at least every five (5) years. Replace any components found to be corroded, damaged, or worn. Increase the frequency of inspections when the valve is exposed to corrosive conditions or chemicals that could impact the valve materials.

## Guarantee

For Reliable Automatic Sprinkler Co., Inc. guarantee, terms, and conditions, visit www.reliablesprinkler.com.

## Ordering Information

Specify:

1. Model G Check Valve.
2. Size.

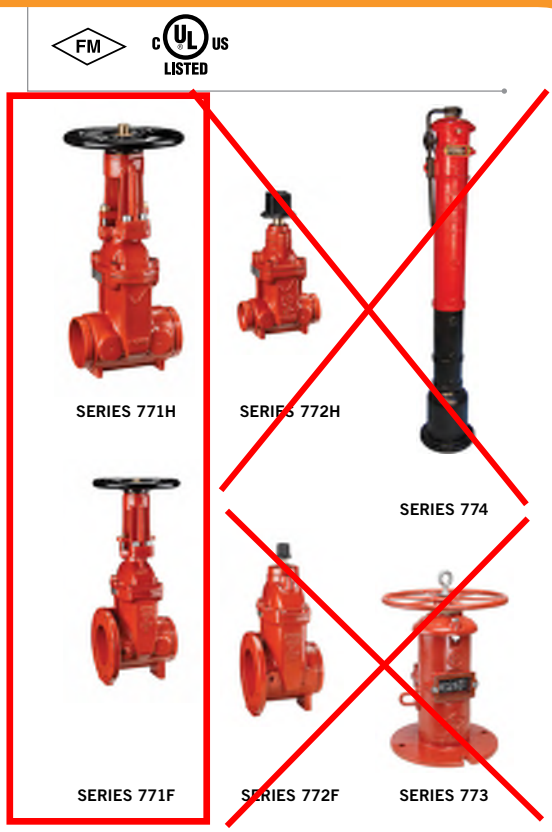
P/N 9999970071

# GATE VALVE

# Gate Valves

**SERIES 771H OS&Y GROOVE x GROOVE**
**SERIES 772H NRS GROOVE x GROOVE**
**SERIES 771F OS&Y GROOVE x FLANGE**
**SERIES 772F NRS GROOVE x FLANGE**
**SERIES 773 WALL POST INDICATOR**
**SERIES 774 UPRIGHT POST INDICATOR**

The Series 771H OS&Y and Series 771F OS&Y gate valves are used when positive shut off is required and a quick visual indicator of open/closed position is required. The Series 772H NRS and Series 772F NRS gate valves are typically used for shut-off service where the valve is operated remotely, such as when the valve is behind a wall or buried. Series 772H NRS and Series 772F NRS gate valves are offered with optional wall (Series 773) or upright (Series 774) post indicators.




## MATERIAL SPECIFICATIONS

**Series 771 OS & Y and 772 NRS Gate Valves**

**Body:** Ductile iron conforming to ASTM A-536 grade 65-45-12

**Body Gasket:** EPDM

**Body Bolts:** Plated Steel w/ Plastic Covers

**Handwheel:**

**OS & Y Yoke (Series 771 only):** Ductile iron conforming to ASTM A-536 grade 65-45-12

**Bonnet:** Ductile iron conforming to ASTM A536 grade 65-45-12

**Bonnet/Body Coating:** Fusion bonded Epoxy coating

**Gate:** Cast iron, EPDM coated

**Gate Nut:** Bronze, conforming to ASTM B62

**Stem:** Brass, ASTM B16

Continued on page 2.

**JOB/OWNER**
System No. _____
Location _____

**CONTRACTOR**
Submitted By _____
Date _____

**ENGINEER**
Spec Sect _____ Para _____
Approved _____
Date _____


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PERMIT #2026 2513934 - CM 04 | RSN:1975523



# Gate Valves

**SERIES 771H OS&Y GROOVE x GROOVE**
**SERIES 772H NRS GROOVE x GROOVE**
**SERIES 771F OS&Y GROOVE x FLANGE**
**SERIES 772F NRS GROOVE x FLANGE**
**SERIES 773 WALL POST INDICATOR**
**SERIES 774 UPRIGHT POST INDICATOR**

## MATERIAL SPECIFICATIONS

Continued from page 1

**O-Ring Seals:** EPDM

**Optional:**

- **Indicator Post Flange:** Ductile iron conforming to ASTM A-536 grade 65-45-12 available for NRS valves only

**Series 773 & 774 Indicators**

**Target Frame:** Bronze conforming to ASTM B62

**Window:** Polycarbonate

**Series 773 Wall Post Indicator:**

**Body:** Cast iron conforming to ASTM A-126-B

**Operating Stem:** Bronze conforming to ASTM B62

**Operating Rod:** Carbon steel

**Series 774 Upright Indicators:**

**Body:** Cast iron conforming to ASTM A-126-B

**Extension Sleeve:** Cast iron conforming to ASTM A-126-B

## CERTIFICATIONS/LISTINGS

| Inches DN | Series 771H | | Series 772H | | Series 771F | | Series 772F | |
|---|---|---|---|---|---|---|---|---|
| | cULus | FM | cULus | FM | cULus | FM | cULus | FM |
| 2½ DN65 | 250 psi 1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa |
| 76.1 mm | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa |
| 3 DN80 | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa |
| 4 DN100 | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa |
| 165.1 mm | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa |
| 6 DN150 | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa |
| 8 DN200 | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa |
| 10 DN250 | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa |
| 12 DN300 | 250 psi/1725 kPa | 250 psi/1725 kPa | 250 psi/1725 kPa | – | 250 psi/1725 kPa | – | 250 psi/1725 kPa | – |
| 14 DN350 | 250 psi/1725 kPa | – | 250 psi/1725 kPa | – | 250 psi/1725 kPa | – | 250 psi/1725 kPa | – |
| 16 DN400 | 250 psi/1725 kPa | – | 250 psi/1725 kPa | – | 250 psi/1725 kPa | – | 250 psi/1725 kPa | – |


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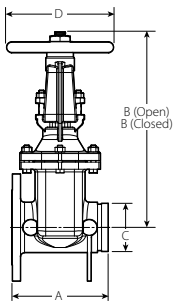


# Gate Valves

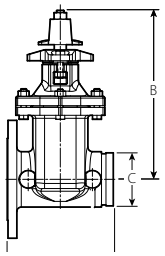
**SERIES 771H OS&Y GROOVE x GROOVE**
**SERIES 772H NRS GROOVE x GROOVE**
**SERIES 771F OS&Y GROOVE x FLANGE**
**SERIES 772F NRS GROOVE x FLANGE**
**SERIES 773 WALL POST INDICATOR**
**SERIES 774 UPRIGHT POST INDICATOR**

## DIMENSIONS

Series 771F OS&Y and Series 772F Flanged x Grooved come standard with an ANSI Class 150 flange. Other sizes are available. Contact Victaulic for details.

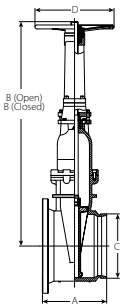



SERIES 771F

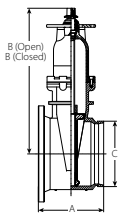



SERIES 772F

| Size | | Dimensions – Inches/mm | | | | | | Approx. Weight Each Lbs./kg | |
|---|---|---|---|---|---|---|---|---|---|
| Nomial Size Inches DN | Actual Outside Dia. Inches mm | A | Series 771F Height B Closed | Series 771F Height B Open | Series 772F Height B | C | D | Series 771F | Series 772F |
| 2½ DN65 | 2.88 73 | 7.500 190.5 | 16.18 411 | 18.74 476 | 11.02 280 | 2.88 73 | 7.87 200 | 38.14 17.3 | 30.43 13.8 |
| 76.1 mm | 3.00 76.1 | 7.500 190.5 | 16.18 411 | 19.18 487.1 | 11.02 280 | 3.00 76.1 | 7.87 200 | 38.14 17.3 | 30.43 13.8 |
| 3 DN80 | 3.50 88.9 | 7.992 203 | 17.09 434 | 20.34 514 | 12.21 310 | 3.50 88.9 | 7.87 200 | 48.06 21.8 | 37.48 17 |
| 4 DN100 | 4.50 114.3 | 9.016 229 | 18.11 460 | 22.05 560 | 13.58 345 | 4.50 114.3 | 10.24 260 | 70.55 32 | 52.91 24 |
| 165.1 mm | 6.50 165.1 | 10.512 267 | 23.90 607 | 30.40 772.1 | 17.13 435 | 6.50 165.1 | 12.40 315 | 121.26 55 | 94.80 43 |
| 6 DN150 | 6.63 168.3 | 10.512 267 | 23.90 607 | 29.80 757 | 17.13 435 | 6.63 168.3 | 12.40 250 | 121.26 55 | 94.80 43 |
| 8 DN200 | 8.63 219.1 | 11.496 292 | 28.59 726 | 36.46 926 | 20.12 511 | 8.63 219.1 | 14.76 375 | 196.22 89 | 158.74 72 |
| 10 DN250 | 10.75 273 | 12.992 330 | 35.04 890 | 44.88 1140 | 24.02 610 | 10.75 273 | 16.38 416 | 310.86 141 | 253.54 115 |
| 12 DN300 | 12.75 323.9 | 14.016 356 | 40.12 1019 | 51.93 1319 | 27.68 703 | 12.75 323.9 | 17.52 445 | 449.75 204 | 376.99 171 |




SERIES 771F




SERIES 772F

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Nomial Size Inches DN | Actual Outside Dia. Inches mm | A | Series 771F Height B Closed | Series 771F Height B Open | Series 772F B | C | D | Series 771F | Series 772F |
| 14 DN350 | 14.000 355.6 | 15.00 381 | 53.00 1346 | 66.75 1695 | 32.50 826 | 14.00 356 | 19.63 498 | 642.0 291 | 547.0 248 |
| 16 DN400 | 16.000 406.4 | 16.00 406 | 55.88 1419 | 71.63 1819 | 36.00 914 | 16.00 406 | 19.63 498 | 847.0 384 | 747.0 339 |



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# Gate Valves

**SERIES 771H OS&Y GROOVE x GROOVE**
**SERIES 772H NRS GROOVE x GROOVE**
**SERIES 771F OS&Y GROOVE x FLANGE**
**SERIES 772F NRS GROOVE x FLANGE**
**SERIES 773 WALL POST INDICATOR**
**SERIES 774 UPRIGHT POST INDICATOR**

**WARRANTY**

Refer to the Warranty section of the current Price List or contact Victaulic for details.

**NOTE**

This product shall be manufactured by Victaulic or to Victaulic specifications. All products to be installed in accordance with current Victaulic installation/assembly instructions. Victaulic reserves the right to change product specifications, designs and standard equipment without notice and without incurring obligations.

**⚠ WARNING**



- **Read and understand all instructions before attempting to install any Victaulic products.**
- **Always verify that the piping system has been completely depressurized and drained immediately prior to installation, removal, adjustment, or maintenance of any Victaulic products.**
- **Wear safety glasses, hardhat, and foot protection.**

**Failure to follow these instructions could result in death or serious personal injury and property damage.**

- **These products shall be used only in fire protection systems that are designed and installed in accordance with current, applicable National Fire Protection Association (NFPA 13, 13D, 13R, etc.) standards, or equivalent standards, and in accordance with applicable building and fire codes. These standards and codes contain important information regarding protection of systems from freezing temperatures, corrosion, mechanical damage, etc.**
- **The installer shall understand the use of this product and why it was specified for the particular application.**
- **The installer shall understand common industry safety standards and potential consequences of improper product installation.**
- **It is the system designer's responsibility to verify suitability of materials for use with the intended fluid media within the piping system and external environment.**
- **The material specifier shall evaluate the effect of chemical composition, pH level, operating temperature, chloride level, oxygen level, and flow rate on materials to confirm system life will be acceptable for the intended service.**

**Failure to follow installation requirements and local and national codes and standards could compromise system integrity or cause system failure, resulting in death or serious personal injury and property damage.**


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# BALL VALVE

# FireLock® Ball Valve

**SERIES 728**

LISTED FM LPCB VdS

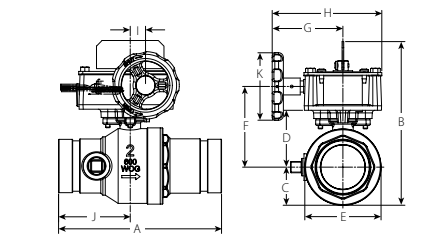
LPS 1185: Issue 3.1
Cert/LPCB Ref. 104i/01

SEE VICTAULIC PUBLICATION 10.01 FOR DETAILS

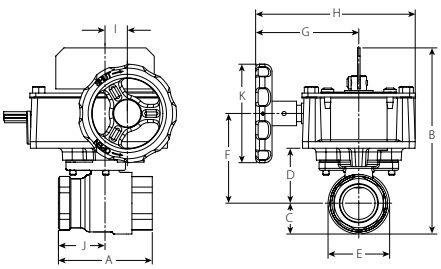
The Series 728 FireLock valve is a full port, ball valve that is UL/FM rated for 365psi/25 BAR service in all sizes (LPCB and VdS listed for 20 BAR services). Available with grooved or threaded ends (NPT), the valve body is brass. The ball is chrome plated brass with a stainless steel stem. Reinforced seats aid ease of operation and provide a durable, corrosion-free seat. Flow characteristics exceed UL Specification 1091 and FM Approval Standard 1112. The valve is approved for indoor and outdoor use.



## DIMENSIONS




GROOVED X GROOVED




THREADED X THREADED

| Size | Dimensions – Inches/mm | | | | | | | | | | | Approx. Wgt. Each |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nominal Inches/mm | E to E A | Height B | C | D | E | F | G | H | I | J | K | Lbs. kg |
| 1/25 Thd. X Thd. | 2.84 72 | 4.74 120 | 0.91 23 | 1.67 42 | 1.82 46 | 2.40 61 | 3.15 80 | 4.86 123 | 0.68 17 | 1.42 36 | 3.00 76 | 5.1 2.3 |
| 1 ¼/32 Thd. X Thd. | 3.31 84 | 4.95 126 | 1.10 28 | 1.88 48 | 2.20 56 | 2.61 66 | 3.15 80 | 4.86 123 | 0.68 17 | 1.65 42 | 3.00 76 | 5.8 2.6 |
| 1 ½/40 Thd. X Thd. | 3.66 92 | 5.13 130 | 1.29 33 | 2.06 52 | 2.58 66 | 2.79 71 | 3.15 80 | 4.86 123 | 0.68 17 | 1.83 47 | 3.00 76 | 6.6 3.0 |
| 2/50 Thd. X Thd. | 4.33 110 | 5.49 140 | 1.69 43 | 2.42 62 | 3.38 86 | 3.15 80 | 3.15 80 | 4.86 123 | 0.68 17 | 2.16 55 | 3.00 76 | 8.5 3.9 |
| 1 ¼/32 Grv. X Grv. | 7.25 184 | 4.95 126 | 1.10 28 | 1.87 48 | 2.20 56 | 2.61 66 | 3.15 80 | 4.86 123 | 0.68 17 | 3.19 81 | 3.00 76 | 7.5 3.4 |
| 1 ½/40 Grv. X Grv.* | 7.25 184 | 5.17 131 | 1.29 33 | 2.10 53 | 2.58 66 | 2.83 72 | 3.15 80 | 4.86 123 | 0.68 17 | 3.19 81 | 3.00 76 | 8.5 3.9 |
| 2/50 Grv. X Grv.* | 7.25 184 | 5.47 139 | 1.69 43 | 2.40 61 | 3.38 86 | 3.13 80 | 3.15 80 | 4.86 123 | 0.68 17 | 3.19 81 | 3.00 76 | 10.5 4.8 |

* 1½ and 2"/40 and 50mm sizes feature a ½"/12mm tap (Groove by Groove only).

## PERFORMANCE

| SIZE Nominal Inches/mm | Equivalent Feet/meters of Pipe | SIZE Nominal Inches/mm | Equivalent Feet/meters of Pipe |
|---|---|---|---|
| 1/25 Thread X Thread | 0.5 0.2 | 1 ¼/32 Groove X Groove | 0.7 0.2 |
| 1 ¼/32 Thread X Thread | 1.0 0.3 | 1 ½/40 Groove X Groove | 0.7 0.2 |
| 1 ½/40 Thread X Thread | 1.0 0.3 | 2/50 Groove X Groove | 0.7 0.2 |
| 2/50 Thread X Thread | 1.0 0.3 | | |

**JOB/OWNER**

System No. _____

Location _____

**CONTRACTOR**

Submitted By _____

Date _____

**ENGINEER**

Spec Sect _____ Para _____

Approved _____

Date _____



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# FireLock® Ball Valve

**SERIES 728**

## SWITCH AND WIRING

1. The supervisory switch contains two single pole, double throw, pre-wired switches.
2. Switches are rated:

   10 amps @ 125 or 250 VAC/60 Hz

   0.50 amps @ 125 VDC

   0.25 amps @ 250 VDC

**3. Switches supervise the valve in the "OPEN" position.**

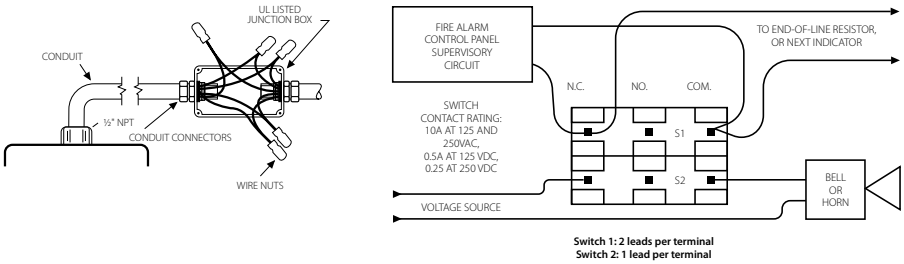
4. One switch has two #18 insulated wires per terminal, which permit complete supervision of leads (refer to diagrams and notes below). The second switch has one #18 insulated wire per terminal. This double circuit provides flexibility to operate two electrical devices at separate locations, such as an indicating light and an audible alarm, in the area that the valve is installed.
5. A #14 insulated ground lead (green) is provided.

   Switch #1 = S1 For connection to the supervisory circuit of a UL Listed alarm control panel

   Switch #2 = S2 Auxiliary switch that may be connected to auxiliary devices, per the authority having jurisdiction

**S1**
- Normally Closed: (2) Blue
- Common: (2) Yellow

**S2**
- Normally Closed: Blue with Orange Stripe
- Normally Open: Brown with Orange Stripe
- Common: Yellow with Orange Stripe




NOTE: The above diagram shows a connection between the common terminal (yellow – S1 and yellow-with-orange stripe – S2) and the normally closed terminal (blue – S1 and blue-with-orange stripe – S2). In this example, the indicator light and alarm will stay on until the valve is fully open. When the valve is fully open, the indicator light and alarm will go out. Cap off any unused wires (e.g. brown with orange stripe).

Only S1 (two leads per terminal) may be connected to the fire alarm control panel.

The connection of the alarm switch wiring shall be in accordance with NFPA 72 and the auxiliary switch per NFPA 70 (NEC).

## MATERIAL SPECIFICATIONS

**Valve Body:** Brass ASTM B124

**Ball:** Chrome Plated Brass

**Ball Valve Stem:** 316 Stainless Steel

**Seat:** Carbon Filled (TFE) tetrafluoroethylene

**Stem Nut:** Brass ASTM B-16 C36000

**Actuator:** Brass traveling nut, on a steel lead screw, in a ductile iron housing



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PERMIT #2026 2513934 - CM 04 | RSN:1975523



# FireLock® Ball Valve

**SERIES 728**

**INSTALLATION**

Reference should always be made to the I-100 Victaulic Field Installation Handbook for the product you are installing. Handbooks are included with each shipment of Victaulic products for complete installation and assembly data, and are available in PDF format on our website at www.victaulic.com.

**WARRANTY**

Refer to the Warranty section of the current Price List or contact Victaulic for details.

**NOTE**

This product shall be manufactured by Victaulic or to Victaulic specifications. All products to be installed in accordance with current Victaulic installation/assembly instructions. Victaulic reserves the right to change product specifications, designs and standard equipment without notice and without incurring obligations.



**10.17 2226 REV I UPDATED 03/2021**

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# GLOBE VALVE

# UNITED BRASS WORKS, INC

714 S. Main St.. Randleman, N.C. 27317

Phone: 800/334-3

035 Fax: 800/498-4696




## Model 125SUL Globe Valve
## Soft Disc

**UL Listed for Fire Sprinkler Service at 250 WOG**

**200 WOG @ 180 ° Max**

**100% Pressure Tested**

**Threaded Ends**

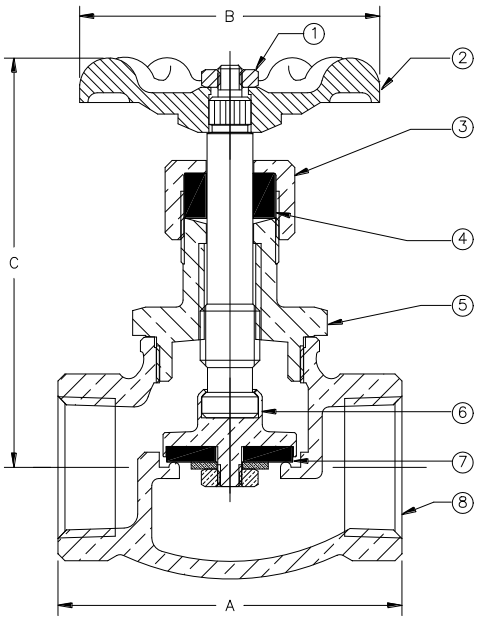
**Rising Stem • Integral Seat**

**Swivel Disc Holder**

***Contains Lead. Not Intended for Use in Potable Water Systems***

# MATERIAL LIST

| NO. | DESCRIPTION | MATERIAL |
|---|---|---|
| 1 | Hex Nut | Steel |
| 2 | Hand Wheel | Zinc |
| 3 | Packing Nut | Brass |
| 4 | Packing | Graphite Non-Asb. |
| 5 | Bonnet (¼" – 1")<br>Bonnet (1¼" – 2") | Brass<br>Bronze |
| 6 | Stem & Disc Holder | Brass |
| 7 | Disc | Buna N |
| 8 | Body | Bronze |




| Size | ½" | ¾" | 1" | 1 ¼" | 1 ½" | 2" |
|---|---|---|---|---|---|---|
| A | 2.22 | 2.47 | 2.97 | 3.56 | 4.06 | 4.69 |
| B | 2.03 | 2.38 | 2.75 | 3.00 | 3.72 | 3.72 |
| C (closed) | 3.38 | 3.50 | 4.25 | 4.75 | 5.50 | 5.50 |
| Ship Wt. (lbs.) | 0.69 | 0.94 | 1.76 | 2.50 | 3.26 | 5.32 |
| Qty. Unit Pack | 12 | 6 | 6 | 4 | 2 | 2 |
| Qty. Per Case | 72 | 60 | 36 | 24 | 12 | 12 |

# AIR VENTS

PURGENVENT™

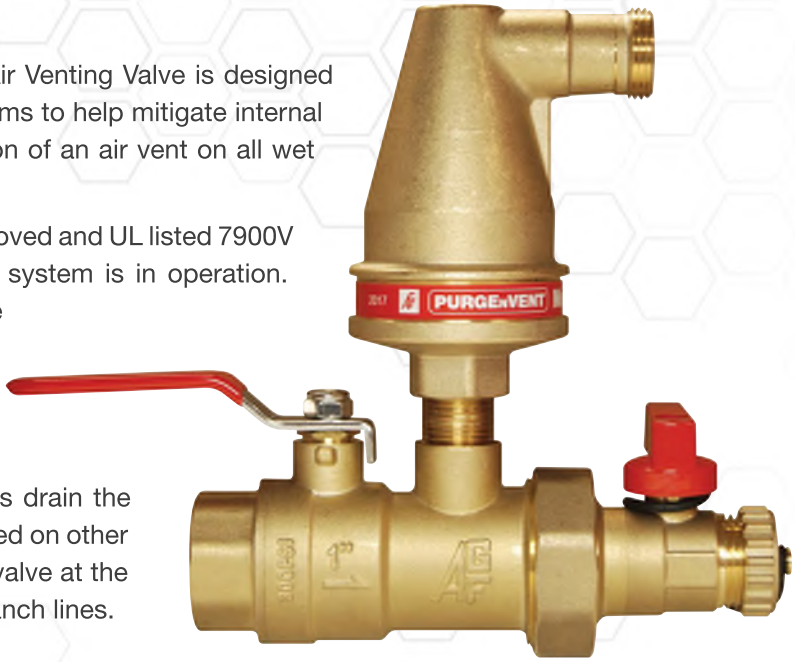
# Model 7900AAV

QUALITY COMPONENTS FOR FIRE SPRINKLER SYSTEMS

## Automatic Air Venting Valve

The AGF PURGENVENT Model 7900AAV Automatic Air Venting Valve is designed to remove excess air from wet pipe fire sprinkler systems to help mitigate internal pipe corrosion. NFPA 13 standard requires the addition of an air vent on all wet pipe fire sprinkler systems that utilize metallic pipe.

The PURGENVENT Model 7900AAV features a FM approved and UL listed 7900V automatic air vent that releases excess air while the system is in operation. It also includes an isolation valve, strainer, and purge valve with union and hose connection. The purge valve helps remove air from the system faster when filling, helps flush and clean the valve, and can be used as a vacuum break when draining the system. When being used as a vacuum break it helps drain the system faster and protects gaskets from being dislodged on other system components. AGF recommends installing the valve at the highest point in the system or at the end of system branch lines.

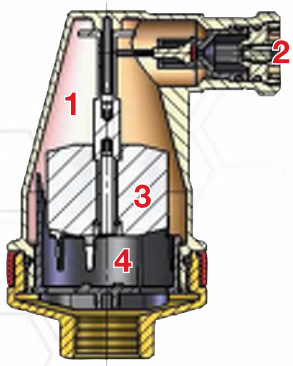



## Features

- NFPA Compliant
- FM Approved and UL Listed 7900V Air Vent
- 175 PSI Rated
- Isolation Valve
- Internal Strainer
- Purge Valve with Union and Hose Connection
- System Drain Vacuum Break

## 7900V Air Vent Advantages

1. Conical shape maximizes clearance and protects the venting valve from contamination.
2. Recessed venting valve prevents vent redundancy and protects it from damage.
3. Single float allows only vertical movement.
4. Bubble breaker acts as a secondary filter and maximizes air passage.

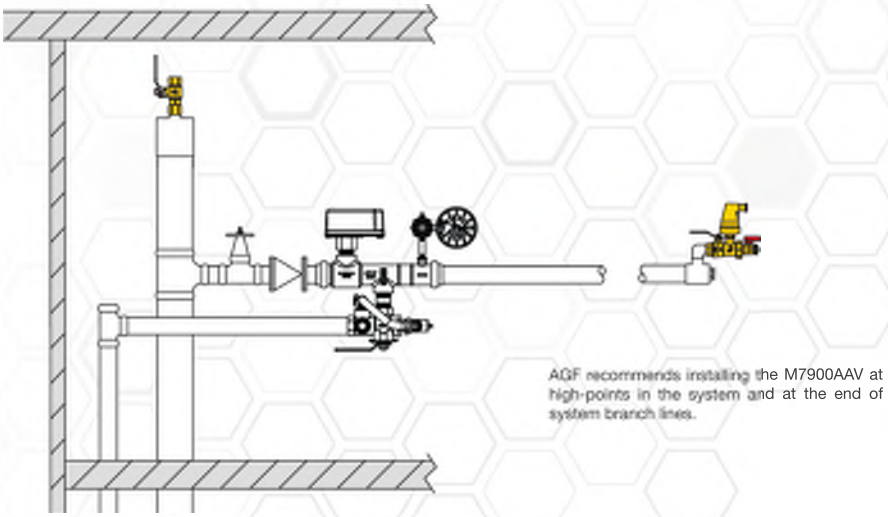



## Models

| Part Number |
|---|
| 7900AAV |

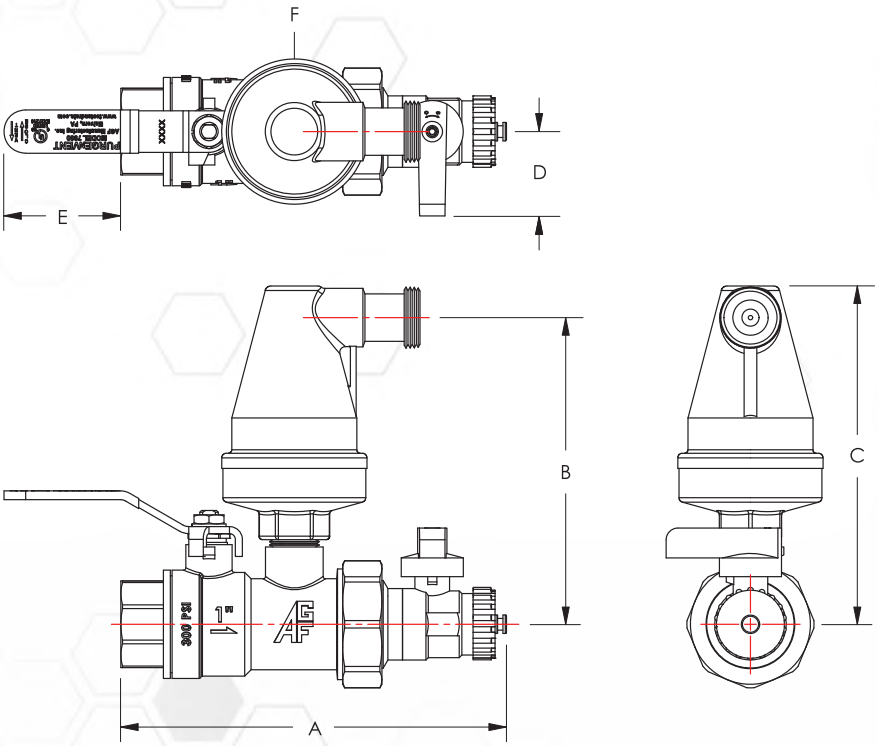
7610-2281 : 0500

## Installation



AGF recommends installing the M7900AAV at high-points in the system and at the end of system branch lines.

## Dimensions




| A | B | C | D | E | F |
|---|---|---|---|---|---|
| 6⅝" (167 mm) | 5¼" (133 mm) | 5¾" (147 mm) | 1½" (37 mm) | 2" (51 mm) | ø2½" (63 mm) |

Sizes have been rounded to the highest millimeter

USA Patent and Other Patents Pending

For use on wet fire sprinkler systems.

## Valve Size

1”

## Connections

Isolation Valve Inlet.....1” NPT
Purge Valve Outlet.....Hose
7900V Vent Outlet.....¾” NPT

## Installation Orientation

Horizontal with 7900V in Upright Position

## Electrical Requirements

None

## Materials

Handle.....Steel
Stem.....Rod Brass
Ball.....C.P. Brass
Body.....Brass
Valve Seat.....PTFE
Strainer.....Stainless Steel
7900V.....Bronze

## Rating

175 PSI

## Compliance

NFPA 13, 13D, & 13R
NYC-BSA No. 720-87-SM

## Approvals

7900V: UL/ULC (EX27596)
7900V: FM

7610-2281 : 0500

**AGF Manufacturing Inc.**
100 Quaker Lane, Malvern, PA 19355
Phone: 610-240-4900
Fax: 610-240-4906
www.agfmfg.com

Job Name: _____
Architect: _____
Engineer: _____
Contractor: _____

# BUTTERFLY VALVE

# FireLock® Butterfly Valve
# Series 705 with Weatherproof Actuator

10.81



## 1.0 PRODUCT DESCRIPTION

- Available Sizes: 2 – 12"/50 – 300 mm
- cULus Listed, LPCB Listed, FM and VdS Approved for service up to 300 psi/2068 kPa /20 bar.
- Designed for fire protection services only.
- Features a weatherproof actuator housing Approved for indoor and outdoor use.
- Actuation options: Hand wheel (2 – 12”/50 – 300 mm)
- Exclusively for use with pipe and Victaulic products which feature ends formed with the Victaulic Original Groove System (OGS) groove profile (see section 7.0 for Reference Materials).

## 2.0 CERTIFICATION/LISTINGS

G410013

LPS 1185: Issue 3.1
Cert/LPCB Ref. 104j/01
846a/01

**ALWAYS REFER TO ANY NOTIFICATIONS AT THE END OF THIS DOCUMENT REGARDING PRODUCT INSTALLATION, MAINTENANCE OR SUPPORT.**


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## 2.1 CERTIFICATION/LISTINGS

| Size | Approval/Listing Service Pressures<br>Series 705 Butterfly Valve<br>cULus | FM | Vds | LPCB |
|---|---|---|---|---|
| 2<br>50 | up to 300psi/2068kPa | up to 300psi/2068kPa | up to 300psi/2068kPa | up to 300psi/2068kPa |
| 2½<br>65 | up to 300psi/2068kPa | up to 300psi/2068kPa | n/a | up to 300psi/2068kPa |
| 76.1 mm | up to 300psi/2068kPa | up to 300psi/2068kPa | up to 300psi/2068kPa | up to 300psi/2068kPa |
| 3<br>80 | up to 300psi/2068kPa | up to 300psi/2068kPa | up to 300psi/2068kPa | up to 300psi/2068kPa |
| 4<br>100 | up to 300psi/2068kPa | up to 300psi/2068kPa | up to 300psi/2068kPa | up to 300psi/2068kPa |
| 5<br>125 | up to 300psi/2068kPa | up to 300psi/2068kPa | n/a | up to 300psi/2068kPa |
| 139.7 mm | up to 300psi/2068kPa | up to 300psi/2068kPa | up to 300psi/2068kPa | up to 300psi/2068kPa |
| 6<br>150 | up to 300psi/2068kPa | up to 300psi/2068kPa | up to 300psi/2068kPa | up to 300psi/2068kPa |
| 165.1 mm | up to 300psi/2068kPa | up to 300psi/2068kPa | n/a | up to 300psi/2068kPa |
| 8<br>200 | up to 300psi/2068kPa | up to 300psi/2068kPa | up to 300psi/2068kPa | up to 300psi/2068kPa |
| 10<br>250 | up to 300psi/2068kPa | up to 300psi/2068kPa | n/a | up to 300psi/2068kPa |
| 12<br>300 | up to 300psi/2068kPa | up to 300psi/2068kPa | n/a | up to 300psi/2068kPa |

## 3.0 SPECIFICATIONS – MATERIAL

**Body:** Ductile Iron conforming to ASTM A-536, Grade 65-45-12

**End Face, 2 – 6”/50 – 150 mm:** Ductile Iron conforming to ASTM A-536, Grade 65-45-12

**Seal Retainer, 8 – 12”/200 – 300 mm:** Ductile Iron conforming to ASTM A-536, Grade 65-45-12

**Body Coating:** Black alkyd enamel

**Disc:** Ductile Iron conforming to ASTM A-536, Grade 65-45-12, with electroless nickel coating conforming to ASTM B-733

**Seat:** Grade “E” EPDM

**Stems:** 416 stainless steel conforming to ASTM A-582

**Stem Seal Cartridge:** C36000 brass

**Bearings:** Stainless steel with TFE lining

**Stem Seals:** EPDM

**Stem Retaining Ring:** Carbon steel

**Actuator:**

- ☐ 2 – 8"/50 – 200 mm: Brass or bronze traveling nut on a steel lead screw, in a ductile iron housing
- ☐ 10 – 12"/250 – 300 mm: Steel worm and cast iron quadrant gear, in a cast iron housing

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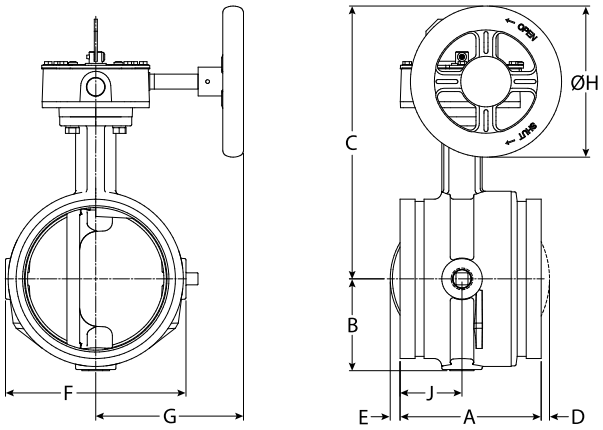
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## 4.0 DIMENSIONS

### Series 705




| Size | | Dimensions | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Nominal** inches mm | **Actual Outside Diameter** inches mm | **E to E A** inches mm | **B** inches mm | **C** inches mm | **D** inches mm | **E** inches mm | **F** inches mm | **G** inches mm | **DIA H** inches mm | **J** inches mm |
| 2<br>60.3 | 2.375<br>60.3 | 4.25<br>108.0 | 2.28<br>57.9 | 6.41<br>162.8 | – | – | 4.00<br>101.6 | 4.22<br>107.2 | 4.50<br>114.3 | 2.12<br>53.8 |
| 2½<br>73 | 2.875<br>73.0 | 3.77<br>95.8 | 2.28<br>57.9 | 7.54<br>191.5 | – | – | 4.00<br>101.6 | 4.22<br>107.2 | 4.50<br>114.3 | 1.77<br>45.0 |
| 76.1 mm | 3.000<br>76.1 | 3.77<br>95.8 | 2.28<br>57.9 | 7.54<br>191.5 | – | – | 4.00<br>101.6 | 4.22<br>107.2 | 4.50<br>114.3 | 1.77<br>45.0 |
| 3<br>88.9 | 3.500<br>88.9 | 3.77<br>95.8 | 2.53<br>64.3 | 7.79<br>197.9 | – | – | 4.50<br>114.3 | 4.22<br>107.2 | 4.50<br>114.3 | 1.77<br>45.0 |
| 108 mm | 4.250<br>108.0 | 4.63<br>117.6 | 2.88<br>73.2 | 8.81<br>223.8 | – | – | 5.50<br>139.7 | 4.22<br>107.2 | 4.50<br>114.3 | 2.20<br>55.9 |
| 4<br>114.3 | 4.500<br>114.3 | 4.63<br>117.6 | 2.88<br>73.2 | 8.81<br>223.8 | – | – | 5.50<br>139.7 | 4.22<br>107.2 | 4.50<br>114.3 | 2.20<br>55.9 |
| 133 mm | 5.250<br>133.0 | 5.88<br>149.4 | 3.35<br>85.1 | 10.88<br>276.4 | – | – | 6.56<br>166.6 | 6.19<br>157.2 | 6.30<br>160.0 | 2.58<br>65.5 |
| 139.7 mm | 5.500<br>139.7 | 5.88<br>149.4 | 3.35<br>85.1 | 10.88<br>276.4 | – | – | 6.56<br>166.6 | 6.19<br>157.2 | 6.30<br>160.0 | 2.58<br>65.6 |
| 5<br>141.3 | 5.563<br>141.3 | 5.88<br>149.4 | 3.35<br>85.1 | 10.88<br>276.4 | – | – | 6.56<br>166.6 | 6.19<br>157.2 | 6.30<br>160.0 | 2.58<br>65.5 |
| 159 mm | 6.250<br>159.0 | 5.88<br>149.4 | 3.84<br>97.5 | 11.38<br>289.1 | – | 0.41<br>10.4 | 7.52<br>191.0 | 6.19<br>157.2 | 6.30<br>160.0 | 2.58<br>65.5 |
| 165.1mm | 6.500<br>165.1 | 5.88<br>149.4 | 3.84<br>97.5 | 11.38<br>289.1 | – | 0.41<br>10.4 | 7.52<br>191.0 | 6.19<br>157.2 | 6.30<br>160.0 | 2.58<br>65.5 |
| 6<br>168.3 | 6.625<br>168.3 | 5.88<br>149.4 | 3.84<br>97.5 | 11.38<br>289.1 | – | 0.41<br>10.4 | 7.52<br>191.0 | 6.19<br>157.2 | 6.30<br>160.0 | 1.90<br>48.3 |
| 8<br>219.1 | 8.625<br>219.1 | 5.33<br>135.4 | 5.07<br>128.8 | 13.53<br>343.6 | 0.80<br>20.3 | 1.47<br>37.3 | 10.00<br>254.0 | 6.19<br>157.2 | 8.10<br>205.7 | 2.33<br>59.2 |
| 10<br>273 | 10.750<br>273.0 | 6.40<br>162.6 | 6.37<br>161.8 | 15.64<br>397.3 | 1.41<br>35.8 | 1.81<br>46.0 | 12.25<br>311.2 | 8.10<br>205.7 | 9.00<br>228.6 | – |
| 12<br>323.9 | 12.750<br>323.9 | 6.50<br>165.1 | 7.36<br>186.9 | 16.64<br>422.7 | 2.30<br>58.4 | 2.80<br>71.1 | 14.25<br>362.0 | 8.10<br>205.7 | 9.00<br>228.6 | – |

**NOTE**

- Optional ½"/15 mm tap available. Contact Victaulic for details.

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## 5.0 PERFORMANCE

### Series 705

The chart expresses the frictional resistance of Victaulic Series 705 Butterfly Valve in equivalent feet/meters of straight pipe.

| Nominal Size<br>mm<br>inches | Outside Diameter<br>mm<br>inches | Equivalent<br>Feet/m<br>of pipe |
|---|---|---|
| 2<br>50 | 2.375<br>60.3 | 6<br>1.8 |
| 2½<br>65 | 2.875<br>73.0 | 6<br>1.8 |
| 76.1 mm | 3.000<br>76.1 | 6<br>1.8 |
| 3<br>80 | 3.500<br>88.9 | 7<br>2.1 |
| 4<br>100 | 4.500<br>114.3 | 8<br>2.4 |
| 108 mm | 108 mm | 8<br>2.4 |
| 5<br>125 | 5.563<br>141.3 | 12<br>3.7 |
| 133 mm | 133 mm | 12<br>3.7 |
| 139.7 mm | 5.500<br>139.7 | 12<br>3.7 |
| 6<br>150 | 6.625<br>168.3 | 14<br>4.2 |
| 159 mm | 159 mm | 14<br>4.3 |
| 165.1 mm | 6.500<br>165.1 | 14<br>4.2 |
| 8<br>200 | 8.625<br>219.1 | 16<br>4.9 |
| 10<br>250 | 10.750<br>273.0 | 18<br>5.5 |
| 12<br>300 | 12.750<br>323.9 | 19<br>5.8 |

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## 5.1 PERFORMANCE

### Series 705

$C_V$ values for flow of water at +60°F/+16°C through a fully open valve are shown in the table below.
For additional details, contact Victaulic.

**Formulas for $C_v$ values**

$$\Delta P = \frac{Q^2}{C_v^2}$$

$$Q = C_v \times \sqrt{\Delta P}$$

**Where:**
Q = Flow (GPM)
ΔP = Pressure Drop (psi)
$C_v$ = Flow Coefficient

**Formulas for $K_v$ values**

$$\Delta P = \frac{Q^2}{K_v^2}$$

$$Q = K_v \times \sqrt{\Delta P}$$

**Where:**
Q = Flow ($m^3$/hr)
ΔP = Pressure Drop (Bar)
$K_v$ = Flow Coefficient

| Valve Size | | Full Open |
|---|---|---|
| **Nominal Size** inches mm | **Actual Outside Diameter** inches mm | **Flow Coefficient** $C_v$ |
| 2<br>50 | 2.375<br>60.3 | 170 |
| 2½<br>65 | 2.875<br>73.0 | 260 |
| 76.1 mm | 3.000<br>76.1 | 260 |
| 3<br>80 | 3.500<br>88.9 | 440 |
| 4<br>100 | 4.500<br>114.3 | 820 |
| 108 mm | 108 mm | 820 |
| 5<br>125 | 5.563<br>141.3 | 1200 |
| 133 mm | 133 mm | 1200 |
| 139.7 mm | 5.500<br>139.7 | 1200 |
| 6<br>150 | 6.625<br>168.3 | 1800 |
| 159 mm | 159 mm | 1800 |
| 165.1 mm | 6.500<br>165.1 | 1800 |
| 8<br>200 | 8.625<br>219.1 | 3400 |
| 10<br>250 | 10.750<br>273.0 | 5800 |
| 12<br>300 | 12.750<br>323.9 | 9000 |

| Valve Size | | Full Open |
|---|---|---|
| **Nominal Size** inches mm | **Actual Outside Diameter** inches mm | **Flow Coefficient** $K_v$ |
| 2<br>50 | 2.375<br>60.3 | 147 |
| 2½<br>65 | 2.875<br>73.0 | 225 |
| 76.1 mm | 3.000<br>76.1 | 225 |
| 3<br>80 | 3.500<br>88.9 | 380 |
| 4<br>100 | 4.500<br>114.3 | 710 |
| 108 mm | 108 mm | 710 |
| 5<br>125 | 5.563<br>141.3 | 1040 |
| 133 mm | 133 mm | 1040 |
| 139.7 mm | 5.500<br>139.7 | 1040 |
| 6<br>150 | 6.625<br>168.3 | 1560 |
| 159 mm | 159 mm | 1560 |
| 165.1 mm | 6.500<br>165.1 | 1560 |
| 8<br>200 | 8.625<br>219.1 | 2940 |
| 10<br>250 | 10.750<br>273.0 | 5020 |
| 12<br>300 | 12.750<br>323.9 | 7790 |


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## 6.0 NOTIFICATIONS

**⚠ WARNING**



- **Read and understand all instructions before attempting to install, remove, adjust, or maintain any Victaulic piping products.**
- **Depressurize and drain the piping system before attempting to install, remove, adjust, or maintain any Victaulic piping products.**
- **Wear safety glasses, hardhat, and foot protection.**

**Failure to follow these instructions could result in death or serious personal injury and property damage.**

## 7.0 REFERENCE MATERIALS

### Switch and Wiring

1. The supervisory switch contains two single pole, double throw, pre-wired switches.
2. Switches are rated:

   10 amps @ 125 or 250 VAC/60 Hz

   0.50 amps @ 125 VDC

   0.25 amps @ 250 VDC
3. Switches supervise the valve in the “OPEN” position.
5. One switch has two #18 insulated wires per terminal, which permit complete supervision of leads (refer to diagrams and notes below). The second switch has one #18 insulated wire per terminal. This double circuit provides flexibility to operate two electrical devices at separate locations, such as an indicating light and an audible alarm, in the area that the valve is installed.
6. A #14 insulated ground lead (green) is provided.

   Switch #1 = S1

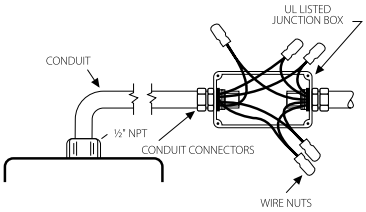
   For connection to the supervisory circuit of a UL Listed alarm control panel

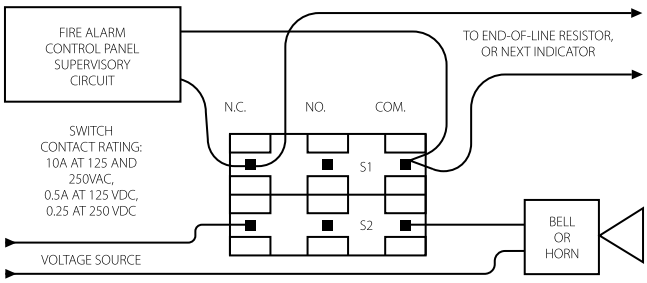
   Switch #2 = S2

   Auxiliary switch that may be connected to auxiliary devices, per the authority having jurisdiction

**S1**
- Normally Closed: (2) Blue
- Common: (2) Yellow

**S2**
- Normally Closed: Blue with Orange Stripe
- Normally Open: Brown with Orange Stripe
- Common: Yellow with Orange Stripe




**Switch 1: 2 leads per terminal**
**Switch 2: 1 lead per terminal**

**NOTES**

- The above diagram shows a connection between the common terminal (yellow – S1 and yellow-with-orange stripe – S2) and the normally closed terminal (blue – S1 and blue-with-orange stripe – S2). In this example, the indicator light and alarm will stay on until the valve is fully open. When the valve is fully open, the indicator light and alarm will go out. Cap off any unused wires (e.g. brown with orange stripe).
- Only S1 (two leads per terminal) may be connected to the fire alarm control panel.
- The connection of the alarm switch wiring shall be in accordance with NFPA 72 and the auxiliary switch per NFPA 70 (NEC).

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PERMIT #2026 2513934 - CM 04 | RSN:1975523



## 7.1 REFERENCE MATERIALS

10.01: Regulatory Approval Reference Guide

29.01: Terms and Conditions/Warranty

I-100: Field Installation Handbook

**User Responsibility for Product Selection and Suitability**
Each user bears final responsibility for making a determination as to the suitability of Victaulic products for a particular end-use application, in accordance with industry standards and project specifications, and the applicable building codes and related regulations as well as Victaulic performance, maintenance, safety, and warning instructions. Nothing in this or any other document, nor any verbal recommendation, advice, or opinion from any Victaulic employee, shall be deemed to alter, vary, supersede, or waive any provision of Victaulic Company's standard conditions of sale, installation guide, or this disclaimer.

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**Note**
This product shall be manufactured by Victaulic or to Victaulic specifications. All products to be installed in accordance with current Victaulic installation/assembly instructions. Victaulic reserves the right to change product specifications, designs and standard equipment without notice and without incurring obligations.

**Installation**
Reference should always be made to the Victaulic installation handbook or installation instructions of the product you are installing. Handbooks are included with each shipment of Victaulic products, providing complete installation and assembly data, and are available in PDF format on our website at www.victaulic.com.

**Warranty**
Refer to the Warranty section of the current Price List or contact Victaulic for details.

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# EASY RISER CHECK

# TECHNICAL DATA

## EASY RISER® SWING CHECK VALVE MODELS E-1 & F-1

**The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058**
**Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com**
**Visit the Viking website for the latest edition of this technical data page: www.vikinggroupinc.com**

## 1. DESCRIPTION

The Viking Easy Riser® Swing Check Valve is a general purpose rubber-faced check valve approved for use in fire service systems. The valve is for use in wet system risers, preaction system risers and wherever a check valve with a drain connection and gauge connections can be utilized. When used with a flow switch on wet pipe systems not requiring a mechanical alarm, the Easy Riser® Swing Check Valve may replace an alarm check valve.



**WARNING**: Cancer and Reproductive Harm- www.P65Warnings.ca.gov

### 1-A Features

1. Ductile iron body for less weight and extra strength.
2. Rated to 300 psi (20.7 bar) water working pressure.
3. Rubber-faced clapper hinged to access cover for quick removal and easy servicing. All moving parts can be serviced without removing the valve from the installed position.
4. With the cover/clapper assembly removed, clapper rubber replacement requires removal of only one screw.
5. Valve housing tapped for inlet and outlet pressure gauges, and system main drain.

### 1-B Accessories

300 PSI (20.7 bar) Trim Package including:

A. All necessary nipples and fittings
B. Main Drain Ball Valve
C. Necessary gauges

## 2. LISTINGS AND APPROVALS:.

**cULus Listed:** HMER
**FM Approved:** Single Check Valves
**NYC Department of Buildings:** MEA 89-92-E, Vol. XI
**VNIIPO** (250 psi (17.2 bar) MWP)
**CE:** Pressure Equipment Directive 97/23/EC (250 psi (17.2 bar) MWP)

## 3. TECHNICAL DATA

### Specifications:

**Standard Flanged Connections:** ANSI B16.42 Class 150 (mates with ANSI Class 125 and Class 150 flanges).

**Standard Grooved Connections:** ANSI/AWWA C606

**Drain outlet:** 2-1/2” and 3” valves - one 1-1/4” (32 mm) NPT; 4”, 6” & 8” valves - 2” (50 mm) NPT

**Gauge Outlets:** two 1/4” (8 mm) NPT

**Other Outlets:** two 1/2” (15 mm) NPT

Systems with water working pressures above 175 psi (12 bar) may require extra-heavy pattern fittings. Viking Easy Riser® Swing Check Valve flanges are Ductile Iron ANSI B16.42, Class 150, with a maximum water working pressure of 300 psi (20.7 bar). ANSI B16.42, Class 150 flanges are NOT compatible with ANSI Class 250 or Class 300 flanges. To mate the Easy Riser® Swing Check Valve with ANSI Class 250 or Class 300 flanges, use the grooved-inlet/grooved-outlet style installed with listed grooved/flanged adapters of the appropriate pressure rating. For piping with grooved connections, the grooved-inlet and/or grooved-outlet style Easy Riser® Swing Check Valve may be installed with listed grooved couplings of the appropriate pressure rating.

### Material Standards:

Refer to Figure 1.

### Ordering Information:

See Table 1 for part numbers and shipping weights.

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## 4. INSTALLATION

The Easy Riser® Swing Check Valve must be installed in an area not subject to freezing temperatures or physical damage. When corrosive atmospheres and/or contaminated water supplies are present, it is the owner's responsibility to verify compatibility with the Easy Riser® Swing Check Valve, trim, and associated equipment.

Prior to installing the valve, thoroughly flush the water supply piping to verify that no foreign matter is present.

The Easy Riser® Swing Check Valve may be installed in the vertical position with direction of flow up, or in the horizontal position with the access cover up.

1. Remove all plastic thread protectors from the openings of the Easy Riser® Swing Check Valve.
2. Apply a small amount of pipe-joint compound or tape to the external threads of all pipe connections required. Take care not to allow any compound, tape, or other foreign matter inside any of the nipples or openings of the valve or trim components.
3. Easy Riser® Swing Check Valve Trim Charts are provided with Trim Packages and on the Viking website.
4. Verify that all system components are rated for the water working pressure of the system.

### Hydrostatic Test:

The Easy Riser® Swing Check Valve is manufactured and listed for use at a maximum water working pressure of 300 psi (20.7 bar). The valve is factory tested at 600 psi (41.4 bar). Easy Riser® Swing Check Valves may be hydrostatically tested at 350 psi (24.1 bar) and/or 50 psi (3.5 bar) above the normal water working pressure for limited periods of time (two hours) for the purpose of acceptance by the Authority Having Jurisdiction. If air testing is required, DO NOT exceed 40 psi (2.8 bar) air pressure.

## 5. OPERATION (Refer to Figure 1.)

Water flowing through the Viking Easy Riser® Swing Check Valve lifts the rubber-gasketed clapper (8 and 9) off the seat (12) and flows into the sprinkler piping. When flow through the valve stops, the clapper (8) closes quickly. The rubber gasket (9) forms a tight seal against the brass water seat (12), trapping pressurized water above the clapper and preventing reverse flow from the sprinkler piping.

## 6. INSPECTIONS, TESTS, AND MAINTENANCE

***NOTICE***

**The owner is responsible for maintaining the fire protection system and devices in proper operating condition.**

The Viking Easy Riser® Swing Check Valve and trim must be kept free of foreign matter, freezing conditions, corrosive atmospheres, contaminated water supplies, and any condition that could impair its operation or damage the device.

It is imperative that the system be inspected and tested on a regular basis. The frequency of the inspections may vary due to contaminated water supplies, corrosive water supplies, and corrosive atmospheres. For minimum maintenance and inspection requirements, refer to NFPA 25. In addition, the Authority Having Jurisdiction may have additional maintenance, testing, and inspection requirements that must be followed.

**⚠ WARNING**

**Any system maintenance that involves placing a control valve or detection system out of service may eliminate the fire protection capabilities of that system. Prior to proceeding, notify all Authorities Having Jurisdiction. Consideration should be given to employment of a fire patrol in the affected areas.**

### 6-A. Five-Year Internal Inspection

Internal inspection of check valves is recommended every five years unless inspections and tests indicate more frequent inspections are required. (Refer to Figure 1.)

1. Notify the Authority Having Jurisdiction, remote station alarm monitors, and those in the area affected that the system will be taken out of service. Consideration should be given to employment of a fire patrol in the affected areas.
2. Close the water supply main control valve, placing the system out of service.
3. Open the main drain. If necessary, open the system test valve to vent and completely drain the system.
4. Use the appropriate wrench to loosen and remove cover screws (14), and remove cover and clapper assembly (2-11).
5. Inspect water seat (12). Wipe away all contaminants, dirt, and mineral deposits. DO NOT use solvents or abrasives.
6. Inspect cover and clapper assembly (2-11) and cover gasket (13). Test the hinged clapper (8) for freedom of movement. Renew or replace damaged or worn parts as required.

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**⚠ CAUTION**

**NEVER apply any lubricant to seats, gaskets, or any internal operating parts of the valve. Petroleum-based grease or oil will damage rubber components and may prevent proper operation.**

7. When internal inspection of the Easy Riser® Swing Check Valve is complete, perform step 5 of paragraph 6-B. MAINTENANCE to re-install cover and clapper assembly (2-11).

**6-B. Maintenance** (Refer to Figure 1.)

1. Perform steps 1 through 5 of paragraph 6-A, FIVE-YEAR INTERNAL INSPECTION.
2. To replace clapper assembly (3, 6-11):
   a. Remove the cover screws (14) from the cover (2) using a Socket Wrench with a 9/16" socket.
   b. Remove the cover and clapper assembly (2-11) from the valve.
   c. Remove the cover gasket (13) by sliding it over the clapper assembly.
   d. Remove the existing clapper assembly (3, 6-11) from the cover assembly (2):
      i. Remove one of the retaining rings (5) from the clapper hinge pin (4) using a flat head screwdriver.
      ii. Remove the clapper hinge pin (4) from the cover and clapper assembly. This will allow the clapper assembly (3, 6-11) to be removed from the cover assembly (2).
   e. Install the new clapper assembly (3, 6-11) onto the cover assembly (2):
      i. Make sure the clapper rubber (9) is facing opposite the direction of the flow arrow on the inside of the cover (2).
      ii. Line up the holes of the cover assembly (2) and the clapper assembly (3, 6-11) and insert the hinge pin (4).
      iii. Install the retaining ring (5) onto the hinge pin (4).
      iv. Install the cover gasket (13) onto the new cover and clapper assembly (2-11) by sliding the cover gasket (13) over the clapper assembly (3, 6-11) and lining up the holes with the cover (2).
      v. To install the new cover and clapper assembly (2-11) into the valve, slide the clapper assembly into the valve with the clapper rubber (9) lined up with the water seat (12). Ensure the rubber retainer (10) fits inside the seat of the valve (pull back slightly and there should be some resistance).
      vi. Line up the holes of the cover (2) and cover gasket (13) with the valve body (1) and replace the cover screws (14) using a Socket Wrench with a 9/16" socket.
3. To replace the clapper rubber (9):
   i. Remove the cover screws (14) from the cover (2) using a Socket Wrench with a 9/16" socket.
   ii. Remove the cover and clapper assembly (2-11) from the valve.
   iii. Remove the cover gasket (13) by sliding it over the clapper assembly (3, 6-11).
   iv. Use a 7/32" Allen wrench to hold the button head socket screw (11) in place and remove the jam nut (6) from the clapper rubber (9) using a Socket Wrench with a 9/16" socket.
   v. Remove the button head socket screw (11) and sealing washer (7) from the clapper assembly (3, 6-11).
   vi. Remove the clapper rubber retainer (10) from the clapper (8) to free the clapper rubber (9).
   vii. To install the new clapper rubber (9), position the clapper rubber (9) on the clapper assembly so the grooved edge is facing down. This will allow the clapper rubber retainer (10) to fit up into the grooved edge of the clapper rubber (9).
   viii. Install the button head socket screw (11) and sealing washer assembly (7) and the jam nut (6) using a 7/32" Allen wrench and a Socket Wrench with a 9/16" socket.
   ix. Install the cover gasket (13) onto the cover (2) by sliding it over the clapper assembly (3, 6-11).
   x. Re-install the cover and clapper assembly (2-11) back into the valve, with the clapper rubber (9) lined up with the water seat (12). Ensure the clapper rubber retainer (10) fits inside the seat of the valve (pull back slightly and there should be some resistance).
   xi. Line up the holes of the cover (2) and cover gasket (13) with the valve body (1) and replace the cover screws (14) using a Socket Wrench with a 9/16" socket.
4. To replace the cover gasket (13):
   i. Remove the cover screws (14) from the cover (2) using a Socket Wrench with a 9/16" socket.
   ii. Remove the cover and clapper assembly (2-11) from the valve.
   iii. Remove the cover gasket (13) by sliding it over the clapper assembly (3, 6-11).
   iv. Install the new cover gasket (13) by sliding it over the clapper assembly (3, 6-11), onto the cover (2).
5. Reinstall the cover and clapper assembly (2-11) into the valve:
   i. Line up the clapper rubber (9) with the water seat (12). Ensure the clapper rubber retainer (10) fits inside the seat of the valve (pull back slightly and there should be some resistance).
   ii. Line up the holes of the cover (2) and cover gasket (13) with the valve body (1) and replace the cover screws (14) using a Socket Wrench with a 9/16" socket.

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## 7. AVAILABILITY

The Viking Easy Riser® Swing Check Valve is available through a network of domestic and international distributors. See the Viking Corp. Web site for closest distributor or contact The Viking Corporation.

## 8. GUARANTEES

For details of warranty, refer to Viking's current list price schedule or contact Viking directly.

**Table 1 - Valve Part Numbers and Specifications**

| Description | Nominal Size | Part Number | Friction Loss* | Shipping Weight |
|---|---|---|---|---|
| **Flange/Flange** | | | | |
| **Flange Drilling** | **Model F-1** | | | |
| ANSI | 3" | 08505 | 10 ft. (3.1m) | 35 lbs. (16 kg) |
| ANSI | 4" | 08508 | 13 ft. (4.0 m) | 44 lbs. (20 kg) |
| ANSI | 6" | 08511 | 20 ft. (6.0 m) | 75 lbs. (34 kg) |
| ANSI/Japan | DN100 | 09039 | 13 ft. (4.0 m) | 44 lbs. (20 kg) |
| ANSI/Japan | DN150 | 09385 | 20 ft. (6.0 m) | 75 lbs. (34 kg) |
| ANSI/Japan | DN200 | 14023 | 23 ft. (7.0 m) | 119 lbs. (54 kg) |
| PN10/16 | DN80 | 08796 | 10 ft. (3.1m) | 35 lbs. (16 kg) |
| PN10/16 | DN100 | 08797 | 13 ft. (4.0 m) | 44 lbs. (20 kg) |
| PN10/16 | DN150 | 08835 | 20 ft. (6.0 m) | 75 lbs. (34 kg) |
| PN10 | DN200 | 08836 | 23 ft. (7.0 m) | 119 lbs. (54 kg) |
| PN16 | DN200 | 12355 | 23 ft. (7.0 m) | 119 lbs. (54 kg) |
| **Flange/Groove** | | | | |
| **Flange Drilling / Pipe O.D.** | **Model F-1** | | | |
| ANSI / 89mm | 3" | 08506 | 10 ft. (3.1m) | 27 lbs. (12 kg) |
| ANSI / 114mm | 4" | 08509 | 13 ft. (4.0 m) | 37 lbs. (17 kg) |
| ANSI / 168mm | 6" | 08512 | 20 ft. (6.0 m) | 64 lbs. (29 kg) |
| ANSI / 219mm | 8" | 08515 | 23 ft. (7.0 m) | 119 lbs. (54 kg) |
| PN10/16 / 89mm | DN80 | 12648 | 10 ft. (3.1m) | 27 lbs. (12 kg) |
| PN10/16 / 114mm | DN100 | 12649 | 13 ft. (4.0 m) | 37 lbs. (17 kg) |
| PN10/16 / 165mm | DN150 | 12652 | 20 ft. (6.0 m) | 64 lbs. (29 kg) |
| PN10/16 / 168mm | DN150 | 08512 | 20 ft. (6.0 m) | 64 lbs. (29 kg) |
| PN10 / 219mm | DN200 | 12651 | 23 ft. (7.0 m) | 119 lbs. (54 kg) |
| PN16 / 219mm | DN200 | 12650 | 23 ft. (7.0 m) | 119 lbs. (54 kg) |
| **Groove/Groove** | | | | |
| **Pipe O.D.** | **Model E-1** | | | |
| 73mm | 2½" / DN65 | 07929 | 6 ft. (1.8m) | 16 lbs. (7 kg) |
| 76 mm | 2½" / DN65 | 13516 | 6 ft. (1.8m) | 16 lbs. (7 kg) |
| | **Model F-1** | | | |
| 89mm | 3" / DN80 | 08507 | 10 ft. (3.1m) | 20 lbs. (9 kg) |
| 114mm | 4" / DN100 | 08510 | 13 ft. (4.0 m) | 27 lbs. (12 kg) |
| 165mm | DN150 | 12356 | 20 ft. (6.0 m) | 51 lbs. (23 kg) |
| 168mm | 6" / DN150 | 08513 | 20 ft. (6.0 m) | 51 lbs. (23 kg) |
| 219mm | 8" / DN200 | 08516 | 23 ft. (7.0 m) | 106 lbs. (48 kg) |

*Expressed in equivalent length of Schedule 40 pipe based on Hazen & Williams formula: C = 120.

**Table 2 - Torque Values for Easy Riser Swing Check Valve Cover Screws**

| Valve Size | Screw Size | Torque Value |
|---|---|---|
| 2-1/2" (DN65) | 3/8"-16 H.H.C. | 19 ft-lb (2.63 kg-m) |
| 3" (DN80) | 3/8"-16 H.H.C. | 19 ft-lb (2.63 kg-m) |
| 4" (DN100) | 3/8"-16 H.H.C. | 19 ft-lb (2.63 kg-m) |
| 6" (DN150) | ½"-13 H.H.C. | 45 ft-lb (6.23 kg-m) |
| 8" (DN200) | 5/8"-11 H.H.C. | 93 ft-lb (12.9 kg-m) |

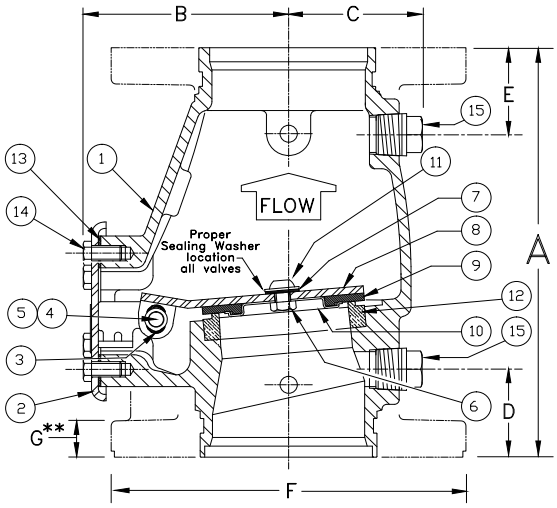
**Table 3 - Trim Package Part Numbers**

| Valve Size | Part Number |
|---|---|
| **Wet System Trim Packages** | |
| 2-1/2", 3" (DN65), (DN80) | 07236 |
| 4", 6", 8", (DN100), (DN150), (DN200) | 07237 |
| **Preaction System Trim Packages** | |
| 2-1/2", 3" (DN65) | 13776 |
| 4", 6", 8", (DN80), (DN100), (DN150), (DN200) | 13777 |

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| SIZE | A | B | C | D | E | F | G** |
|---|---|---|---|---|---|---|---|
| 2-1/2" (65mm) | 9" (228,6) | 4-1/2" (114,3) | 2-5/8" (66,7) | 2" (50,8) | 2" (50,8) | Flg-Flg Not Available | |
| 3" (80mm) | 10-1/8" (257) | 4-13/16" (122,2) | 2-11/16" (68,3) | 2-9/32" (58.1) | 2-9/32" (58.1) | 7-7/8" (200) | 25/32" (20) |
| 4" (100mm) | 10-5/8" (269,9) | 5-3/16" (131,8) | 3-1/8" (79.4) | 2-1/4" (57.2) | 2-1/4" (57,2) | 9" (228,6) | 15/16" (23,81) |
| 6" (150mm) | 13-3/8" (340) | 6-13/16" (173,3) | 4-1/16" (103.2) | 2-1/4" (57,2) | 2-1/4" (57,2) | 11" (279,4) | 1" (25,4) |
| 8" (200mm) | 17" (431,8) | 8-13/16" (223,4) | 5" (127) | 2-1/2" (63,4) | 2-7/8" (73,0) | 13-1/2" (342,9) | 1-1/8" (28,58) |

Dimensions shown in parentheses are millimeter.

* For availability of Flg X Flg, Flg X Grv, or Grv X Grv options refer to Table 1.

** 4", 6", and 8" valves are manufactured with sculptured flanges. Dimension indicates thickness of flange at bolt holes.

## Figure 1 - Replacement Parts

| ITEM NO. | PART NUMBER E-1 2-1/2" (DN65) | F-1 3" (DN80) | F-1 4" (DN100) | F-1 6" (DN150) | F-1 8" (DN200) | DESCRIPTION | MATERIAL | NO. REQ'D 2-1/2" | 3" | 4" | 6" | 8" |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -- | -- | -- | -- | -- | Body | Ductile Iron, ASTM A536 (65-45-12) | 1 | 1 | 1 | 1 | 1 |
| 2 | -- | -- | -- | -- | -- | Cover Assembly | E-Coated HSLA Steel, A715 and Stainless Steel, UNS-S30400 | 1 | 1 | 1 | 1 | 1 |
| 3 | 07576 | 07576 | 07576 | 07576 | None | Bushing | Lubricomp 189 Ryton | 2 | 2 | 2 | 2 | 0 |
| 4 | 05355A | 05355A | 04900A | 04991A | 05334A | Clapper Hinge Pin | Stainless Steel, UNS-S30400 | 1 | 1 | 1 | 1 | 1 |
| 5 | 05445A | 05445A | 05445A | 05445A | 05369A | Hinge Pin Retaining Ring | Stainless Steel, UNS-S15700 | 2 | 2 | 2 | 2 | 2 |
| 6 | 01755A | | | | | Clapper Hex Jam Nut #10-24 UNC | Stainless Steel, UNS-S30400 | 1 | 0 | 0 | 0 | 0 |
| | | 08159 | 08159 | | | Clapper Hex Jam Nut 3/8"-24 UNF | Stainless Steel, UNS-S30400 | 0 | 1 | 1 | 0 | 0 |
| | | | | 08144 | 08144 | Clapper Hex Jam Nut ½"-20 UNF | Stainless Steel, UNS-S30400 | 0 | 0 | 0 | 1 | 1 |
| 7 | -- | 08158 | 08158 | 08143 | 08143 | Sealing Washer | EPDM and Stainless Steel | 1 | 1 | 1 | 1 | 1 |
| 8 | * | * | * | * | * | Clapper | PTFE Coated HR Steel UNS-G10180 | 1 | 1 | 1 | 1 | 1 |
| 9 | * | * | * | * | * | Clapper Rubber | EPDM, ASTM D2000 | 1 | 1 | 1 | 1 | 1 |
| 10 | * | * | * | * | * | Clapper Rubber Retainer | Stainless Steel, UNS-S30400 | 1 | 1 | 1 | 1 | 1 |
| 11 | 06595A | | | | | H.H.C. Screw, #10-24 UNC x 1/2" (12.7 mm) lg. | Stainless Steel, UNS-S30400 | 1 | 0 | 0 | 0 | 0 |
| | | 10194 | 10194 | | | Screw, Button Head, Socket, 3/8" - 24 UNF x 1/2 (12.7 mm) lg. | Stainless Steel, UNS-S30400 | 0 | 1 | 1 | 0 | 0 |
| | | | | 10308 | | Screw, Button Head, Socket, 1/2" - 20 UNF x 3/4 (19.1 mm) lg. | Stainless Steel, UNS-S30400 | 0 | 0 | 0 | 1 | 0 |
| | | | | | 10686 | Screw, Button Head, Socket, 1/2" - 20 UNF x 7/8 (22.2 mm) lg. | Stainless Steel, UNS-S30400 | 0 | 0 | 0 | 0 | 1 |
| 12 | -- | -- | -- | -- | -- | Seat | Brass, UNS-C84400 | 1 | 1 | 1 | 1 | 1 |
| 13 | 05354B | 05354B | 04649B | 04992B | 05339C | Cover Gasket | EPDM, ASTM D2000 | 1 | 1 | 1 | 1 | 1 |
| 14 | 01517A | 01517A | 01517A | | | Screw, Hex Head Cap, 3/8" - 16 UNC x 3/4 (19.1 mm) lg. | Steel, Zinc Plated | 4 | 4 | 6 | 0 | 0 |
| | | | | 04993A | | Screw, Hex Head Cap, 1/2" - 13 x 7/8 (22.2 mm) lg. | Steel, Zinc Plated | 0 | 0 | 0 | 6 | 0 |
| | | | | | 01922A | Screw, Hex Head Cap, 5/8" - 11 UNC x 1-1/4" (31.8 mm) lg. | Steel, Zinc Plated | 0 | 0 | 0 | 0 | 6 |
| 15 | -- | -- | -- | -- | -- | 1/2" (15 mm) NPT Pipe Plug | Steel | 2 | 2 | 2 | 2 | 2 |

-- Indicates replacement part is not available

* Indicates replacement part only available in a Sub-Assembly listed below.

**Sub-Assemblies**

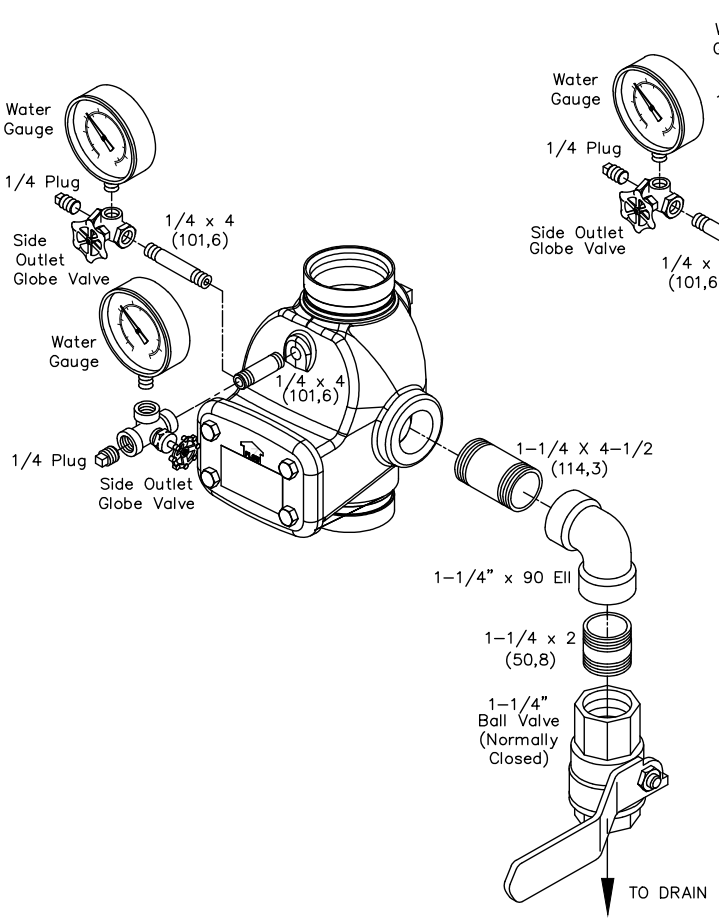
| | | | | | | |
|---|---|---|---|---|---|---|
| 3, 6-11 | 05499B | 08518 | 08519 | 08520 | 08521 | Clapper Assembly |
| 6, 7, 9-11,13 | 06343A | 08522 | 08523 | 08524 | 08525 | Replacement Rubber Kit |

VIKING®

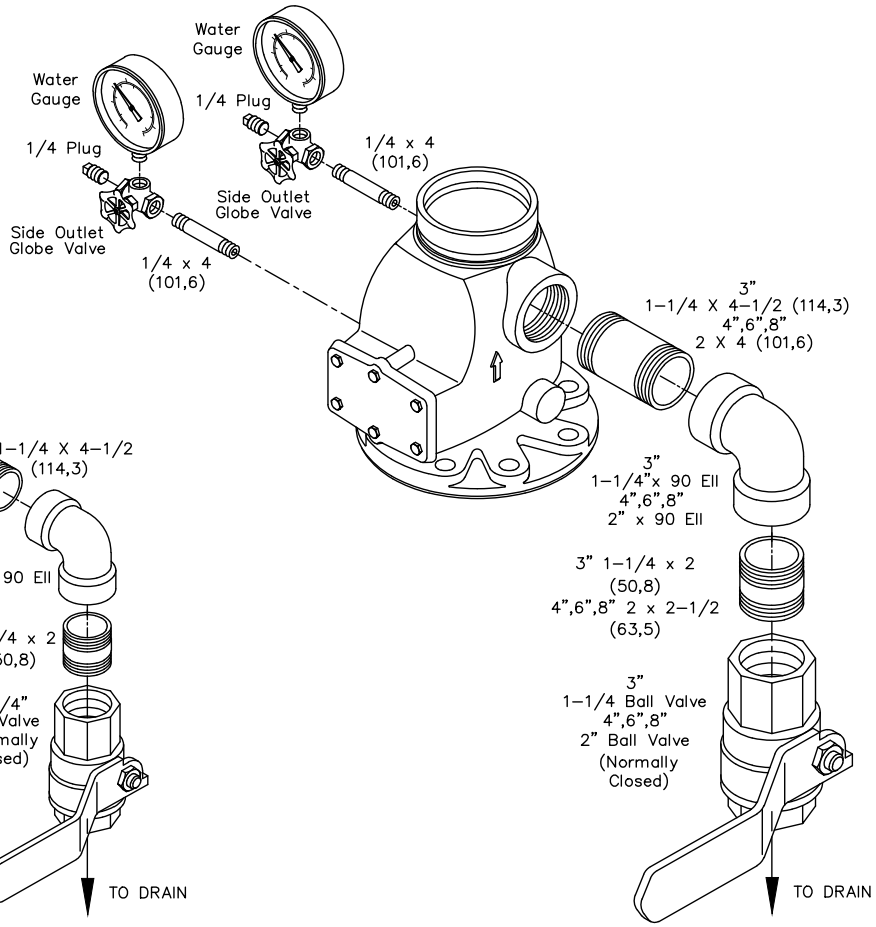
# TECHNICAL DATA

## EASY RISER® SWING CHECK VALVE MODELS E-1 & F-1

**The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058**
**Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com**
**Visit the Viking website for the latest edition of this technical data page: www.vikinggroupinc.com**




**2-1/2" Model E-1**
**Easy Riser Check Valve**
**Trim Chart**




**3", 4", 6" and 8" Model F-1**
**Easy Riser Check Valve**
**Trim Chart**

## Figure 2

**Note 1:** 300 psi (20.7 bar) water pressure gauges are provided with trim. 600 psi (41.4 bar) water pressure gauges are available. Order separately when needed*. Refer to Viking's current price schedule.

* NFPA 13 requires gauges to have a minimum limit not less than twice the normal water working pressure at the point where the gauges are installed. When normal water working pressure exceeds 150 psi (10.3 bar), order 600 psi (41.4 bar) water pressure gauges separately.

**Note 2:** System Drain Ball Valve is UL Listed and FM Approved for 300 psi (20.7 bar) water working pressure.

# TECHNICAL DATA

## EASY RISER® SWING CHECK VALVE MODELS E-1 & F-1

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com
Visit the Viking website for the latest edition of this technical data page: www.vikinggroupinc.com

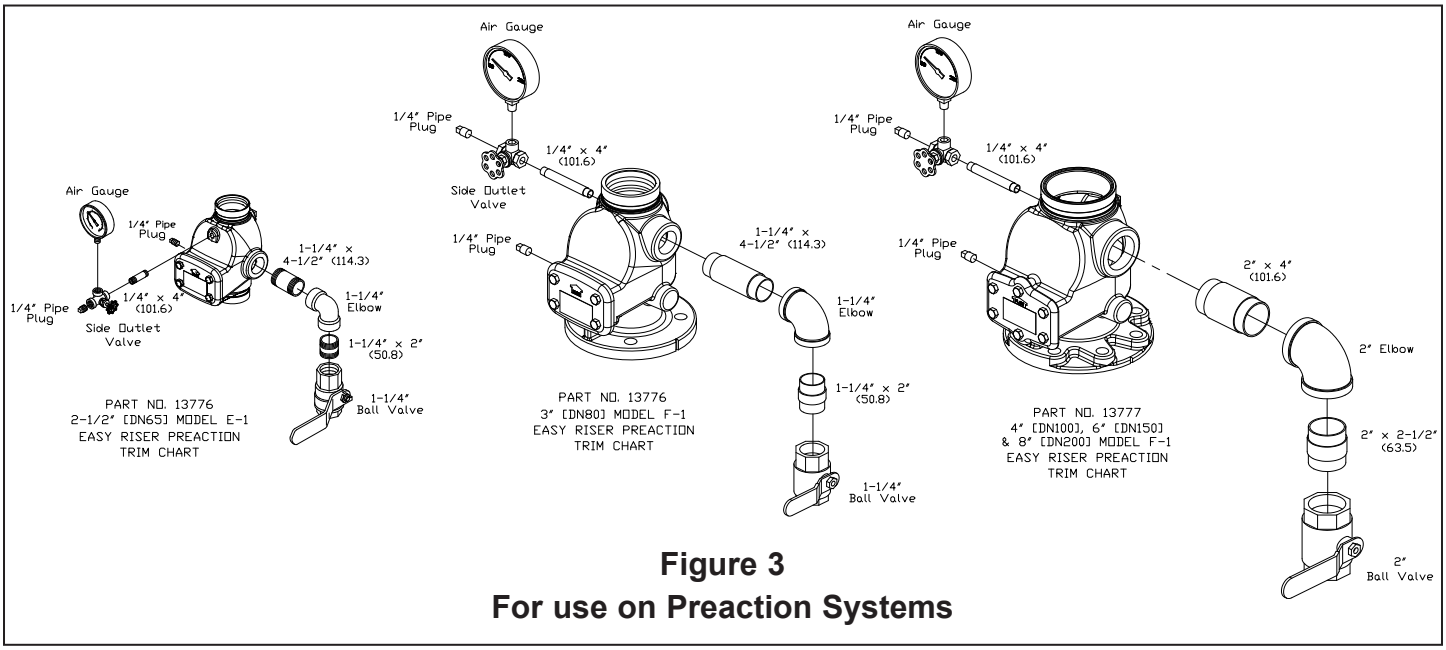
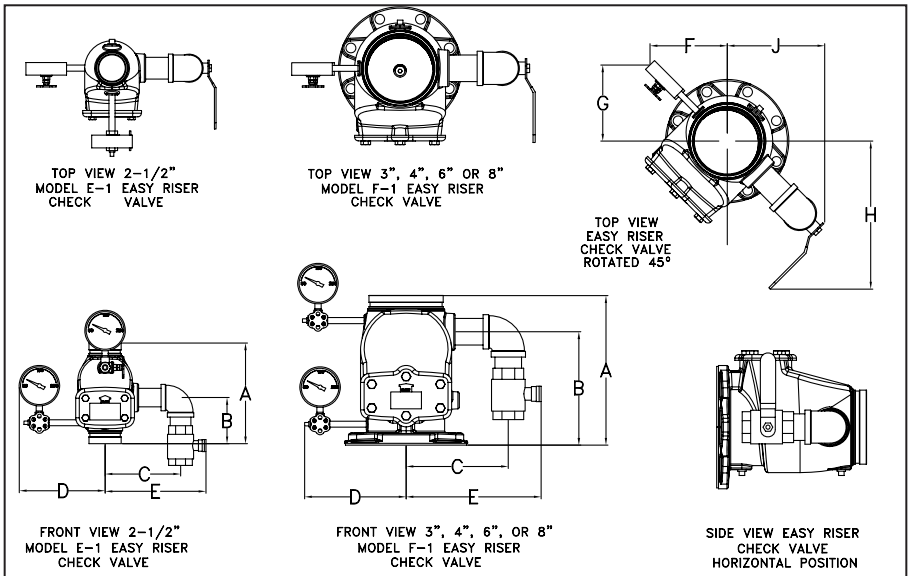



**Figure 3**
**For use on Preaction Systems**




| SIZE | A | B | C | D | E | F | G | H | J |
|---|---|---|---|---|---|---|---|---|---|
| 2-1/2" (65mm) | 9" (228,6) | 4-1/8" (105) | 6-3/4" (171) | 7-5/8" (194) | 9" (229) | 5-1/2" (139) | 5-3/8" (137) | 10-7/16" (265) | 6-5/8" (169) |
| 3" (80mm) | 10-1/8" (257) | 7-1/4" (184) | 6-3/4" (171) | 7-7/8" (200) | 8-7/8" (226) | 5-15/16" (150) | 5-7/8" (149) | 9-7/8" (251) | 6-7/16" (163) |
| 4" (100mm) | 10-5/8" (270) | 7-3/8" (187) | 8-3/8" (213) | 8-7/16" (214) | 11-5/16" (287) | 6-3/16"" (157) | 6-1/8" (155) | 12-11/16" (322) | 8-1/16" (205) |
| 6" (150mm) | 13-3/8" (340) | 10-1/8" (257) | 9-1/8" (232) | 9-1/2" (241) | 12-1/16" (306) | 6-7/8" (175) | 6-13/16" (173) | 13-3/16" (336) | 8-5/8" (219) |
| 8" (200mm) | 17" (432) | 13-1/8" (333) | 9-15/16" (253) | 10-3/4" (273) | 13-1/16" (332) | 7-5/8" (193) | 7-1/2" (191) | 13-15/16" (354) | 9-5/16" (237) |

**Figure 4**

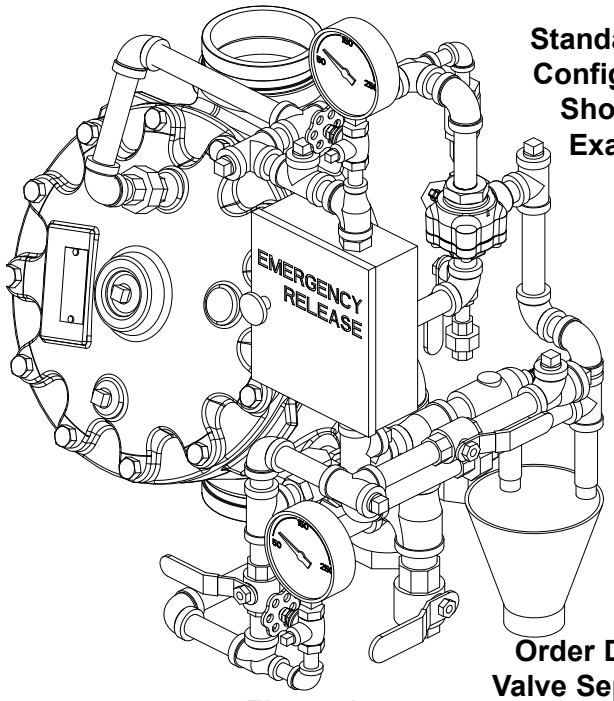
Dimensions in parentheses are millimeter.
Dimensions are approximate.

# DELUGE VALVE

# TECHNICAL DATA

## 4” (DN100) MODEL F-1 STRAIGHT THROUGH DELUGE VALVE VERTICAL CONVENTIONAL TRIM CHART Maximum 250 PSI WWP

**The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058**
**Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com**




**Standard Trim Configuration Shown as Example**

**Order Deluge Valve Separately**

**Figure 1**

**WARNING**: Cancer and Reproductive Harm- www.P65Warnings.ca.gov

| This Trim Chart is for use with the following Viking Trim Sets | | | |
|---|---|---|---|
| **Valve Size** | **Galvanized Trim Part No.** | **U.S. ONLY (galvanized)** | **Brass Trim Part No.** |
| 4” (DN100) | 14639-1 Figure 2 | 14639-1USA Figure 3 | 14639-2 Figure 2 |

| This Trim is for use with the following Release Module Trim Kits | | |
|---|---|---|
| **Release Type** | **Galvanized*** | **Brass**** |
| Pneumatic | 10809 | 10811 |
| Electric | 10830 | 10832 |
| Electric/ Pneumatic | 12661-1 | 12661-2 |
| Pneumatic/ Pneumatic | 12662-1 | 12662-2 |

* Standard Trim sets for Model F Deluge Valves consist of galvanized nipples and fittings.

**Refer to Technical Data describing the Halar® Coated Deluge Valve and the Viking Website for applications where brass trim is recommended.

**Note:** Nipple lengths for brass trim may vary from those shown on this Trim Chart.

**Notes: For use with Trim Chart on Pages 2 and 3**

## General Notes:

- Valve must be trimmed as shown. Any deviation from trim size or arrangement may affect the proper operation of the valve.
- All pipe 3/4” (20 mm) and smaller shall be galvanized steel except when other materials are specified in the Technical Data for the Halar® Coated Deluge Valve or when other materials are specified on the *Viking website*.
- When Model F Deluge Valves are used on pre-mixed Foam Systems, trim piping must be of copper pipe with brass fittings unless otherwise specified in the Technical Data for the Halar® Coated Deluge Valve or on t*he Viking website*.
- Dimensions in parentheses are millimeter and may be approximations.

**Note 1:** 1/2” (15 mm) NPT plugged outlet provided for connecting certain optional components and associated trim.

**Note 2:** Release System connection. Viking Deluge and Flow Control Valves are compatible with hydraulic, pneumatic, and electric release systems. A Pneumatic Actuator is required on all Viking Deluge Valves and Flow Control Valves equipped with Pneumatic Release Systems.

**Note 3:** Alarm Connections: Connect alarm line piping to 3/4” (20 mm) NPT outlet. When using a Water Motor Alarm, a strainer is required. 1/2” (15 mm) NPT outlet is for electric Alarm Pressure Switch.

**Note 4:** Optional non-interruptible connection for Alarm Pressure Switch to activate electric alarm panel. Note: After the Deluge Valve trips, this location cannot be shut off. Alarms may operate until the outlet chamber of the deluge valve is de-pressurized below the set point of the Alarm Pressure Switch.

**Note 5:** Viking Drain Check Valve is manufactured with a 0.067“ (1.7 mm) orifice to allow alarm line to drain. Do not substitute. Check Figure 2 for proper orientation.

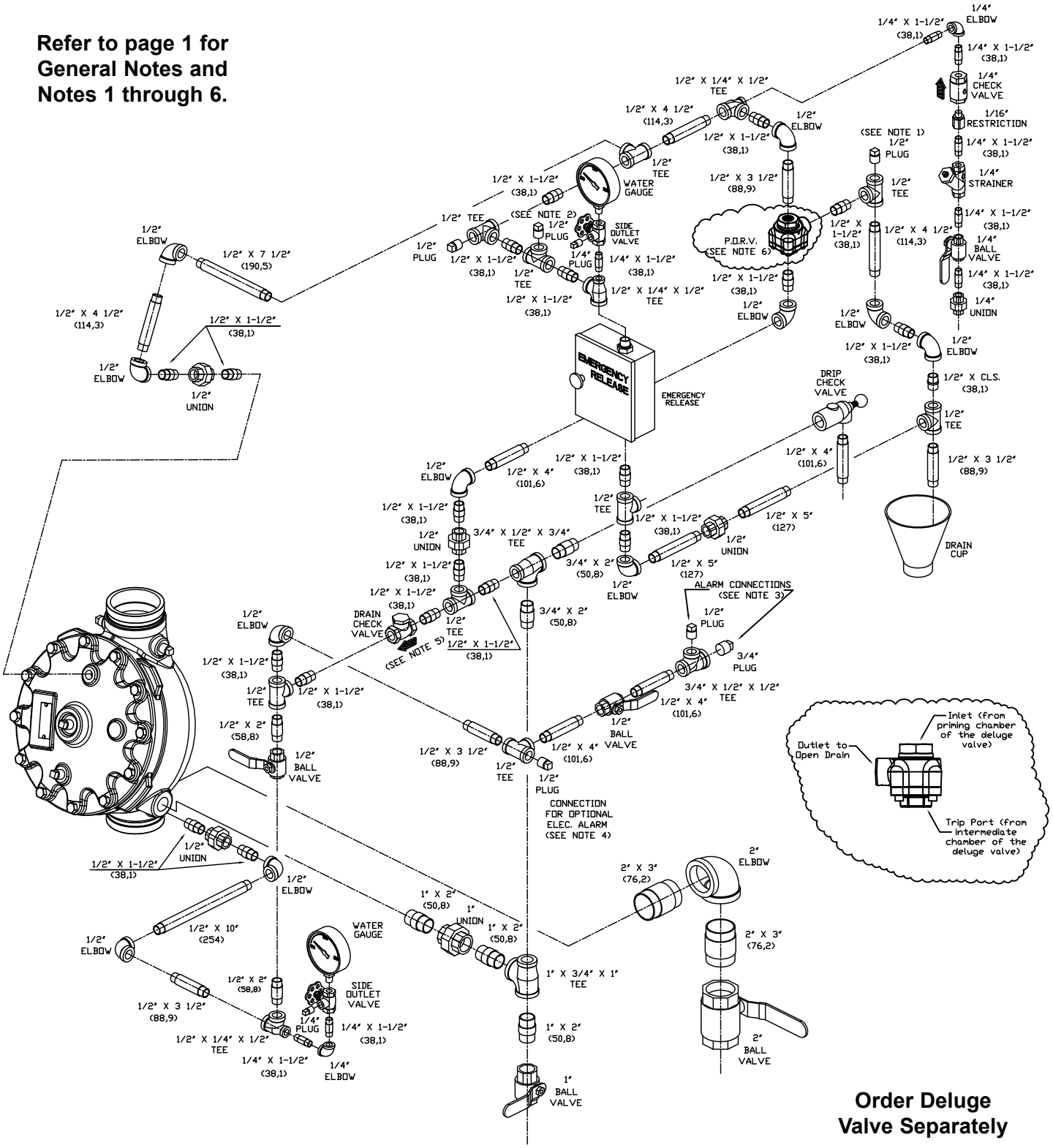
**Note 6:** Inlet side of PORV is connected to the top chamber of the deluge valve. Inlet of PORV should be facing up. Outlet goes to open drain.

# TECHNICAL DATA

## 4" (DN100) MODEL F-1 STRAIGHT THROUGH DELUGE VALVE VERTICAL CONVENTIONAL TRIM CHART Maximum 250 PSI WWP

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

**Refer to page 1 for General Notes and Notes 1 through 6.**




**Order Deluge Valve Separately**

**Figure 2**

VIKING®

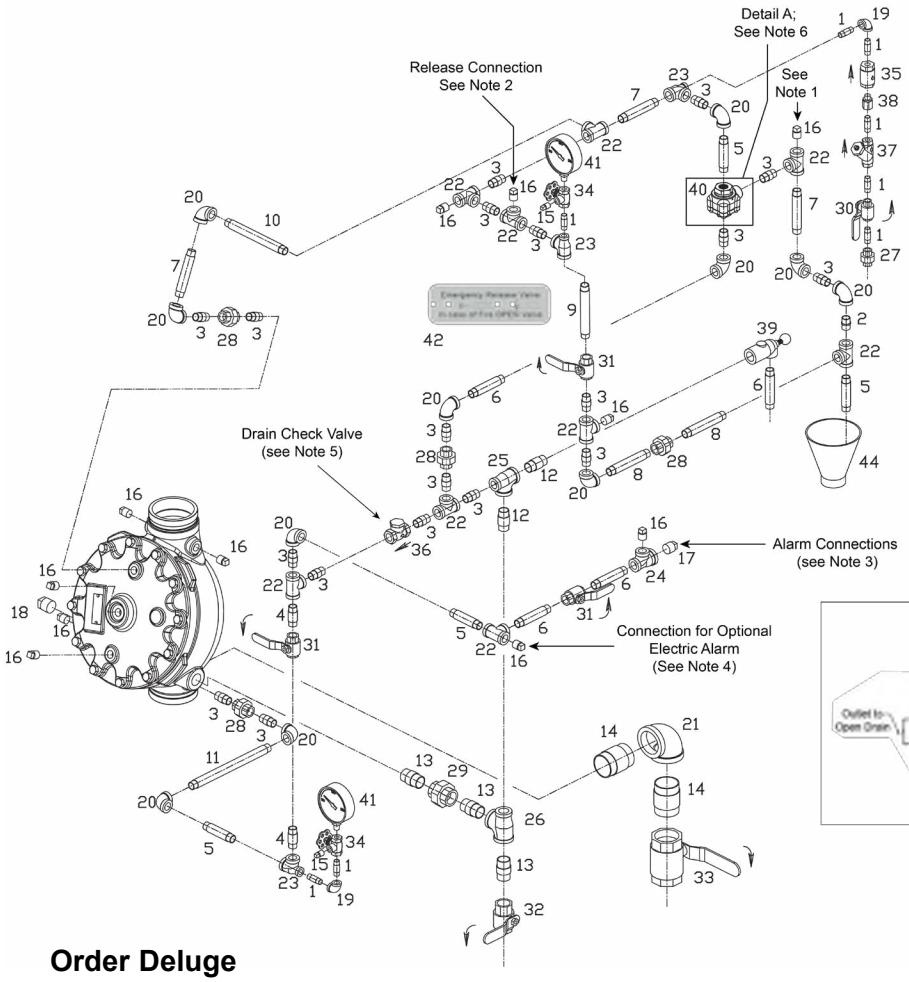
# TECHNICAL DATA

## 4" (DN100) MODEL F-1 STRAIGHT THROUGH DELUGE VALVE VERTICAL CONVENTIONAL TRIM CHART Maximum 250 PSI WWP

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

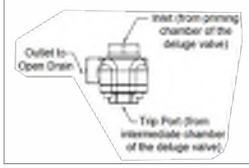
**Figure 3**

**Refer to page 1 for General Notes and Notes 1 through 6.**




| ITEM | DESCRIPTION | REQ. |
|---|---|---|
| 1 | NIPPLE, 1/4" x 1 1/2" | 8 |
| 2 | NIPPLE, 1/2" x CLOSE | 1 |
| 3 | NIPPLE, 1/2" x 1 1/2" | 19 |
| 4 | NIPPLE, 1/2" x 2" | 2 |
| 5 | NIPPLE, 1/2" x 3 1/2" | 4 |
| 6 | NIPPLE, 1/2" x 4" | 4 |
| 7 | NIPPLE, 1/2" x 4 1/2" | 3 |
| 8 | NIPPLE, 1/2" x 5" | 2 |
| 9 | NIPPLE, 1/2" x 6 1/2" | 1 |
| 10 | NIPPLE, 1/2" x 7 1/2" | 2 |
| 11 | NIPPLE, 1/2" x 10" | 1 |
| 12 | NIPPLE, 3/4" x 2" | 2 |
| 13 | NIPPLE, 1" x 2" | 3 |
| 14 | NIPPLE, 2" x 3" | 2 |
| 15 | PLUG, 1/4" | 2 |
| 16 | PLUG, 1/2" | 11 |
| 17 | PLUG, 3/4" | 1 |
| 18 | PLUG, 1" | 1 |
| 19 | ELBOW, 1/4" | 2 |
| 20 | ELBOW, 1/2" | 11 |
| 21 | ELBOW, 2" | 1 |
| 22 | TEE, 1/2" | 9 |
| 23 | TEE, 1/2" x 1/4" x 1/2" | 3 |
| 24 | TEE, 3/4" x 1/2" x 1/2" | 1 |
| 25 | TEE, 3/4" x 1/2" x 3/4" | 1 |
| 26 | TEE, 1" x 3/4" x 1" | 1 |
| 27 | UNION, 1/4" | 1 |
| 28 | UNION, 1/2" | 4 |
| 29 | UNION, 1" | 1 |
| 30 | BALL VALVE, 1/4" | 1 |
| 31 | BALL VALVE, 1/2" | 3 |
| 32 | BALL VALVE, 1" | 1 |
| 33 | BALL VALVE, 2" | 1 |
| 34 | SIDE OUTLET VALVE | 2 |
| 35 | CHECK VALVE, 1/4" | 1 |
| 36 | DRAIN CHECK VALVE | 1 |
| 37 | STRAINER, 1/4" | 1 |
| 38 | RESTRICTION, 1/16" | 1 |
| 39 | DRIP CHECK VALVE | 1 |
| 40 | P.O.R.V. ASSEMBLY | 1 |
| 41 | WATER GAUGE | 2 |
| 42 | EMERGENCY RELEASE LABEL | 1 |
| 43 | ZIP TIE | 1 |
| 44 | DRAIN CUP | 1 |

Detail A;
See Note 6




**Order Deluge Valve Separately**

# TECHNICAL DATA

**4" (DN100) MODEL F-1 STRAIGHT THROUGH DELUGE VALVE VERTICAL CONVENTIONAL TRIM CHART** Maximum 250 PSI WWP

**The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058**
**Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com**

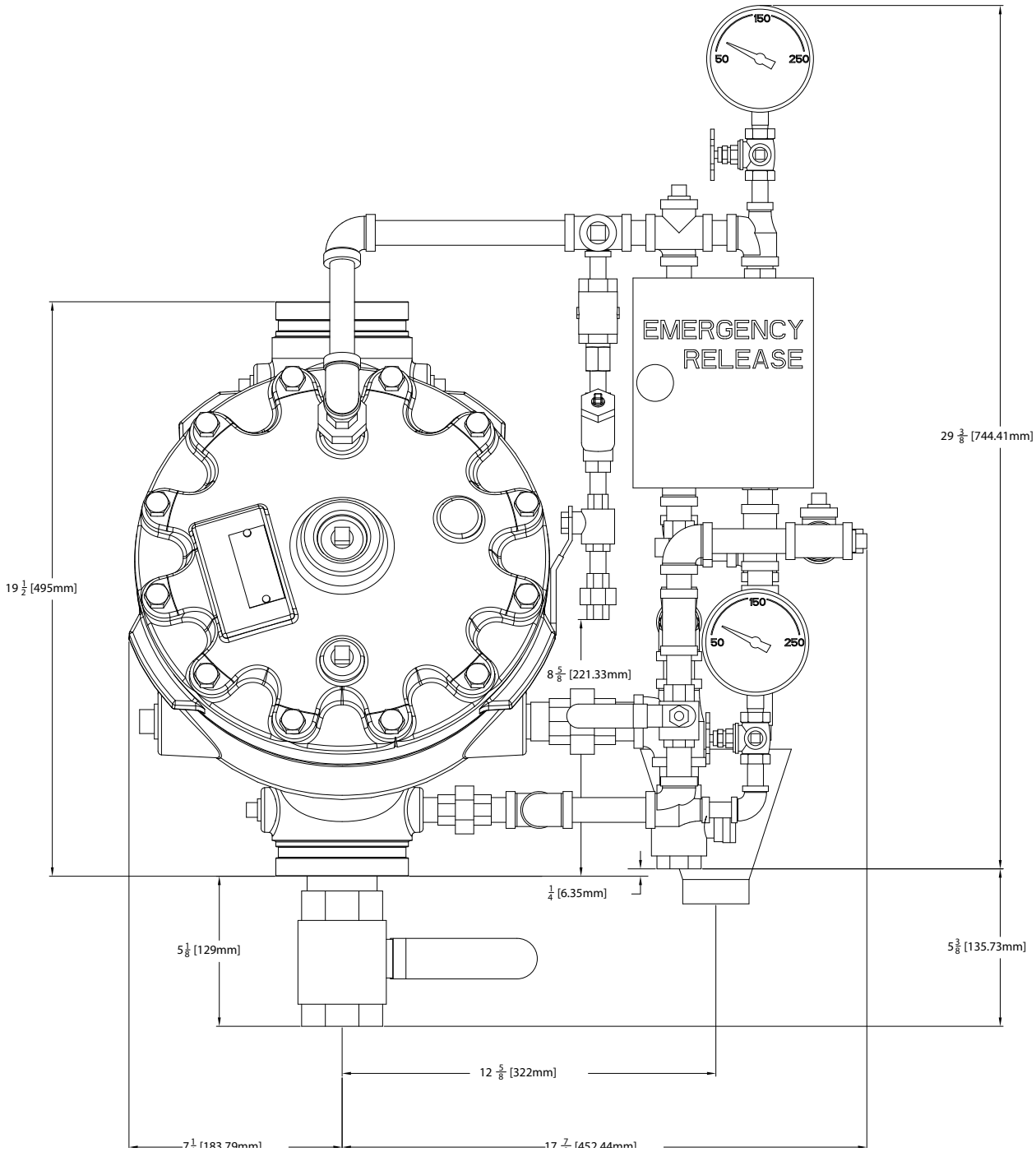



**Figure 4: Installation Dimensions - Front View**

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# TECHNICAL DATA

**4" (DN100) MODEL F-1 STRAIGHT THROUGH DELUGE VALVE VERTICAL CONVENTIONAL TRIM CHART** Maximum 250 PSI WWP

**The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058**
**Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com**

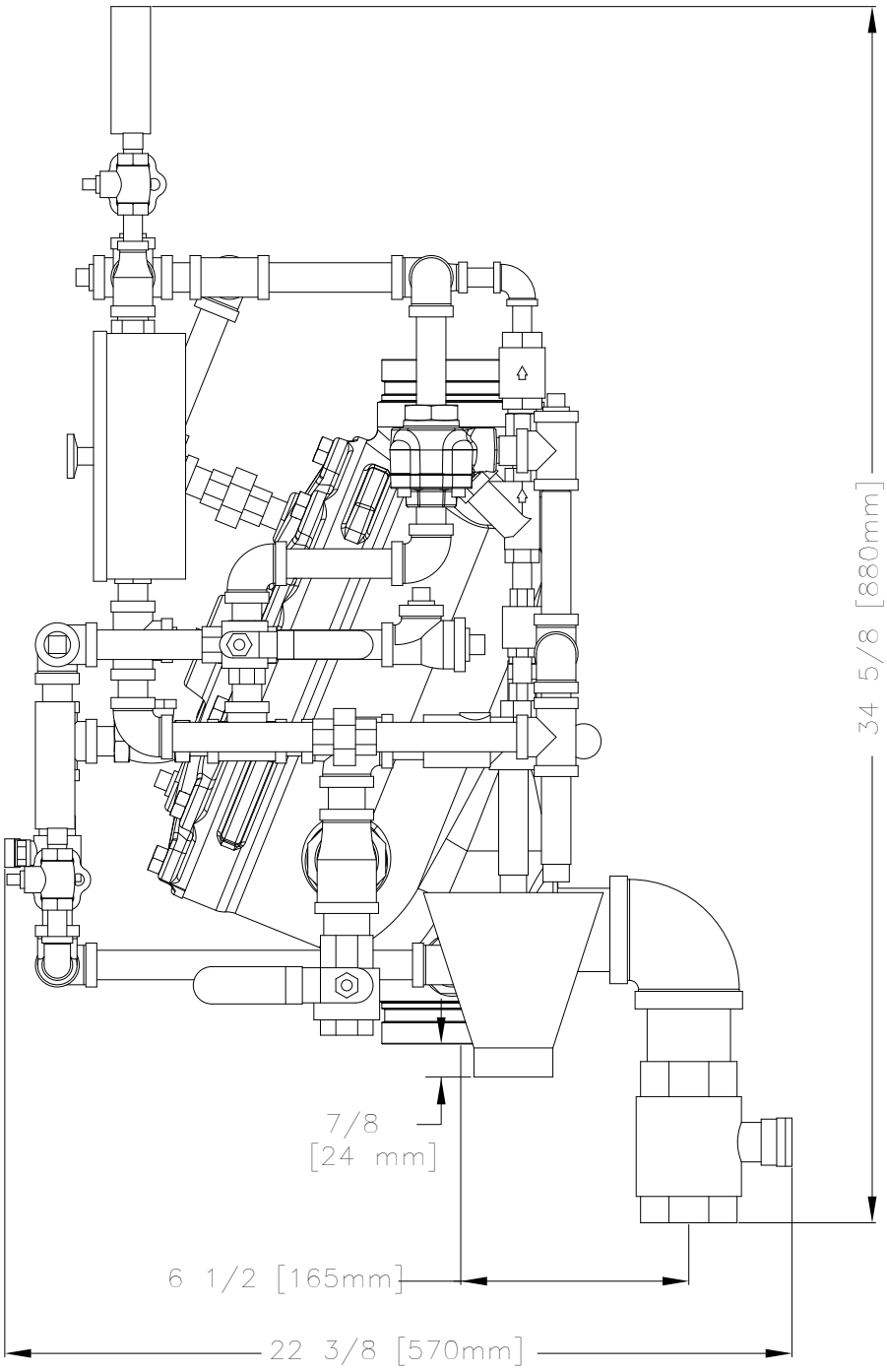



**Figure 5: Installation Dimensions - Side View**

# INSPECTORS TEST

# InspectorsTEST™

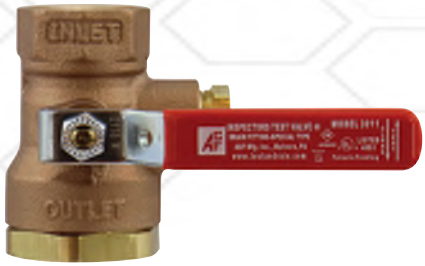
# Model 3011

QUALITY COMPONENTS FOR FIRE SPRINKLER SYSTEMS

**3011**
Shown with
Relief Valve
A-Kit Installed



**3011**
Ball Valve



**3011**
Shown with
Sight Glass
Installed



## Inspector's Test Valves

The AGF InspectorsTEST Model 3011 family of valves are 1" ball valves designed to provide the remote inspector's test valve required on dry systems, single story gridded systems, and other applications, with the benefit of locating the orifice indoors. The Model 3011 valve is available in orifice sizes ranging from 2.8K to 11.2K ELO.

The Model 3011 valve is compliant with industry standards requiring an approved test orifice and provisions for the proper draining of a system. To meet code requirements for the inclusion of a pressure relief valve on all wet systems (NFPA 13), the Model 3011 valve can be ordered with the optional A-Kit. The Model 3011 with A-Kit includes a UL Listed, FM Approved Model 7000L pressure relief valve, 175 PSI standard (other ratings available include: 200, 225, and 300 PSI) with relief valve drain trim and optional sight glass. For dry systems and other applications the Model 3011 can be ordered with or without an optional sight glass.

## Features

- NFPA 13 Compliant
- 1" Ball Valve
- Compact, Single-Handle Design
- Orifice Options (2.8K—11.2K ELO)
- Tamper-Resistant Test Orifice
- 300 PSI Rated
- Allows the Orifice to be Located Indoors

## Models

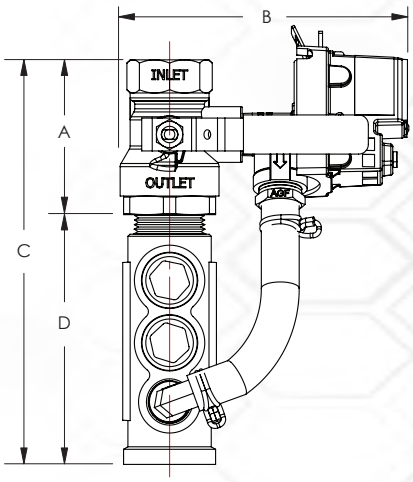
| Model 3011 Part Numbers | | | | |
|---|---|---|---|---|
| Orifice Size | | 3011 with A-Kit | 3011 | 3011 with Sight Glass |
| K-Factor | Fractional | | | |
| 2.8 | 3/8" | 300A | 300BV | 300SG |
| 4.2 | 7/16" | 301A | 301BV | 301SG |
| 5.6 | 1/2" | 302A | 302BV | 302SG |
| 8.0 | 17/32" | 303A | 303BV | 303SG |
| 11.2 (ELO) | 5/8" | 304A | 304BV | 304SG |

Most Popular Models

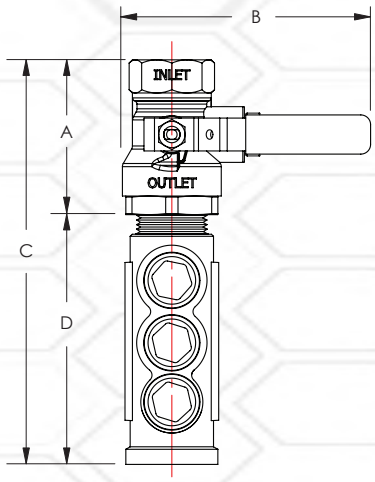
Products shown above may include field installed options.

## Dimensions

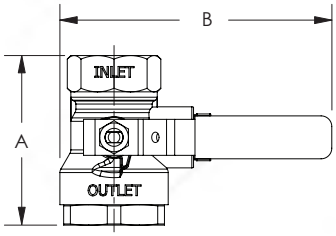
### 3011 with A-Kit




### 3011 with Sight Glass




### Ball Valve




| Model | A | B | C | D |
|---|---|---|---|---|
| **3011** with A-Kit | 3” (75 mm) | 5½” (139 mm) | 7¾” (195 mm) | 4¾” (121 mm) |
| **3011** Ball Valve | 3” (75 mm) | 4 11/16” (118 mm) | - | - |
| **3011** with Sight Glass | 3” (75 mm) | 4 11/16” (118 mm) | 7¾" (195 mm) | 4¾" (121 mm) |

Sizes have been rounded to the highest millimeter

**NOTE:** UL and FM standards for sprinkler system pressure relief valves require relief valves to operate within a range of their ratings. FM requires a relief valve to OPEN at a pressure no less than 85% of their rating and UL requires OPENING at a pressure no greater than 105% of their rating. Both standards require the relief valves to CLOSE within a percentage below OPEN. Choose the relief valve comparing static pressure to 90% of the relief valve's rating to determine the estimated minimum OPENING and 80% of the relief valve's rating for approximate maximum CLOSING. The relief valve should be installed where it is easily accessible for maintenance. Care should be taken that the relief valve CANNOT be isolated from the system when the system is operational. A relief valve should NEVER have a shutoff valve or a plug downstream of its outlet.

USA Patent #4971109 and Other Patents Pending

For use on wet and dry fire sprinkler systems.

## Valve Sizes

1”

## Orifice Options

2.8K, 4.2K, 5.6K, 8.0K, and 11.2K (ELO)

## Connections

Inlet..... NPT
Outlet..... NPT

## Installation Orientation

Vertical

## Electrical Requirements

None

## Materials

Handle ..... Steel
Stem ..... Rod Brass
Ball..... C.P. Brass
Body ..... Bronze
Valve Seat..... Virgin Teflon®
Relief Valve ..... Brass
Bypass Fitting..... Brass
Bypass Tube..... Nylobraid
Sight Glass .....Plastic

## Rating

300 PSI

## Compliance

NFPA 13
NYC-BSA No. 720-87-SM

## Model 3011 Valve Approvals

UL/ULC (EX4019 & EX4533)
FM

FM APPROVED
UL LISTED

**AGF Manufacturing Inc.**
100 Quaker Lane, Malvern, PA 19355
Phone: 610-240-4900
Fax: 610-240-4906
www.agfmfg.com

Job Name: _____
Architect: _____
Engineer: _____
Contractor: _____

# PIPE

SHAMBAUGH & SON, L.P.
CONTRACTORS · ENGINEERS

# FIRE PROTECTION SYSTEM
# BLACK PIPE SPECIFICATION

## SCHEDULE 40 “STANDARD WALL” PIPE

Schedule 40 (6” and smaller) and schedule 30 (8” and larger) pipe shall be produced and tested in accordance with the requirements of ASTM-A135 or ASTM-A53 specifications for chemistries, tensiles, and yields for carbon steel.

## SCHEDULE 10 “THIN WALL” PIPE

Schedule 10 pipe shall be produced and tested in accordance with the requirements of ASTM A-135 specifications for chemistries, tensiles, and yields for carbon steel.

SHAMBAUGH & SON, L.P.
CONTRACTORS · ENGINEERS

# FIRE PROTECTION SYSTEM
# GALVANIZED PIPE SPECIFICATION

## SCHEDULE 40 “STANDARD WALL” PIPE

Schedule 40 (8” and smaller) and schedule 30 (8” and larger) pipe shall be produced and tested in accordance with the requirements of ASTM-A135 or ASTM-A53 specifications for chemistries, tensiles, and yields for carbon steel.

## SCHEDULE 10 “THIN WALL” PIPE

Schedule 10 pipe shall be produced and tested in accordance with the requirements of ASTM A-135 specifications for chemistries, tensiles, and yields for carbon steel.

# ASTM A53 Type E Grade B

ASTM A53 Grade B Type E pipe is produced at our Nucor Tubular Products (NTP) Trinity, Alabama division. NTP pipe is always made, melted, and rolled in the U.S.A. – so it's steel you can trust!

**All Nucor Tubular Products ASTM A53 Grade B Type E Pipe is:**

- UL Listed (US and Canada) 1" NPS – 8" NPS
- FM Approved 1" NPS – 8" NPS
- Produced from 100% domestically sourced steel
- NDT Weld Tested
- Hydrotested
- MIC Guard coated

**In addition:**

- Stock Lengths Available in 21' (1" through 8") and 42' (3" through 8")
- Custom Lengths Available
- Plain End or Roll Grooved
- Black proprietary coating, or bare
- Complies with NFPA 13 and 14
- NYC SCA Approved

| A53 Type E Grade B - Schedule 40 | | | | | | | |
|---|---|---|---|---|---|---|---|
| NPS | Nom OD | Nom ID | Nom Wall | Nom Weight | PCS/BDL | 21' Lift Weight | CRR (Threaded) |
| 1" | 1.315" | 1.049" | 0.133" | 1.68 | 70 | 2,470 | 1.00 |
| 1 1/4" | 1.660" | 1.380" | 0.140" | 2.27 | 51 | 2,431 | 1.00 |
| 1 1/2" | 1.900" | 1.610" | 0.145" | 2.72 | 44 | 2,513 | 1.00 |
| 2" | 2.375" | 2.067" | 0.154" | 3.65 | 30 | 2,300 | 1.00 |
| 2 1/2" | 2.875" | 2.469" | 0.203" | 5.57 | 19 | 2,310 | 1.00 |
| 3" | 3.500" | 3.068" | 0.216" | 7.34 | 13 | 2,069 | 1.00 |
| 4" | 4.500" | 4.026" | 0.237" | 10.78 | 10 | 2,266 | 1.00 |
| 6" | 6.625" | 6.065" | 0.280" | 18.99 | 7 | 2,792 | 1.00 |
| 8" | 8.625" | 7.981" | 0.322" | 28.58 | 5 | 3,001 | 1.00 |

www.nucortubular.com

**2000 Cooperage Way, Trinity, AL 35673**

**(256) 301-5560**

NUCOR®

TUBULAR PRODUCTS

BULL MOOSE TUBE

# SCHEDULE 10 & 40 SPRINKLER PIPE SUBMITTAL DATA SHEET

## APPROVALS AND SPECIFICATIONS

- ASTM A135, Grade A
- ASTM A795, Type E, Grade A
- Pressure rated to 300 psi
- Underwriters Laboratories—United States of America
- Underwriters Laboratories—Canada
- Factory Mutual
- NFPA-13
- NFPA-13R
- NFPA-14
- CIVIL DEFENSE APPROVAL—United Arab Emirates
- Made in the United States of America
- UL, ULC & FM listed for roll-groove, plain-end and welded joints for wet, dry, preaction and deluge sprinkler systems.
- LEED v4 Certified

## FINISHES AND COATINGS

- Schedule 10, 30 & 40 Sprinkler Pipe receives an OD mill coating of water-based paint which has corrosion protection expected with a painted carbon steel product, i.e. it would be expected to resist corrosion for an extended and indefinite period in a clean and dry environment and, as environmental conditions deteriorate, the corrosion protection would also diminish.
- Schedule 10, 30 & 40 Sprinkler Pipe (black) receives an ID mill coating of Eddy Guard II MIC preventative coating. EG2 has been tested at independent laboratories to resist bacterial growth and maintain minimal bacterial count after multiple flushes (25) of the pipe.
- Schedule 10, 30 & 40 Sprinkler Pipe when Hot Dip Galvanized by ASTM A123 and supplied by Bull Moose Tube is UL listed and FM approved.

## PRODUCT IDENTIFICATION

- Every length of Bull Moose fire sprinkler pipe features large, easy-to-read, continuous stenciling, clearly identifying the manufacturer, type of pipe, size, and length.

| | Nominal Pipe Size (inches) | 1 | 1-1/4" | 1-1/2" | 2" | 2-1/2" | 3" | 4" | 6" | 8"† |
|---|---|---|---|---|---|---|---|---|---|---|
| Schedule 10 | O.D. (in) | 1.315 | 1.660 | 1.900 | 2.375 | 2.875 | 3.500 | 4.500 | 6.625 | 8.625 |
| | I.D. (in) | 1.097 | 1.422 | 1.682 | 2.157 | 2.635 | 3.260 | 4.260 | 6.357 | 8.249 |
| | Empty Weight (lb/ft) | 1.41 | 1.81 | 2.09 | 2.64 | 3.53 | 4.34 | 5.62 | 9.29 | 16.94 |
| | Water Filled Weight (lb/ft) | 1.800 | 2.518 | 3.053 | 4.223 | 5.893 | 7.957 | 11.796 | 23.038 | 40.086 |
| | C.R.R.* | 15.270 | 9.910 | 7.760 | 6.270 | 4.920 | 3.540 | 2.500 | 1.158 | 1.805 |
| | Pieces per Lift | 91 | 61 | 61 | 37 | 30 | 19 | 19 | 10 | 7 |
| Schedule 40 & 30† | O.D. (in) | 1.315 | 1.660 | 1.900 | 2.375 | 2.875 | 3.500 | 4.500 | 6.625 | 8.625 |
| | I.D. (in) | 1.049 | 1.380 | 1.610 | 2.067 | 2.469 | 3.068 | 4.026 | 6.065 | 8.071 |
| | Empty Weight (lb/ft) | 1.68 | 2.27 | 2.72 | 3.66 | 5.8 | 7.58 | 10.8 | 18.99 | 24.72 |
| | Water Filled Weight (lb/ft) | 2.055 | 2.918 | 3.602 | 5.114 | 7.875 | 10.783 | 16.316 | 31.498 | 50.240 |
| | C.R.R.* | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| | Pieces per Lift | 70 | 51 | 44 | 30 | 30 | 19 | 19 | 10 | 7 |

*Calculated using Standard UL CRR formula, UL Fire Protection Directory, Category VIZY

## SUBMITTAL INFORMATION

Project

Contractor

Engineer

Specification Reference

Date

System Type

Locations

Comments

○ Schedule 10 - Black ○ Schedule 10 - Hot Dip Galvanized ○ Schedule 30 - Black ○ Schedule 30 - Hot Dip Galvanized ○ Schedule 40 - Black ○ Schedule 40 - Hot Dip Galvanized

PERMIT #2026 2513934 - CM 04 | RSN:1975523

# Fire Sprinkler Pipe

Schedule 40

**Submittal Data Sheet**



**FM Approved and Fully Listed Sprinkler Pipe**
Wheatland Tube's Schedule 40 steel fire sprinkler pipe is FM Approved and UL® and C-UL Listed.

**Approvals and Specifications**
Schedule 40 meets or exceeds the following standards:

- ASTM A795, Type E, Grade A (Schedule 40, 1–2 NPS)
- ASTM A53, Type E, Grade B (Schedule 40, 2–8 NPS)
- ASTM A53, Type F, Grade B (Schedule 40, 1–4 NPS)
- ASTM A53, Type F, Grade A (Schedule 40, 1–4 NPS)
- NFPA® 13 and NFPA 14

**Manufacturing Protocols**
Schedule 40 is subjected to the toughest possible testing protocols to ensure the highest quality and long-lasting performance.

**Finishes and Coatings**
Schedule 40 can be ordered in black or hot-dip galvanized to meet FM/UL requirements for dry systems that meet the zinc coating specifications of ASTM A53 or A795.

Schedule 40 receives a proprietary mill coating to ensure a clean, corrosion-resistant surface that outperforms and outlasts standard lacquer coatings. This coating allows the pipe to be easily painted without special preparation.

Every black steel Schedule 40 pipe also receives our MIC SHIELD™ antimicrobial coating to limit corrosion from microbes on the interior of the pipe.

**Product Marking**
Each length of Wheatland fire sprinkler pipe is continuously stenciled to show the manufacturer, type of pipe, grade, size and length. Bar coding is acceptable as a supplementary identification method.

**Increased Working Pressure Ratings**

- Schedule 40
  1" through 4" ..... 500 psi
  5", 6" and 8" ..... 400 psi

## SUBMITTAL INFORMATION

PROJECT: _____ CONTRACTOR: _____ DATE: _____

ENGINEER: _____ SPECIFICATION REFERENCE: _____ SYSTEM TYPE: _____

LOCATIONS: _____ COMMENTS: _____

☐ BLACK ☐ HOT-DIP GALVANIZED

1 Council Avenue, P.O. Box 608
Wheatland, PA 16161
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PERMIT #2026 2513934 - CM 04 | RSN:1975523

# Fire Sprinkler Pipe

Schedule 40

**Submittal Data Sheet**



## SCHEDULE 40 WEIGHTS AND DIMENSIONS

| NPS | NOMINAL OD | | NOMINAL ID | | NOMINAL WALL | | WT./FT. | WT./FT. $H_2O$ FILLED | PCS./LIFT | WT./LIFT 21' | WT./LIFT 24' | WT./LIFT 25' | UL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | in. | mm | in. | mm | in. | mm | lbs. | lbs. | | lbs. | lbs. | lbs. | CRR* |
| **1** | 1.315 | 33.4 | 1.049 | 26.6 | 0.133 | 3.38 | 1.68 | 2.055 | 70 | 2470 | 2822 | 2940 | 1.000 |
| **1¼** | 1.660 | 42.2 | 1.380 | 35.1 | 0.140 | 3.56 | 2.27 | 2.922 | 51 | 2431 | 2778 | 2894 | 1.000 |
| **1½** | 1.900 | 48.3 | 1.610 | 40.9 | 0.145 | 3.68 | 2.72 | 3.602 | 44 | 2513 | 2872 | 2992 | 1.000 |
| **2** | 2.375 | 60.3 | 2.067 | 52.5 | 0.154 | 3.91 | 3.66 | 5.109 | 24 | 1845 | 2108 | 2196 | 1.000 |
| **2½** | 2.875 | 73.0 | 2.469 | 62.7 | 0.203 | 5.16 | 5.80 | 7.871 | 20 | 2436 | 2784 | 2900 | 1.000 |
| **3** | 3.500 | 88.9 | 3.068 | 77.9 | 0.216 | 5.49 | 7.58 | 10.783 | 13 | 2069 | 2365 | 2464 | 1.000 |
| **3½** | 4.000 | 101.6 | 3.548 | 90.1 | 0.226 | 5.74 | 9.12 | 13.400 | 10 | 1915 | 2189 | 2280 | 1.000 |
| **4** | 4.500 | 114.3 | 4.026 | 102.3 | 0.237 | 6.02 | 10.80 | 16.311 | 10 | 2268 | 2592 | 2700 | 1.000 |
| **5** | 5.563 | 141.3 | 5.047 | 158.2 | 0.258 | 6.55 | 14.63 | 23.262 | 7 | 2151 | 2458 | 2560 | 1.000 |
| **6** | 6.625 | 168.3 | 6.065 | 154.1 | 0.280 | 7.11 | 18.99 | 31.498 | 5 | 1994 | 2279 | 2374 | 1.000 |
| **8** | 8.625 | 219.1 | 7.981 | 202.7 | 0.322 | 8.18 | 28.58 | 50.240 | 5 | 3001 | 3430 | 3573 | 1.000 |

** Calculated using Standard UL CRR formula, UL Fire Protection Directory, Category VIZY. The CRR is a ratio value used to measure the ability of a pipe to withstand corrosion. Threaded Schedule 40 steel pipe is used as the benchmark (value of 1.0).*

c UL us

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WFS-012324

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**F** 724.346.7260

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# FITTINGS

PERMIT #2026 2513934 - CM 04 | RSN:1975523

# Ductile Iron Threaded Fittings



# Ductile Iron Threaded Fittings

## Specifications

- SCI branded fittings are UL Listed and FM Approved at ***500 psi***
- Rated to 300 psi WSP
- Ductile iron castings conform to ASTM A536
- Fitting dimensions conform to ASME B16.3
- Bushings and plugs conform to ASME B16.14
- All fittings are 100% air tested
- NPT threads on all fittings conform to ASME B1.20.1
- Independent lab verification that fittings meet applicable chemical & mechanical properties
- Manufacturing facilities are ISO 9001:2008 and ISO 14001
- ProPak™ Packaging

| Temperature Degrees F | Working Pressure, Non-Shock psig Class 300 Threaded Fittings |
|---|---|
| -20 to 100 | 500 |
| 150 | 500 |
| 200 | 480 |
| 250 | 460 |
| 300 | 440 |
| 350 | 420 |
| 400 | 400 |
| 450 | 380 |
| 500 | 360 |
| 550 | 340 |
| 600 | 320 |
| 650 | 300 |




***SCI ProPak™ System***

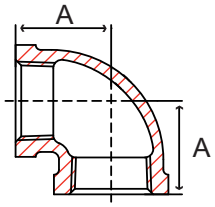
PERMIT #2026-2513934 - CM 04 | RSN:1975523





## Fig. 35E 3 – 90° Elbow

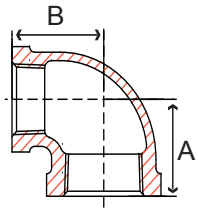





| Size in | Part Number | A in | Packing Inner | Packing Master | Weight lb |
|---|---|---|---|---|---|
| 1/2 | 35E 3004 | 1.13 | 100 | 200 | 0.2 |
| 3/4 | 35E 3006 | 1.31 | 70 | 140 | 0.3 |
| 1 | 35E 3010 | 1.50 | 40 | 80 | 0.5 |
| 1-1/4 | 35E 3012 | 1.75 | 25 | 50 | 0.8 |
| 1-1/2 | 35E 3014 | 1.94 | 18 | 36 | 1.1 |
| 2 | 35E 3020 | 2.25 | 10 | 20 | 1.8 |
| 2-1/2 | 35E 3024 | 2.70 | 4 | 8 | 3.2 |

## Fig. 35RE3 – 90° Reducing Elbow

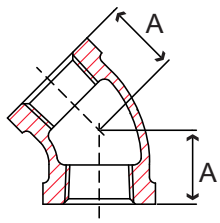





| Size in | Part Number | A in | B in | Packing Inner | Packing Master | Weight lb |
|---|---|---|---|---|---|---|
| 3/4 x 1/2 | 35RE3006004 | 1.20 | 1.22 | 80 | 160 | 0.3 |
| 1 x 1/2 | 35RE3010004 | 1.26 | 1.36 | 70 | 140 | 0.4 |
| 1 x 3/4 | 35RE3010006 | 1.38 | 1.45 | 50 | 100 | 0.4 |
| 1-1/4 x 1/2 | 35RE3012004 | 1.34 | 1.53 | 35 | 70 | 0.5 |
| 1-1/4 x 3/4 | 35RE3012006 | 1.45 | 1.63 | 35 | 70 | 0.6 |
| 1-1/4 x 1 | 35RE3012010 | 1.58 | 1.67 | 30 | 60 | 0.7 |
| 1-1/2 x 1/2 | 35RE3014004 | 1.52 | 1.75 | 30 | 60 | 0.6 |
| 1-1/2 x 3/4 | 35RE3014006 | 1.52 | 1.75 | 25 | 50 | 0.7 |
| 1-1/2 x 1 | 35RE3014010 | 1.65 | 1.80 | 20 | 40 | 0.8 |
| 1-1/2 x 1-1/4 | 35RE3014012 | 1.82 | 1.88 | 18 | 36 | 1.0 |
| 2 x 1/2 | 35RE3020004 | 1.60 | 1.97 | 18 | 36 | 1.0 |
| 2 x 3/4 | 35RE3020006 | 1.60 | 1.97 | 18 | 36 | 1.0 |
| 2 x 1 | 35RE3020010 | 1.73 | 2.02 | 16 | 32 | 1.2 |
| 2 x 1-1/4 | 35RE3020012 | 1.90 | 2.10 | 12 | 24 | 1.3 |
| 2 x 1-1/2 | 35RE3020014 | 2.02 | 2.16 | 10 | 20 | 1.5 |
| 2-1/2 x 1-1/2 | 35RE3024014 | 2.16 | 2.51 | 6 | 12 | 2.2 |
| 2-1/2 x 2 | 35RE3024020 | 2.39 | 2.60 | 6 | 12 | 2.5 |

## Fig. 35F 3 – 45° Elbow

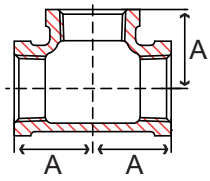





| Size in | Part Number | A in | Packing Inner | Packing Master | Weight lb |
|---|---|---|---|---|---|
| 1/2 | 35F 3004 | 0.88 | 150 | 300 | 0.2 |
| 3/4 | 35F 3006 | 0.98 | 80 | 160 | 0.3 |
| 1 | 35F 3010 | 1.13 | 40 | 80 | 0.5 |
| 1-1/4 | 35F 3012 | 1.29 | 25 | 50 | 0.7 |
| 1-1/2 | 35F 3014 | 1.44 | 20 | 40 | 1.0 |
| 2 | 35F 3020 | 1.69 | 10 | 20 | 1.6 |
| 2-1/2 | 35F 3024 | 1.95 | 4 | 8 | 2.7 |

## Fig. 35T 3 – Tee






| Size in | Part Number | A in | Packing Inner | Packing Master | Weight lb |
|---|---|---|---|---|---|
| 1/2 | 35T 3004 | 1.13 | 80 | 160 | 0.3 |
| 3/4 | 35T 3006 | 1.31 | 30 | 60 | 0.5 |
| 1 | 35T 3010 | 1.50 | 25 | 50 | 0.7 |
| 1-1/4 | 35T 3012 | 1.75 | 10 | 20 | 1.1 |
| 1-1/2 | 35T 3014 | 1.94 | 10 | 20 | 1.5 |
| 2 | 35T 3020 | 2.25 | 6 | 12 | 2.4 |
| 2-1/2 | 35T 3024 | 2.70 | 4 | 8 | 4.3 |



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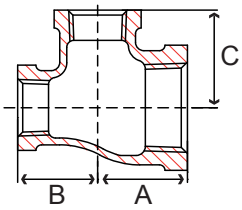
PERMIT #2026.2513934 - CM 04 | RSN:1975523





## Fig. 35RT3 – Reducing Tee

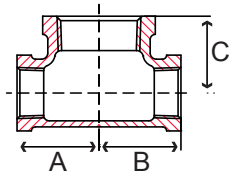





| Size in | Part Number | A in | B in | C in | Packing Inner | Packing Master | Weight lb |
|---|---|---|---|---|---|---|---|
| 3/4 x 1/2 | 35RT3006004 | 1.20 | 1.20 | 1.22 | 60 | 120 | 0.4 |
| 1 x 1/2 | 35RT3010004 | 1.26 | 1.26 | 1.36 | 30 | 60 | 0.6 |
| 1 x 1/2 x 1 | 35RT3010004010 | 1.50 | 1.36 | 1.50 | 30 | 60 | 0.6 |
| 1 x 3/4 | 35RT3010006 | 1.38 | 1.38 | 1.45 | 25 | 50 | 0.6 |
| 1 x 3/4 x 3/4 | 35RT3010006006 | 1.38 | 1.31 | 1.45 | 35 | 70 | 0.6 |
| 1 x 3/4 x 1 | 35RT3010006010 | 1.50 | 1.45 | 1.50 | 25 | 50 | 0.7 |
| 1-1/4 x 1/2 | 35RT3012004 | 1.34 | 1.34 | 1.53 | 20 | 40 | 0.8 |
| 1-1/4 x 1/2 x 1-1/4 | 35RT3012004012 | 1.75 | 1.53 | 1.75 | 25 | 50 | 0.9 |
| 1-1/4 x 3/4 | 35RT3012006 | 1.45 | 1.45 | 1.62 | 15 | 30 | 0.9 |
| 1-1/4 x 3/4 x 1-1/4 | 35RT3012006012 | 1.75 | 1.62 | 1.75 | 20 | 40 | 1.0 |
| 1-1/4 x 1 | 35RT3012010 | 1.58 | 1.58 | 1.67 | 15 | 30 | 1.0 |
| 1-1/4 x 1 x 1/2 | 35RT3012010004 | 1.34 | 1.26 | 1.53 | 25 | 50 | 0.7 |
| 1-1/4 x 1 x 3/4 | 35RT3012010006 | 1.45 | 1.38 | 1.63 | 20 | 40 | 0.8 |
| 1-1/4 x 1 x 1 | 35RT3012010010 | 1.58 | 1.50 | 1.69 | 20 | 40 | 0.9 |
| 1-1/4 x 1 x 1-1/4 | 35RT3012010012 | 1.75 | 1.69 | 1.75 | 15 | 30 | 1.0 |
| 1-1/2 x 1/2 | 35RT3014004 | 1.41 | 1.41 | 1.66 | 16 | 32 | 1.0 |
| 1-1/2 x 1/2 x 1-1/4 | 35RT3014004012 | 1.81 | 1.56 | 1.88 | 24 | 48 | 1.1 |
| 1-1/2 x 1/2 x 1-1/2 | 35RT3014004014 | 1.94 | 1.66 | 1.94 | 12 | 24 | 1.2 |
| 1-1/2 x 3/4 | 35RT3014006 | 1.52 | 1.52 | 1.75 | 16 | 32 | 1.1 |
| 1-1/2 x 3/4 x 1-1/4 | 35RT3014006012 | 1.94 | 1.66 | 1.88 | 20 | 40 | 1.1 |
| 1-1/2 x 3/4 x 1-1/2 | 35RT3014006014 | 1.94 | 1.75 | 1.94 | 18 | 36 | 1.2 |
| 1-1/2 x 1 | 35RT3014010 | 1.65 | 1.65 | 1.80 | 12 | 24 | 1.2 |
| 1-1/2 x 1 x 1/2 | 35RT3014010004 | 1.44 | 1.25 | 1.69 | 20 | 40 | 0.8 |
| 1-1/2 x 1 x 3/4 | 35RT3014010006 | 1.50 | 1.44 | 1.75 | 16 | 32 | 0.9 |
| 1-1/2 x 1 x 1 | 35RT3014010010 | 1.65 | 1.50 | 1.80 | 16 | 32 | 1.0 |
| 1-1/2 x 1 x 1-1/4 | 35RT3014010012 | 1.82 | 1.67 | 1.88 | 12 | 24 | 1.2 |
| 1-1/2 x 1 x 1-1/2 | 35RT3014010014 | 1.94 | 1.80 | 1.94 | 12 | 24 | 1.3 |
| 1-1/2 x 1-1/4 | 35RT3014012 | 1.82 | 1.82 | 1.88 | 12 | 24 | 1.4 |
| 1-1/2 x 1-1/4 x 1/2 | 35RT3014012004 | 1.41 | 1.34 | 1.66 | 16 | 32 | 0.9 |
| 1-1/2 x 1-1/4 x 3/4 | 35RT3014012006 | 1.52 | 1.45 | 1.75 | 16 | 32 | 1.0 |
| 1-1/2 x 1-1/4 x 1 | 35RT3014012010 | 1.65 | 1.58 | 1.80 | 16 | 32 | 1.1 |
| 1-1/2 x 1-1/4 x 1-1/4 | 35RT3014012012 | 1.82 | 1.75 | 1.88 | 14 | 28 | 1.3 |
| 1-1/2 x 1-1/4 x 1-1/2 | 35RT3014012014 | 1.94 | 1.88 | 1.94 | 14 | 28 | 1.4 |
| 2 x 1/2 | 35RT3020004 | 1.49 | 1.49 | 1.88 | 10 | 20 | 1.5 |
| 2 x 3/4 | 35RT3020006 | 1.60 | 1.60 | 1.97 | 10 | 20 | 1.6 |
| 2 x 1 | 35RT3020010 | 1.73 | 1.73 | 2.02 | 8 | 16 | 1.7 |
| 2 x 1 x 2 | 35RT3020010020 | 2.25 | 2.02 | 2.25 | 8 | 16 | 1.9 |
| 2 x 1-1/4 | 35RT3020012 | 1.90 | 1.90 | 2.10 | 8 | 16 | 1.9 |
| 2 x 1-1/4 x 2 | 35RT3020012020 | 2.25 | 2.10 | 2.25 | 8 | 16 | 2.0 |
| 2 x 1-1/2 | 35RT3020014 | 2.02 | 2.02 | 2.16 | 8 | 16 | 2.1 |
| 2 x 1-1/2 x 1/2 | 35RT3020014004 | 1.49 | 1.41 | 1.88 | 10 | 20 | 1.3 |
| 2 x 1-1/2 x 3/4 | 35RT3020014006 | 1.60 | 1.52 | 1.97 | 10 | 20 | 1.4 |
| 2 x 1-1/2 x 1 | 35RT3020014010 | 1.73 | 1.65 | 2.02 | 8 | 16 | 1.5 |
| 2 x 1-1/2 x 1-1/4 | 35RT3020014012 | 1.90 | 1.82 | 2.10 | 8 | 16 | 1.7 |
| 2 x 1-1/2 x 1-1/2 | 35RT3020014014 | 2.02 | 1.94 | 2.16 | 8 | 16 | 1.8 |

## Fig. 35BT3 – Bull Head Tee






| Size in | Part Number | A in | B in | C in | Packing Inner | Packing Master | Weight lb |
|---|---|---|---|---|---|---|---|
| 3/4 x 1 | 35BT3006010 | 1.45 | 1.45 | 1.37 | 30 | 60 | 0.6 |
| 1 x 1-1/4 | 35BT3010012 | 1.67 | 1.67 | 1.58 | 20 | 40 | 0.9 |
| 1 x 1-1/2 | 35BT3010014 | 1.80 | 1.80 | 1.65 | 15 | 30 | 1.0 |
| 1-1/4 x 1 x 1-1/2 | 35BT3012010014 | 1.88 | 1.80 | 1.82 | 15 | 30 | 1.2 |
| 1-1/4 x 1-1/2 | 35BT3012014 | 1.88 | 1.88 | 1.82 | 15 | 30 | 1.3 |
| 1-1/4 x 2 | 35BT3012020 | 2.10 | 2.10 | 1.90 | 10 | 20 | 1.6 |
| 1-1/2 x 1-1/4 x 2 | 35BT3014012020 | 2.16 | 2.10 | 2.02 | 10 | 20 | 1.8 |
| 1-1/2 x 2 | 35BT3014020 | 2.16 | 2.16 | 2.02 | 8 | 16 | 1.8 |

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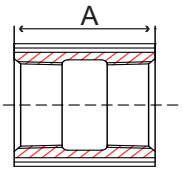


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## Fig. 35CP3 – Straight Coupling with Ribs

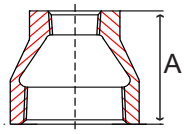





| Size in | Part Number | A in | Packing Inner | Packing Master | Weight lb |
|---|---|---|---|---|---|
| 1/2 | 35CP3004 | 1.38 | 200 | 400 | 0.1 |
| 3/4 | 35CP3006 | 1.63 | 100 | 200 | 0.2 |
| 1 | 35CP3010 | 1.75 | 60 | 120 | 0.4 |
| 1-1/4 | 35CP3012 | 2.00 | 35 | 70 | 0.5 |
| 1-1/2 | 35CP3014 | 2.19 | 25 | 50 | 0.7 |
| 2 | 35CP3020 | 2.62 | 15 | 30 | 1.2 |
| 2-1/2 | 35CP3024 | 3.00 | 9 | 18 | 2.2 |

## Fig. 35RC3 – Hex Reducing Coupling

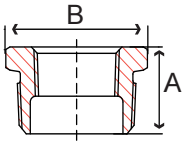





| Size in | Part Number | A in | Packing Inner | Packing Master | Weight lb |
|---|---|---|---|---|---|
| 1 x 1/2 | 35RC3010004 | 1.69 | 80 | 160 | 0.3 |
| 1 x 3/4 | 35RC3010006 | 1.69 | 60 | 120 | 0.4 |
| 1-1/4 x 3/4 | 35RC3012006 | 2.06 | 40 | 80 | 0.6 |
| 2 x 1 (not hex) | 35RC3020010 | 2.81 | 20 | 40 | 1.0 |

## Fig. 35HB3 – Hex Bushing

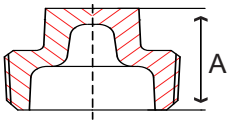





| Size in | Part Number | A in | Packing Inner | Packing Master | Weight lb |
|---|---|---|---|---|---|
| 1 x 1/2 | 35HB3010004 | 1.06 | 180 | 360 | 0.2 |
| 1 x 3/4 | 35HB3010006 | 1.06 | 180 | 360 | 0.1 |
| 1-1/4 x 1 | 35HB3012010 | 1.19 | 90 | 180 | 0.2 |
| 1-1/2 x 1 | 35HB3014010 | 1.25 | 75 | 150 | 0.4 |
| 1-1/2 x 1-1/4 | 35HB3014012 | 1.25 | 75 | 150 | 0.3 |
| 2 x 1 | 35HB3020010 | 1.38 | 40 | 80 | 0.6 |
| 2 x 1-1/4 | 35HB3020012 | 1.38 | 40 | 80 | 0.6 |
| 2 x 1-1/2 | 35HB3020014 | 1.38 | 40 | 80 | 0.6 |

## Fig. 35SP3 – Square Head Plug

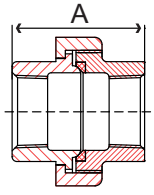





| Size in | Part Number | A in | Packing Inner | Packing Master | Weight lb |
|---|---|---|---|---|---|
| 1/2 | 35SP3004 | 0.94 | 600 | 1200 | 0.07 |
| 3/4 | 35SP3006 | 1.12 | 350 | 700 | 0.1 |
| 1 | 35SP3010 | 1.25 | 200 | 400 | 0.1 |
| 1-1/4 | 35SP3012 | 1.37 | 100 | 200 | 0.3 |
| 1-1/2 | 35SP3014 | 1.44 | 80 | 160 | 0.4 |
| 2 | 35SP3020 | 1.50 | 45 | 90 | 0.6 |

## Fig. 35U 3 – Union with Brass Seat






| Size in | Part Number | A in | Packing Inner | Packing Master | Weight lb |
|---|---|---|---|---|---|
| 1 | 35U 3010 | 2.19 | 20 | 40 | 1.0 |
| 1-1/4 | 35U 3012 | 2.50 | 15 | 30 | 1.2 |
| 1-1/2 | 35U 3014 | 2.62 | 10 | 20 | 1.7 |
| 2 | 35U 3020 | 3.12 | 6 | 12 | 2.4 |



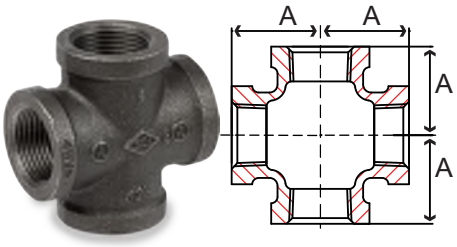
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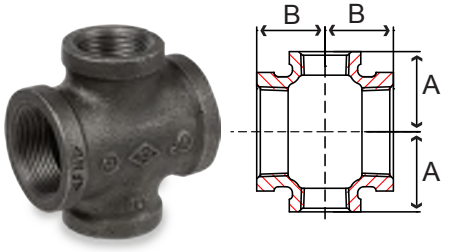


## Fig. 35X 3 – Cross



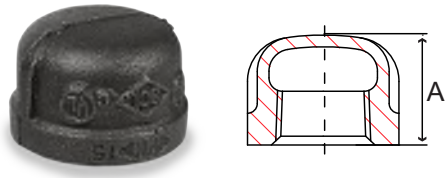

| Size in | Part Number | A in | Packing | | Weight lb |
|---|---|---|---|---|---|
| | | | Inner | Master | |
| 1 | 35X 3010 | 1.50 | 20 | 40 | 0.9 |
| 1-1/4 | 35X 3012 | 1.75 | 12 | 24 | 1.4 |
| 1-1/2 | 35X 3014 | 1.94 | 8 | 16 | 1.8 |
| 2 | 35X 3020 | 2.25 | 6 | 12 | 2.8 |

## Fig. 35RX3 – Reducing Cross



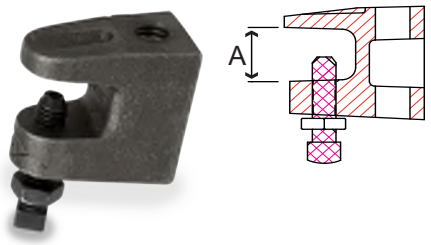

| Size in | Part Number | A in | B in | Packing | | Weight lb |
|---|---|---|---|---|---|---|
| | | | | Inner | Master | |
| 1-1/4 x 1 | 35RX3012010 | 1.67 | 1.58 | 15 | 30 | 1.2 |
| 1-1/2 x 1 | 35RX3014010 | 1.80 | 1.65 | 12 | 24 | 1.4 |
| 2 x 1 | 35RX3020010 | 2.02 | 1.73 | 8 | 16 | 2.0 |

## Fig. 35C 3 – Cap




| Size in | Part Number | A in | Packing | | Weight lb |
|---|---|---|---|---|---|
| | | | Inner | Master | |
| 1/2 | 35C 3004 | 0.87 | 300 | 600 | 0.1 |
| 3/4 | 35C 3006 | 0.97 | 200 | 400 | 0.1 |
| 1 | 35C 3010 | 1.16 | 110 | 220 | 0.2 |
| 1-1/4 | 35C 3012 | 1.28 | 70 | 140 | 0.4 |
| 1-1/2 | 35C 3014 | 1.33 | 50 | 100 | 0.5 |
| 2 | 35C 3020 | 1.45 | 25 | 50 | 0.8 |
| 2-1/2 | 35C 3024 | 1.70 | 18 | 36 | 1.6 |

## Fig. 35BC3 – Beam Clamp




| Size in | Part Number | A in | Packing | | Weight lb |
|---|---|---|---|---|---|
| | | | Inner | Master | |
| 3/8 | 35BC3003 | 0.75 | 100 | 200 | 0.3 |
| 1/2 | 35BC3004 | 0.75 | 80 | 160 | 0.5 |

# Victaulic® FireLock™ Fittings





## 1.0 PRODUCT DESCRIPTION

### Available Sizes

- 1 ¼ – 8"/DN32 – DN200

### Maximum Working Pressure

- Pressure ratings for Victaulic FireLock™ Fittings conform to the ratings of Victaulic FireLock EZ™ Style 009N couplings (refer to publication 10.64 for more information).

### Application

- FireLock™ fittings are designed for use exclusively with Victaulic couplings that have been Listed or Approved for Fire Protection Services. Use of other couplings or flange adapters may result in bolt pad interference.
- Connects pipe, provides change in direction and adapts sizes or components

### Pipe Materials

- Carbon steel

## 2.0 CERTIFICATION/LISTINGS

EN 10311
CPR (EU)
No. 305/2011

BS EN 10311
CPR (UK)
2019 No. 465

## 3.0 SPECIFICATIONS – MATERIAL

**Fitting:** Ductile iron conforming to ASTM A536, Grade 65-45-12.

**Fitting Coating: (specify choice)**

- ☐ Orange coating.
- ☐ Red coating (standard for EMEA-I and Asia Pacific).
- ☐ Optional: Hot dipped galvanized.

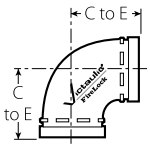
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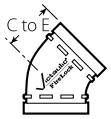
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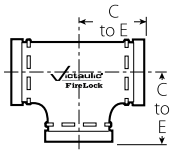
## 4.0 DIMENSIONS




No. 001




No. 003




No. 002




No. 006

| Nominal Size<br>inches<br>DN | Actual Outside Diameter<br>inches<br>mm | No. 001 90° Elbow<br>C to E<br>inches<br>mm | No. 001 90° Elbow<br>Approximate Weight Each<br>lb<br>kg | No. 003 45° Elbow<br>C to E<br>inches<br>mm | No. 003 45° Elbow<br>Approximate Weight Each<br>lb<br>kg | No. 002 Straight Tee<br>C to E<br>inches<br>mm | No. 002 Straight Tee<br>Approximate Weight Each<br>lb<br>kg | No. 006 Cap<br>T<br>inches<br>mm | No. 006 Cap<br>Approximate Weight Each<br>lb<br>kg |
|---|---|---|---|---|---|---|---|---|---|
| 1 ¼<br>DN32 | 1.660<br>42.4 | —<br>— | —<br>— | —<br>— | —<br>— | —<br>— | —<br>— | 0.82<br>21 | 0.3<br>0.1 |
| 1 ½<br>DN40 | 1.900<br>48.3 | —<br>— | —<br>— | —<br>— | —<br>— | —<br>— | —<br>— | 0.82<br>21 | 0.4<br>0.2 |
| 2<br>DN50 | 2.375<br>60.3 | 2.75<br>70 | 1.7<br>0.8 | 2.00<br>51 | 1.8<br>0.8 | 2.75<br>70 | 2.4<br>1.1 | 0.88<br>22 | 0.6<br>0.3 |
| 2 ½ | 2.875<br>73.0 | 3.00<br>76 | 3.1<br>1.4 | 2.25<br>57 | 2.2<br>1.0 | 3.00<br>76 | 3.6<br>1.6 | 0.88<br>22 | 1.0<br>0.5 |
| DN65 | 3.000<br>76.1 | 3.00<br>76 | 3.30<br>1.5 | 2.25<br>57 | 2.4<br>1.1 | 3.00<br>76 | 3.8<br>1.7 | — | — |
| 3<br>DN80 | 3.500<br>88.9 | 3.38<br>86 | 4.0<br>1.8 | 2.50<br>64 | 3.1<br>1.4 | 3.38<br>86 | 5.3<br>2.4 | 0.88<br>22 | 1.2<br>0.5 |
|  | 4.250<br>108.0 | 4.00<br>102 | 5.7<br>2.6 | 3.00<br>76 | 5.1<br>2.3 | 4.00<br>102 | 7.5<br>3.4 | — | — |
| 4<br>DN100 | 4.500<br>114.3 | 4.00<br>102 | 6.7<br>3.0 | 3.00<br>76 | 5.6<br>2.5 | 4.00<br>102 | 8.7<br>3.9 | 1.00<br>25 | 2.4<br>1.1 |
| 5 | 5.563<br>141.3 | 4.88<br>124 | 12.6<br>5.7 | 3.25<br>83 | 8.3<br>3.8 | 4.88<br>124 | 15.7<br>7.1 | 1.00<br>25 | 4.1<br>1.9 |
| DN125 | 5.500<br>139.7 | 4.88<br>124 | 12.4<br>5.6 | 3.25<br>82.6 | 8.2<br>3.7 | 4.88<br>124 | 15.4<br>6.9 | — | — |
|  | 6.250<br>158.8 | 5.50<br>140 | 12.6<br>5.7 | 3.50<br>89 | 9.2<br>4.2 | 5.50<br>140 | 17.9<br>8.0 | — | — |
| 6<br>DN150 | 6.625<br>168.3 | 5.50<br>140 | 18.3<br>8.3 | 3.50<br>89 | 11.7<br>5.3 | 5.50<br>140 | 22.7<br>10.3 | 1.00<br>25 | 5.9<br>2.7 |
|  | 6.500<br>165.1 | 5.43<br>140 | 17.6<br>7.9 | 3.50<br>89 | 11.4<br>5.2 | 5.50<br>140 | 22.0<br>9.9 | — | — |
| 8<br>DN200 | 8.625<br>219.1 | 6.81<br>173 | 25.5<br>11.6 | 4.25<br>108 | 20.4<br>9.3 | 6.94<br>176 | 38.7<br>17.6 | 1.13<br>29 | 12.7<br>5.8 |
|  | 8.515<br>216.3 | 6.81<br>173 | 23.1<br>10.5 | —<br>— | —<br>— | 6.94<br>176 | 33.6<br>15.2 | —<br>— | —<br>— |

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## 5.0 PERFORMANCE

### Flow Data

| Size | | Frictional Resistance Equivalent of Straight Pipe[1] | | | |
|---|---|---|---|---|---|
| | | Elbows | | No. 002 Straight Tee | |
| Nominal Size<br>inches<br>DN | Actual Outside Diameter<br>inches<br>mm | No. 001 90° Elbow<br>feet<br>meters | No. 003 45° Elbow<br>feet<br>meters | Branch<br>feet<br>meters | Run<br>feet<br>meters |
| 1 ¼<br>DN32 | 1.660<br>42.4 | —<br>— | —<br>— | —<br>— | —<br>— |
| 1 ½<br>DN40 | 1.900<br>48.3 | —<br>— | —<br>— | —<br>— | —<br>— |
| 2<br>DN50 | 2.375<br>60.3 | 3.5<br>1.1 | 1.8<br>0.5 | 8.5<br>2.6 | 3.5<br>1.1 |
| 2 ½ | 2.875<br>73.0 | 4.3<br>1.3 | 2.2<br>0.7 | 10.8<br>3.3 | 4.3<br>1.3 |
| DN65 | 3.000<br>76.1 | 4.5<br>1.4 | 2.3<br>0.7 | 11.0<br>3.4 | 4.5<br>1.4 |
| 3<br>DN80 | 3.500<br>88.9 | 5.0<br>1.5 | 2.6<br>0.8 | 13.0<br>4.0 | 5.0<br>1.5 |
| | 4.250<br>108.0 | 6.4<br>2.0 | 3.2<br>0.9 | 15.3<br>4.7 | 6.4<br>2.0 |
| 4<br>DN100 | 4.500<br>114.3 | 6.8<br>2.1 | 3.4<br>1.0 | 16.0<br>4.9 | 6.8<br>2.1 |
| 5 | 5.563<br>141.3 | 8.5<br>2.6 | 4.2<br>1.3 | 21.0<br>6.4 | 8.5<br>2.6 |
| DN125 | 5.500<br>139.7 | 8.3<br>2.5 | 4.1<br>1.3 | 20.6<br>6.3 | 8.3<br>2.5 |
| | 6.250<br>158.8 | 9.4<br>2.9 | 4.9<br>1.5 | 25.0<br>7.6 | 9.6<br>2.9 |
| 6<br>DN150 | 6.625<br>168.3 | 10.0<br>3.0 | 5.0<br>1.5 | 25.0<br>7.6 | 10.0<br>3.0 |
| | 6.500<br>165.1 | 9.8<br>3.0 | 4.9<br>1.5 | 24.5<br>7.5 | 9.8<br>3.0 |
| 8<br>DN200 | 8.625<br>219.1 | 13.0<br>4.0 | 5.0<br>1.5 | 33.0<br>10.1 | 13.0<br>4.0 |
| | 8.515<br>216.3 | 13.0<br>4.0 | —<br>— | 33.0<br>10.1 | 13.0<br>4.0 |

[1] The flow data listed is based upon the pressure drop of Schedule 40 pipe.

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## 6.0 NOTIFICATIONS

### General Notes

NOTE: When assembling FireLock EZ™ couplings onto end caps, take additional care to make certain the end cap is fully seated against the gasket end stop. For FireLock EZ™ Style 009N/009H couplings, use FireLock™ No. 006 end caps containing the “EZ” marking on the inside face or No. 60 end caps containing the “QV EZ” marking on the inside face. Non-Victaulic end cap products shall not be used with Style 009/009V/009H/009N couplings.

## 7.0 REFERENCE MATERIALS

10.64: Victaulic® FireLock™ Rigid Coupling Style 009N

10.02: Victaulic® FireLock™ Rigid Coupling Style 005H with Vic-Plus™ Gasket System

29.01: Victaulic® Terms and Conditions of Sale

**User Responsibility for Product Selection and Suitability**
Each user bears final responsibility for making a determination as to the suitability of Victaulic products for a particular end-use application, in accordance with industry standards and project specifications, and the applicable building codes and related regulations as well as Victaulic performance, maintenance, safety, and warning instructions. Nothing in this or any other document, nor any verbal recommendation, advice, or opinion from any Victaulic employee, shall be deemed to alter, vary, supersede, or waive any provision of Victaulic Company's standard conditions of sale, installation guide, or this disclaimer.

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This product shall be manufactured by Victaulic or to Victaulic specifications. All products to be installed in accordance with current Victaulic installation/assembly instructions. Victaulic reserves the right to change product specifications, designs and standard equipment without notice and without incurring obligations.

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Reference should always be made to the Victaulic installation handbook or installation instructions of the product you are installing. Handbooks are included with each shipment of Victaulic products, providing complete installation and assembly data, and are available in PDF format on our website at www.victaulic.com.

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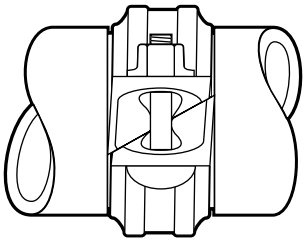
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# Victaulic® FireLock™ Rigid Coupling
# Style 005H

10.02



Patented



*Exaggerated for clarity*

## 1.0 PRODUCT DESCRIPTION

### Available Sizes

- 1 ¼ – 8"/DN32 – DN200

### Maximum Working Pressure

- Up to 350 psi/2413 kPa

### Function

- Joins carbon steel pipe with grooved ends conforming to publication 25.01
- This product is designed for fire protection systems only

### Pipe Material

- Schedule 10, Schedule 40 or specialty carbon steel pipe listed in Section 5. For use with alternative materials and wall thicknesses please contact Victaulic
- For exceptions reference section 6.0 Notifications

## 2.0 CERTIFICATION/LISTINGS

104-1a/02

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## 3.0 SPECIFICATIONS – MATERIAL

**Housing:** Ductile iron conforming to ASTM A-536, grade 65-45-12. Ductile iron conforming to ASTM A-395, grade 65-45-15, is available upon special request.

**Housing Coating: (specify choice)**

☐ Orange coating.

☐ Red coating (standard for EMEA-I and Asia Pacific).

☐ Optional: Hot dipped galvanized.

**Coupling Gasket (specify choice):**

☐ Grade "E" EPDM Type A Vic-Plus™ Gasket System[1]

EPDM (Violet color code). FireLock products have been Listed by Underwriters Laboratories Inc. and Approved by Factory Mutual Research for wet and dry (oil free air) sprinkler services up to the rated working pressure using the Grade "E" Type A Vic-Plus™ Gasket System, requiring no field lubrication for most installation conditions.

☐ Grade "L" silicone

Recommended for dry heat, air without hydrocarbons to +350°F and certain chemical service.

For dry services, Victaulic continues to recommend the use of Grade "E" Type A FlushSeal® Gasket. Contact Victaulic for details.

[1] Standard gasket and FlushSeal gasket approved for dry pipe systems to –40°F/–40°C. Based on "typical" pipe surface conditions, supplemental lubricant is recommended for services installed below 0°F/–18°C and for all dry pipe systems or systems to be subjected to air tests prior to being filled with water. Supplemental lubrication may also be required on pipe with raised or undercut weld seams or pipe that has voids and/or cracks at the weld seams. Victaulic continues to recommend the use of FlushSeal gaskets for dry services.

**NOTE**

- Additional gasket styles are available. Contact Victaulic for details.

**Bolts/Nuts:** Carbon steel oval neck track bolt(s) meeting the mechanical property requirements of ASTM A449 (imperial) and ISO 898-1 Class 9.8 (M10-M16) Class 8.8 (M20 and greater). Carbon steel hex nuts meeting the mechanical property requirements of ASTM A563 Grade B (imperial) and ASTM A563M Class 9 (metric). Track bolts and hex nuts are zinc electroplated per ASTM B633 Fe/Zn 5, finish Type III (imperial) or Type II (metric).

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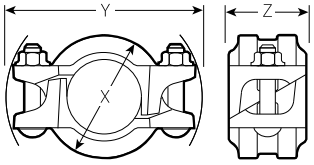
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## 4.0 DIMENSIONS

### Style 005H

Rated for wet and dry sprinkler systems at 350 psi/2413 kPa for 1 ¼ – 4"/32 – 100 mm sizes and 300 psi /2068 kPa for 4 ¼ – 8"/108 – 200 mm sizes; Schedule 10 roll grooved or Schedule 40 cut or roll grooved steel pipe. Style 005H is rigid and does not accommodate expansion, contraction or angular deflection.




Style 005H

| Size | | Maximum Working Pressure[1,4] | Maximum End Load[1] | Allow. Pipe End Separation[2] | Bolt/Nut[3] | Dimensions | | | Approx. Weight Each |
|---|---|---|---|---|---|---|---|---|---|
| Nominal<br>inches<br>mm | Actual Outside Diameter<br>inches<br>mm | psi<br>kPa | lbs<br>N | inches<br>mm | No –size<br>inches | X<br>inches<br>mm | Y<br>inches<br>mm | Z<br>inches<br>mm | lbs<br>kg |
| 1 ¼<br>32 | 1.660<br>42.4 | 350<br>2413 | 755<br>3370 | 0.05<br>1.2 | 2 – ⅜ × 2 ¼ | 2.75<br>70 | 4.50<br>114 | 1.88<br>48 | 1.2<br>0.5 |
| 1 ½<br>40 | 1.900<br>48.3 | 350<br>2413 | 990<br>4415 | 0.05<br>1.2 | 2 – ⅜ × 2 ¼ | 3.00<br>76 | 4.75<br>121 | 1.88<br>48 | 1.2<br>0.5 |
| 2<br>50 | 2.375<br>60.3 | 350<br>2413 | 1550<br>6900 | 0.07<br>1.7 | 2 – ⅜ × 2 ½ | 3.50<br>89 | 5.25<br>133 | 1.88<br>48 | 1.6<br>0.7 |
| 2 ½<br>65 | 2.875<br>73.0 | 350<br>2413 | 2270<br>10110 | 0.07<br>1.7 | 2 – ⅜ × 2 ½ | 4.00<br>102 | 5.75<br>146 | 1.88<br>48 | 1.9<br>.09 |
| 76.1 mm | 3.000<br>76.1 | 350<br>2413 | 2475<br>11010 | 0.07<br>1.7 | 2 – ⅜ × 2 ½ | 4.13<br>105 | 5.75<br>146 | 1.88<br>48 | 1.9<br>0.9 |
| 3<br>80 | 3.500<br>88.9 | 350<br>2413 | 3365<br>14985 | 0.07<br>1.7 | 2 – ⅜ × 2 ½ | 4.63<br>118 | 6.13<br>156 | 1.88<br>48 | 2.1<br>1.0 |
| 4<br>100 | 4.500<br>114.3 | 350<br>2413 | 5565<br>24770 | 0.16<br>4.1 | 2 – ⅜ × 2 ½ | 5.75<br>146 | 7.25<br>184 | 2.13<br>54 | 3.1<br>1.4 |
| 108.0 mm | 4.250<br>108.0 | 300<br>2068 | 4255<br>18940 | 0.16<br>4.1 | 2 – ⅜ × 2 ½ | 5.63<br>143 | 7.25<br>184 | 2.13<br>54 | 3.1<br>1.4 |
| 5<br>125 | 5.563<br>141.3 | 300<br>2068 | 7290<br>32445 | 0.16<br>4.1 | 2 – ½ × 3 | 6.88<br>175 | 9.00<br>229 | 2.13<br>54 | 4.5<br>2.0 |
| 133.0 mm | 5.250<br>133.0 | 300<br>2068 | 6495<br>28900 | 0.16<br>4.1 | 2 – ½ × 2 ¾ | 6.63<br>168 | 9.00<br>229 | 2.13<br>54 | 4.5<br>2.0 |
| 139.7 mm | 5.500<br>139.7 | 300<br>2068 | 7125<br>31715 | 0.16<br>4.1 | 2 – ½ × 2 ¾ | 6.88<br>175 | 9.00<br>229 | 2.13<br>54 | 4.8<br>2.2 |
| 6<br>150 | 6.625<br>168.3 | 300<br>2068 | 10340<br>46020 | 0.16<br>4.1 | 2 – ½ × 3 | 8.00<br>203 | 10.00<br>254 | 2.13<br>53 | 5.0<br>2.3 |
| 159.0 mm | 6.250<br>159.0 | 300<br>2068 | 9200<br>40955 | 0.16<br>4.1 | 2 – ½ × 2 ¾ | 7.63<br>194 | 10.00<br>254 | 2.13<br>54 | 5.5<br>2.5 |
| 165.1 mm | 6.500<br>165.1 | 300<br>2068 | 9955<br>44295 | 0.16<br>4.1 | 2 – ½ × 3 | 8.15<br>207 | 10.00<br>254 | 2.13<br>54 | 5.5<br>2.5 |
| 8<br>200 | 8.625<br>219.1 | 300<br>2068 | 17525<br>78000 | 0.19<br>4.8 | 2 – ⅝ × 4 ¼ | 10.50<br>267 | 13.14<br>334 | 2.63<br>67 | 11.3<br>5.1 |

1 Working Pressure and End Load are total, from all internal and external loads, based on standard weight (ANSI) steel pipe, standard roll or cut grooved in accordance with Victaulic specifications. Contact Victaulic for performance on other pipe. WARNING: FOR ONE TIME FIELD TEST ONLY, the Maximum Joint Working Pressure may be increased to 1½ times the figures shown.

2 The allowable pipe separation dimension shown is for system layout purposes only. Style 005H couplings are considered rigid connections and will not accommodate expansion or contraction of the piping system.

3 Number of bolts required equals number of housing segments. Metric thread size bolts are available (color coded gold) for all coupling sizes upon request. Contact Victaulic for details.

4 Style 005H couplings are VdS and LPC Approved to 16 Bar/235 psi.

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## 5.0 PERFORMANCE

### Style 005H

The information provided below is based on the latest listing and approval data at the time of publication. Listings/ Approvals are subject to change and/or additions by the approvals agencies.

Contact Victaulic for performance on other pipe and the latest listings and approvals.

| Related Working Pressure psi | | | | | Related Working Pressure psi | | | | | Related Working Pressure psi | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pipe Sch. | Size inches | UL | ULC | FM | Pipe Sch. | Size inches | UL | ULC | FM | Pipe Sch. | Size inches | UL | ULC | FM |
| 5 | 1¼ – 3 | 175 | 175 | 175 | EL | 1¼ – 2 | 300 | N/A | N/A | MT | 1¼ – 2 | 300 | N/A | N/A |
| 10, 40 | 1¼ – 3 | 350 | 350 | 350 | ET | 1¼ – 2 | 300 | N/A | N/A | STF | 1¼ – 4 | N/A | N/A | 300 |
| | 5 – 8 | 300 | 300 | 300 | EZ | 4 – 6 | 300[6] | N/A | 300 | Steady Thd. | 1¼ – 2 | N/A | N/A | 300 |
| BLT | 1¼ – 2 | 300 | 300 | N/A | FF | 1¼ – 4 | N/A | N/A | 300 | TF | 3 – 8 | N/A | N/A | 300 |
| DF | 1¼ – 4 | 300 | 300 | 300 | GAL -7 | 1¼ – 2 | 300 | N/A | N/A | WLS | 1¼ – 2 | 300 | 300 | N/A |
| DT | 1¼ – 2 | 300 | 300 | N/A | MLT | 1¼ – 2 | 300 | N/A | N/A | XL | 1¼ – 3 | 300 | 300 | 300 |
| EF | 1¼ – 4 | 175[7] | N/A | 175 | MF | 1¼ – 4 | 300 | N/A | 300[5] | | | | | |

[5] FM approved for service in 1½ – 4" pipe.

[6] UL Listed for service up to 4" pipe only.

[7] UL Listed for service up to 3" only.

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## 6.0 NOTIFICATIONS

**⚠ WARNING**



- **Read and understand all instructions before attempting to install any Victaulic products.**
- **Always verify that the piping system has been completely depressurized and drained immediately prior to installation, removal, adjustment, or maintenance of any Victaulic products.**
- **Wear safety glasses, hardhat, and foot protection.**

**Failure to follow these instructions could result in death or serious personal injury and property damage.**

- **These products shall be used only in fire protection systems that are designed and installed in accordance with current, applicable National Fire Protection Association (NFPA 13, 13D, 13R, etc.) standards, or equivalent standards, and in accordance with applicable building and fire codes. These standards and codes contain important information regarding protection of systems from freezing temperatures, corrosion, mechanical damage, etc.**
- **The installer shall understand the use of this product and why it was specified for the particular application.**
- **The installer shall understand common industry safety standards and potential consequences of improper product installation.**
- **It is the system designer's responsibility to verify suitability of materials for use with the intended fluid media within the piping system and external environment.**
- **The material specifier shall evaluate the effect of chemical composition, pH level, operating temperature, chloride level, oxygen level, and flow rate on materials to confirm system life will be acceptable for the intended service.**

**Failure to follow installation requirements and local and national codes and standards could compromise system integrity or cause system failure, resulting in death or serious personal injury and property damage.**

**NOTICE**

- **Victaulic does not recommend the use of any furnace butt-welded pipe with sizes 2"/DN50 and smaller Victaulic gasketed joint products. This includes, but is not limited to, ASTM A53 Type F pipe.**

## 7.0 REFERENCE MATERIALS

10.01 Victaulic Products for Fire Protection Piping Systems – Regulatory Approval Reference Guide

I-100 Victaulic Field Installation Handbook

**User Responsibility for Product Selection and Suitability**
Each user bears final responsibility for making a determination as to the suitability of Victaulic products for a particular end-use application, in accordance with industry standards and project specifications, and the applicable building codes and related regulations as well as Victaulic performance, maintenance, safety, and warning instructions. Nothing in this or any other document, nor any verbal recommendation, advice, or opinion from any Victaulic employee, shall be deemed to alter, vary, supersede, or waive any provision of Victaulic Company's standard conditions of sale, installation guide, or this disclaimer.

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**Note**
This product shall be manufactured by Victaulic or to Victaulic specifications. All products to be installed in accordance with current Victaulic installation/assembly instructions. Victaulic reserves the right to change product specifications, designs and standard equipment without notice and without incurring obligations.

**Installation**
Reference should always be made to the Victaulic installation handbook or installation instructions of the product you are installing. Handbooks are included with each shipment of Victaulic products, providing complete installation and assembly data, and are available in PDF format on WeChat.

**Warranty**
Refer to the Warranty section of the current Price List or contact Victaulic for details.

**Trademarks**
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# Victaulic® FireLock™ Installation-Ready™ Rigid Couplings Style 009N and Style 109





Patented



Patented

## 1.0 PRODUCT DESCRIPTION

### Available Sizes

- Style 009N: 1 ¼ – 12"/DN32 – DN300
- Style 109: 1 ¼ – 4"/DN32 – DN100

### Pipe Material

- Schedule 10, Schedule 40 or specialty carbon steel pipe listed in Section 5. For use with alternative materials and wall thicknesses please contact Victaulic
- For exceptions reference section 6.0 Notifications

### Maximum Working Pressure

- Accommodates pressures ranging from full vacuum (29.9 in Hg/760 mm Hg) to 365 psi/2517 kPa

### Function

- Joins carbon steel pipe with grooved ends conforming to publication 25.01
- Provides a rigid pipe joint designed to restrict axial or angular movement

## 2.0 CERTIFICATION/LISTINGS

LPS 1219: Issue 3.1
Cert/LPCB Ref. 104-1a/36

EN 10311
Regulation (EU)
No. 305/2011

**ALWAYS REFER TO ANY NOTIFICATIONS AT THE END OF THIS DOCUMENT REGARDING PRODUCT INSTALLATION, MAINTENANCE OR SUPPORT.**


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## 3.0 SPECIFICATIONS – MATERIAL

**Housing:** Ductile iron conforming to ASTM A 536, Grade 65-45-12. Ductile iron conforming to ASTM A 395, Grade 65-45-15, is available upon special request.

**Housing Coating: (specify choice)**

- ☐ Orange coating
- ☐ Red coating (standard for EMEA-I and Asia Pacific)
- ☐ Optional for Style 009N: Hot Dipped Galvanized per ASTM A123
- ☐ Optional for Style 109: Mechanically Galvanized per ASTM B695 (available only in North America and Latin America).

**Gasket: (specify choice)**

- ☐ **Grade "E" EPDM (Type A) Vic-Plus™ Pre-lubricated Gasket**

  EPDM (Violet Color Code). Applicable for wet and dry (oil-free air) fire protection systems only. Listed/Approved for continuous use in wet and dry systems. Listed/Approved for dry systems at -40°F/-40°C and above. Not compatible for use with hot water services or steam services.

**NOTES**

- Reference should always be made to publication I-100, Victaulic Field Installation Handbook for gasket lubrication instructions.
- Services listed are General Service Guidelines only. It should be noted that there are services for which these gaskets are not compatible. Reference should always be made to publication 05.01, Victaulic Gasket Selection Guide for specific gasket service guidelines and for a listing of services which are not compatible.

**Bolts/Nuts: (specify choice)**

- ☐ Standard: Carbon steel oval neck track bolt(s) meeting the mechanical property requirements of ASTM A449 (imperial) and ISO 898-1 Class 9.8 (M10-M16) Class 8.8 (M20 and greater). Carbon steel hex nuts meeting the mechanical property requirements of ASTM A563 Grade B (imperial) and ASTM A563M Class 9 (metric). Track bolts and hex nuts are zinc electroplated per ASTM B633 Fe/Zn 5, finish Type III (imperial) or Type II (metric).
- ☐ Optional for Style 009N: Stainless steel oval neck track bolts meeting the requirements of ASTM F593, Group 2 (316 stainless steel), condition CW. Stainless steel Heavy Hex nuts meeting the requirements of ASTM F594, Group 2 (316 stainless steel), condition CW, with galling-resistant coating.[1]

[1] Optional bolts/nuts are available in imperial size only.

**Coupling Linkage:** High Strength Steel with comparable physical properties to that of the Track Bolt (ASTM A449). Linkage is zinc electroplated per ASTM B633 Fe/Zn 5, Type III Finish.

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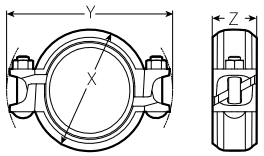
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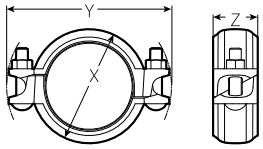


## 4.0 DIMENSIONS

### Style 009N Two-Bolt *Installation-Ready* Coupling




Style 009N Pre-Assembled




Style 009N Joint Assembled

| Size | | Maximum Working Pressure[2] | Maximum End Load[2] | Allow. Pipe End Separation[3] | Bolt/Nut | | Dimensions | | | | | Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pre-assembled | | Joint Assembled | | | |
| Nominal<br>inches<br>DN | Actual Outside Diameter<br>inches<br>mm | psi<br>kPa | lb<br>N | inches<br>mm | Qty. | Size<br>inches<br>mm | X<br>inches<br>mm | Y<br>inches<br>mm | X<br>inches<br>mm | Y<br>inches<br>mm | Z<br>inches<br>mm | Approx. (Each)<br>lb<br>kg |
| 1 ¼<br>DN32 | 1.660<br>42.4 | 365<br>2517 | 790<br>3514 | 0.10<br>2.54 | 2 | ⅜ × 2<br>M10 x 51 | 3.13<br>79 | 5.00<br>127 | 2.75<br>70 | 5.00<br>127 | 2.00<br>51 | 1.4<br>0.6 |
| 1 ½<br>DN40 | 1.900<br>48.3 | 365<br>2517 | 1035<br>4604 | 0.10<br>2.54 | 2 | ⅜ × 2<br>M10 x 51 | 3.38<br>86 | 5.13<br>130 | 3.00<br>76 | 5.13<br>130 | 2.00<br>51 | 1.5<br>0.7 |
| 2<br>DN50 | 2.375<br>60.3 | 365<br>2517 | 1617<br>7193 | 0.12<br>3.05 | 2 | ⅜ × 2 ½<br>M10 x 63 | 4.00<br>102 | 5.63<br>143 | 3.50<br>89 | 5.63<br>143 | 2.00<br>51 | 1.9<br>0.9 |
| 2 ½ | 2.875<br>73.0 | 365<br>2517 | 2370<br>10542 | 0.12<br>3.05 | 2 | ⅜ × 2 ½<br>M10 x 63 | 4.50<br>114 | 6.13<br>156 | 4.00<br>102 | 6.13<br>156 | 2.00<br>51 | 2.1<br>1.0 |
| DN65 | 3.000<br>76.1 | 365<br>2517 | 2580<br>11476 | 0.12<br>3.05 | 2 | ⅜ × 2 ½<br>M10 x 63 | 4.63<br>118 | 6.00<br>152 | 4.13<br>105 | 6.13<br>156 | 2.00<br>51 | 2.1<br>1.0 |
| 3<br>DN80 | 3.500<br>88.9 | 365<br>2517 | 3512<br>15622 | 0.12<br>3.05 | 2 | ⅜ × 2 ½<br>M10 x 63 | 5.13<br>130 | 6.75<br>171 | 4.63<br>117 | 6.75<br>171 | 2.00<br>51 | 2.3<br>1.0 |
| 4<br>DN100 | 4.500<br>114.3 | 365<br>2517 | 5805<br>25822 | 0.17<br>4.32 | 2 | ⅜ × 2 ½<br>M10 x 63 | 6.00<br>152 | 7.88<br>200 | 5.63<br>143 | 7.50<br>191 | 2.13<br>54 | 2.9<br>1.3 |
| | 4.250<br>108.0 | 365<br>2517 | 5178<br>23020 | 0.17<br>4.32 | 2 | ⅜ × 2 ½<br>M10 x 63 | 5.63<br>152 | 7.38<br>1.87 | 5.38<br>137 | 7.38<br>187 | 2.13<br>54 | 3.1<br>1.4 |
| 5 | 5.563<br>141.3 | 365<br>2517 | 8872<br>39456 | 0.17<br>4.32 | 2 | ½ × 3<br>M12 x 76 | 7.25<br>184 | 9.25<br>235 | 6.75<br>171 | 9.13<br>232 | 2.25<br>57 | 5.0<br>2.3 |
| | 5.250<br>133.0 | 365<br>2517 | 7901<br>35106 | 0.17<br>4.32 | 2 | ½ × 3<br>M12 x 76 | 6.63<br>168 | 9.00<br>229 | 6.38<br>162 | 9.00<br>229 | 2.25<br>57 | 4.8<br>2.2 |
| DN125 | 5.500<br>139.7 | 365<br>2517 | 8672<br>38529 | 0.17<br>4.32 | 2 | ½ × 3<br>M12 x 76 | 6.88<br>175 | 9.25<br>235 | 6.75<br>171 | 9.13<br>232 | 2.25<br>57 | 4.9<br>2.2 |
| 6<br>DN150 | 6.625<br>168.3 | 365<br>2517 | 12582<br>44469 | 0.17<br>4.32 | 2 | ½ × 3 ¼<br>M12 x 83 | 8.38<br>213 | 10.38<br>264 | 7.88<br>200 | 10.13<br>257 | 2.25<br>57 | 6.0<br>2.7 |
| | 6.250<br>159.0 | 365<br>2517 | 11198<br>49753 | 0.17<br>4.32 | 2 | ½ × 3 ¼<br>M12 x 83 | 7.88<br>200 | 10.00<br>254 | 7.38<br>187 | 9.88<br>251 | 2.25<br>57 | 5.6<br>2.5 |
| | 6.500<br>165.1 | 365<br>2517 | 12112<br>53813 | 0.17<br>4.32 | 2 | ½ × 3 ¼<br>M12 x 83 | 8.00<br>203 | 10.25<br>260 | 7.75<br>197 | 10.13<br>257 | 2.25<br>57 | 6.0<br>2.7 |
| 8<br>DN200 | 8.625<br>219.1 | 365<br>2517 | 21326<br>94863 | 0.17<br>4.32 | 2 | ⅝ × 4<br>M16 x 101 | 10.88<br>276 | 13.38<br>340 | 10.25<br>260 | 13.13<br>333 | 2.50<br>64 | 11.4<br>5.2 |
| | 8.500<br>216.0 | 365<br>2517 | 20712<br>55968 | 0.17<br>4.32 | 2 | ⅝ × 4<br>M16 x 101 | 10.63<br>270 | 13.25<br>337 | 10.25<br>260 | 10.13<br>257 | 2.63<br>67 | 11.4<br>5.2 |
| 10<br>DN250 | 10.750<br>273.0 | 300<br>2068 | 27229<br>121121 | 0.25<br>6.4 | 2 | ⅞ × 6 ½<br>M22 x 165 | 13.75<br>349 | 17.00<br>432 | 13.25<br>337 | 17.13<br>435 | 2.75<br>70 | 22.6<br>10.3 |
| 12<br>DN300 | 12.750<br>323.9 | 300<br>2068 | 38303<br>170380 | 0.25<br>6.4 | 2 | ⅞ × 6 ½<br>M22 x 165 | 16.00<br>406 | 19.00<br>483 | 15.50<br>394 | 19.13<br>486 | 2.75<br>70 | 27.6<br>12.5 |

[2] Working Pressure and End Load are total, from all internal and external loads, based on standard weight (ANSI) steel pipe, standard roll or cut grooved in accordance with Victaulic specifications. See the Listings/Approvals section of this publication for ratings on other pipe.

[3] The allowable pipe separation dimension shown is for system layout purposes only. Style 009N couplings are considered rigid connections and will not accommodate expansion or contraction of the piping system.

**NOTES**

- When assembling Style 009N or Style 109 couplings onto end caps, take additional care to make certain the end cap is fully seated against the gasket end stop. For Style 009N or Style 109 couplings, use FireLock No. 006 end caps containing the "EZ" marking on the inside face or No. 60 end caps containing the "QV EZ" marking on the inside face. Non-Victaulic end cap products shall not be used with Style 009N or Style 109 couplings. IMPORTANT: Gaskets intended for the Style 009 or Style 009V couplings cannot be used with the Style 009N or Style 109 coupling. There is no interchanging of gaskets or housings between coupling styles.
- **Use Of FlushSeal Gaskets For Dry Pipe Systems** Style 009N or Style 109 couplings are supplied with Grade "E" Type A gaskets. These gaskets include an integral pipe stop, that once installed provides the similar benefits as a FlushSeal gasket for dry pipe systems. It should be noted that standard Victaulic FlushSeal gaskets cannot be used with the Style 009N or Style 109 couplings.
- The Allowable Pipe End Separation dimension shown is for system layout purposes only. Style 009N or Style 109 Installation-Ready rigid couplings are considered rigid connections and will not accommodate expansion/contraction or angular movement of the piping system. Contact Victaulic for torsional resistance information.

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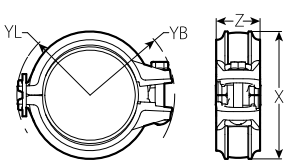
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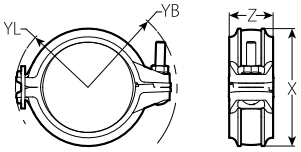


## 4.1 DIMENSIONS

### Style 109 One-Bolt *Installation-Ready* Coupling




Style 109 Pre-Assembled




Style 109 Joint Assembled

| Size | | Max. Working Pressure | Max. End Load | Allow. Pipe End Sep. Maximum | Bolt/Nut | | Dimensions | | | | | | | | Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pre-Assembled | | | | Assembled | | | | |
| Nominal inches DN | Actual Outside Diameter inches mm | psi kPa | Lbs. N | inches mm | Qty. | Size inches mm | YL inches mm | YB inches mm | X inches mm | Z inches m m | YL inches mm | YB inches mm | X inches mm | Z inches mm | Approx. (Each) lb kg |
| 1 ¼ DN32 | 1.660 42.4 | 365 2517 | 790 3514 | 0.10 2.54 | 1 | ⅜ x 2 ¼ M10 x 57 | 1.97 50 | 2.49 63 | 3.17 81 | 1.95 50 | 1.93 49 | 2.59 66 | 2.84 72 | 1.95 50 | 1.5 0.7 |
| 1 ½ DN40 | 1.900 48.3 | 365 2517 | 1035 4603 | 0.10 2.54 | 1 | ⅜ x 2 ¼ M10 x 57 | 2.13 54 | 2.60 66 | 3.41 87 | 1.95 50 | 2.1 53 | 2.68 68 | 3.07 78 | 1.95 50 | 1.6 0.7 |
| 2 DN50 | 2.375 60.3 | 365 2517 | 1617 7192 | 0.12 3.048 | 1 | ⅜ x 2 ¼ M10 x 57 | 2.32 59 | 2.85 72 | 3.76 96 | 1.98 50 | 2.29 58 | 2.95 75 | 3.45 88 | 1.98 50 | 1.9 0.9 |
| 2 ½ | 2.875 73.0 | 365 2517 | 2370 10540 | 0.12 3.048 | 1 | ⅜ x 2 ¼ M10 x 57 | 2.63 67 | 3.09 78 | 4.29 109 | 1.99 51 | 2.61 66 | 3.15 80 | 3.93 100 | 1.99 51 | 2.1 1.0 |
| DN65 | 3.000 76.1 | 365 2517 | 2580 11476 | 0.12 3.048 | 1 | 7⁄16 x 2 ¾ M11 x 69 | 2.68 68 | 3.22 82 | 4.56 116 | 2.03 52 | 2.64 67 | 3.45 88 | 4.22 107 | 2.03 52 | 2.4 1.1 |
| 3 DN80 | 3.500 88.9 | 365 2517 | 3512 15620 | 0.12 3.048 | 1 | 7⁄16 x 2 ¾ M11 x 69 | 2.93 74 | 3.53 90 | 5.13 130 | 2.07 53 | 2.89 73 | 3.78 96 | 4.67 119 | 2.07 53 | 2.7 1.2 |
| 4 DN100 | 4.500 114.3 | 300 2068 | 4771 21223 | 0.17 4.318 | 1 | 7⁄16 x 2 ¾ M11 x 69 | 3.47 88 | 4.01 102 | 6.03 153 | 2.08 53 | 3.43 87 | 4.22 107 | 5.56 141 | 2.08 53 | 3.5 1.6 |

[4] Working Pressure and End Load are total, from all internal and external loads, based on standard weight (ANSI) steel pipe, standard roll or cut grooved in accordance with Victaulic specifications. See the Listings/Approvals section of this publication for ratings on other pipe.

[5] The allowable pipe separation dimension shown is for system layout purposes only. Style 109 couplings are considered rigid connections and will not accommodate expansion or contraction of the piping system.

**NOTES**

- When assembling Style 009N or Style 109 couplings onto end caps, take additional care to make certain the end cap is fully seated against the gasket end stop. For Style 009N or Style 109 couplings, use FireLock No. 006 end caps containing the “EZ” marking on the inside face or No. 60 end caps containing the “QV EZ” marking on the inside face. Non-Victaulic end cap products shall not be used with Style 009N or Style 109 couplings. IMPORTANT: Gaskets intended for the Style 009 or Style 009V couplings cannot be used with the Style 009N or Style 109 coupling. There is no interchanging of gaskets or housings between coupling styles.
- **Use Of FlushSeal Gaskets For Dry Pipe Systems** Style 009N or Style 109 couplings are supplied with Grade “E” Type A gaskets. These gaskets include an integral pipe stop, that once installed provides the similar benefits as a FlushSeal gasket for dry pipe systems. It should be noted that standard Victaulic FlushSeal gaskets cannot be used with the Style 009N or Style 109 couplings.
- The Allowable Pipe End Separation dimension shown is for system layout purposes only. Style 009N or Style 109 Installation-Ready rigid couplings are considered rigid connections and will not accommodate expansion/contraction or angular movement of the piping system. Contact Victaulic for torsional resistance information.

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## 5.0 PERFORMANCE

### Style 009N Two-Bolt *Installation-Ready* Coupling Listings/Approvals[6]

The information provided below is based on the latest listing and approval data at the time of publication. Listings/Approvals are subject to change and/or additions by the approval agencies. Contact Victaulic for performance on other pipe and the latest listings and approvals.

| Size | | cULus | | FM | | VdS | LPCB |
|---|---|---|---|---|---|---|---|
| Nominal<br>inches<br>DN | Actual Outside Diameter<br>inches<br>mm | Sch. 10<br>psi<br>kPa<br>bar | Sch. 40<br>psi<br>kPa<br>bar | Sch. 10<br>psi<br>kPa<br>bar | Sch. 40<br>psi<br>kPa<br>bar | <br>psi<br>kPa<br>bar | <br>psi<br>kPa<br>bar |
| 1¼<br>DN32 | 1.660<br>42.4 | 365<br>2517<br>25 | 365<br>2517<br>25 | 363<br>2503<br>25 | 363<br>2503<br>25 | 363<br>2500<br>25 | 363<br>2500<br>25 |
| 1½<br>DN40 | 1.900<br>48.3 | 365<br>2517<br>25 | 365<br>2517<br>25 | 363<br>2503<br>25 | 363<br>2503<br>25 | 363<br>2500<br>25 | 363<br>2500<br>25 |
| 2<br>DN50 | 2.375<br>60.3 | 365<br>2517<br>25 | 365<br>2517<br>25 | 363<br>2503<br>25 | 363<br>2503<br>25 | 363<br>2500<br>25 | 363<br>2500<br>25 |
| 2½ | 2.875<br>73.0 | 365<br>2517<br>25 | 365<br>2517<br>25 | 363<br>2503<br>25 | 363<br>2503<br>25 | –<br>–<br>– | 363<br>2500<br>25 |
| DN65 | 3.000<br>76.1 | 365[7]<br>2517[7]<br>25[7] | –<br>–<br>– | 363[8]<br>2503[8]<br>25[8] | –<br>–<br>– | 363<br>2500<br>25 | 363<br>2500<br>25 |
| 3<br>DN80 | 3.500<br>88.9 | 365<br>2517<br>25 | 365<br>2517<br>25 | 363<br>2503<br>25 | 363<br>2503<br>25 | 363<br>2500<br>25 | 363<br>2500<br>25 |
| | 4.250<br>108.0 | –<br>–<br>– | –<br>–<br>– | 363<br>2503<br>25 | 363<br>2503<br>25 | –<br>–<br>– | –<br>–<br>– |
| 4<br>DN100 | 4.500<br>114.3 | 365<br>2517<br>25 | 365<br>2517<br>25 | 363<br>2503<br>25 | 363<br>2503<br>25 | 363<br>2500<br>25 | 363<br>2500<br>25 |
| | 5.250<br>133.0 | –<br>–<br>– | –<br>–<br>– | 363[8]<br>2503[8]<br>25[8] | –<br>–<br>– | –<br>–<br>– | –<br>–<br>– |
| DN125 | 5.500<br>139.7 | 290[9]<br>2000[9]<br>20[9] | –<br>–<br>– | 363[8]<br>2503[8]<br>25[8] | –<br>–<br>– | 232<br>1600<br>16 | 363<br>2500<br>25 |
| 5 | 5.563<br>141.3 | 290<br>2000<br>20 | 365<br>2517<br>25 | 363<br>2503<br>25 | 363<br>2503<br>25 | 232<br>1600<br>16 | 363<br>2500<br>25 |
| | 6.250<br>159 | –<br>–<br>– | –<br>–<br>– | 363[8]<br>2503[8]<br>25[8] | –<br>–<br>– | –<br>–<br>– | –<br>–<br>– |
| | 6.500<br>165.1 | 290[10]<br>2000[10]<br>20[10] | –<br>–<br>– | 363[8]<br>2503[8]<br>25[8] | –<br>–<br>– | –<br>–<br>– | 363<br>2500<br>25 |

6 Listed/Approved for continuous use in wet and dry systems. Listed/Approved for dry systems -40° F/C and above. Please see the Victaulic Installation Manual I-009N for details concerning when supplemental lubrication is required.

7 cULus listed for DIN 2458 (EN 10220) 2.6 mm pipe wall.

8 FM approved for BS 1387 (EN 10255) Medium 3.6 mm pipe wall.

9 cULus listed for EN 10220 4.0 mm pipe wall.

10 cULus listed for EN 10255 4.5 mm pipe wall.

11 With optional stainless steel fasteners, cULus Listed to 175psi/1207 kPa/12 bar and FM Approved to the FM ratings shown in the above table. The stainless steel fasteners have a marking designation of "316" on the end face of the bolt.

12 FM approved for 0.188" pipe wall.

13 cULus listed for 0.188" pipe wall.

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## 5.0 PERFORMANCE (CONTINUED)

### Style 009N Two-Bolt *Installation-Ready* Coupling Listings/Approvals[6]

The information provided below is based on the latest listing and approval data at the time of publication. Listings/Approvals are subject to change and/or additions by the approval agencies. Contact Victaulic for performance on other pipe and the latest listings and approvals.

| Size | | cULus | | FM | | VdS | LPCB |
|---|---|---|---|---|---|---|---|
| Nominal<br>inches<br>DN | Actual Outside Diameter<br>inches<br>mm | Sch. 10<br>psi<br>kPa<br>bar | Sch. 40<br>psi<br>kPa<br>bar | Sch. 10<br>psi<br>kPa<br>bar | Sch. 40<br>psi<br>kPa<br>bar | <br>psi<br>kPa<br>bar | <br>psi<br>kPa<br>bar |
| 6<br>DN150 | 6.625<br>168.3 | 300<br>2068<br>20 | 365<br>2517<br>25 | 300<br>2068<br>20 | 363<br>2503<br>25 | 232<br>1600<br>16 | 363<br>2500<br>25 |
| | 8.515<br>216.3 | 290<br>2000<br>20 | –<br>–<br>– | 363[8]<br>2503[8]<br>25[8] | –<br>–<br>– | –<br>–<br>– | –<br>–<br>– |
| 8<br>DN200 | 8.625<br>219.1 | 300<br>2068<br>20 | 365<br>2517<br>25 | 300[12]<br>2068[12]<br>20[12] | 363<br>2503<br>25 | 232<br>1600<br>16 | 363<br>2500<br>25 |
| 10<br>DN250 | 10.750<br>273.0 | 300[13]<br>2068[13]<br>20[13] | 300<br>2068<br>20 | 300[12]<br>2068[12]<br>20[12] | 300<br>2068<br>20 | –<br>–<br>– | –<br>–<br>– |
| 12<br>DN300 | 12.750<br>323.9 | 300[13]<br>2068[13]<br>20[13] | 300<br>2068<br>20 | 250[12]<br>1720[12]<br>17[12] | 300<br>2068<br>20 | –<br>–<br>– | –<br>–<br>– |

6 Listed/Approved for continuous use in wet and dry systems. Listed/Approved for dry systems -40° F/C and above. Please see the Victaulic Installation Manual I-009N for details concerning when supplemental lubrication is required.

7 cULus listed for DIN 2458 (EN 10220) 2.6 mm pipe wall.

8 FM approved for BS 1387 (EN 10255) Medium 3.6 mm pipe wall.

9 cULus listed for EN 10220 4.0 mm pipe wall.

10 cULus listed for EN 10255 4.5 mm pipe wall.

11 With optional stainless steel fasteners, cULus Listed to 175psi/1207 kPa/12 bar and FM Approved to the FM ratings shown in the above table. The stainless steel fasteners have a marking designation of "316" on the end face of the bolt.

12 FM approved for 0.188" pipe wall.

13 cULus listed for 0.188" pipe wall.

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## 5.1 PERFORMANCE

### Style 109 One-Bolt *Installation-Ready* Coupling Listings/Approvals[15]

The information provided below is based on the latest listing and approval data at the time of publication. Listings/Approvals are subject to change and/or additions by the approvals agencies. Contact Victaulic for performance on other pipe and the latest listings and approvals.

| Size | | cULus | | FM | | VdS | LPCB |
|---|---|---|---|---|---|---|---|
| **Nominal**<br>inches<br>DN | **Actual Outside Diameter**<br>inches<br>mm | **Sch. 10**<br>psi<br>kPa<br>bar | **Sch. 40**<br>psi<br>kPa<br>bar | **Sch. 10**<br>psi<br>kPa<br>bar | **Sch. 40**<br>psi<br>kPa<br>bar | psi<br>kPa<br>bar | psi<br>kPa<br>bar |
| 1 ¼<br>DN32 | 1.660<br>42.4 | 365<br>2517<br>25 | 365<br>2517<br>25 | 365<br>2517<br>25 | 365<br>2517<br>25 | 232<br>1600<br>16 | 363<br>2503<br>25 |
| 1 ½<br>DN40 | 1.900<br>48.3 | 365<br>2517<br>25 | 365<br>2517<br>25 | 365<br>2517<br>25 | 365<br>2517<br>25 | 232<br>1600<br>16 | 363<br>2503<br>25 |
| 2<br>DN50 | 2.375<br>60.3 | 365<br>2517<br>25 | 365<br>2517<br>25 | 365<br>2517<br>25 | 365<br>2517<br>25 | 232<br>1600<br>16 | 363<br>2503<br>25 |
| 2½ | 2.875<br>73.0 | 365<br>2517<br>25 | 365<br>2517<br>25 | 365<br>2517<br>25 | 365<br>2517<br>25 | –<br>–<br>– | –<br>–<br>– |
| DN65 | 3.000<br>76.1 | 365<br>2517<br>25 | 365<br>2517<br>25 | 365<br>2517<br>25 | 365<br>2517<br>25 | 232<br>1600<br>16 | 363<br>2503<br>25 |
| 3<br>DN80 | 3.500<br>88.9 | 365<br>2517<br>25 | 365<br>2517<br>25 | 365<br>2517<br>25 | 365<br>2517<br>25 | 232<br>1600<br>16 | 363<br>2503<br>25 |
| 4<br>DN100 | 4.500<br>114.3 | 300<br>2068<br>20 | 365<br>2517<br>25 | 300<br>2068<br>20 | 300<br>2068<br>20 | –<br>–<br>– | 290<br>2000<br>20 |

[15] Listed/Approved for continuous use in wet and dry systems. Listed/Approved for dry systems -40° F/C and above. Please see the Victaulic Installation Manual I-109 for details concerning when supplemental lubrication is required.

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## 5.2 PERFORMANCE

### Specialty Pipe
### Style 009N Two-Bolt *Installation-Ready* Coupling Listings/Approvals

| Pipe Type | Size<br>inches<br>DN | Pressure Rating<br>cULus<br>psi<br>kPa<br>bar | Pressure Rating<br>FM<br>psi<br>kPa<br>bar |
|---|---|---|---|
| EF | 1 ¼ – 4<br>DN32 – DN100 | 300<br>2068<br>20 | N/A |
| EL | 1 ¼ – 2<br>DN32 – DN50 | 300<br>2068<br>20 | 300<br>2068<br>20 |
| ET40 | 1 ¼ – 2<br>DN32 – DN50 | 300<br>2068<br>20 | N/A |
| EZF | 3 – 4<br>DN80 – DN100 | 300<br>2068<br>20 | N/A |
| EZT | 1 ¼ – 2<br>DN32 – DN50 | 300<br>2068<br>20 | 300<br>2068<br>20 |
| FF | 1 ½ – 4<br>DN40 – DN100 | 300<br>2068<br>20 | N/A |
| GL | 1 ¼ – 2<br>DN32 – DN50 | 300<br>2068<br>20 | 300<br>2068<br>20 |
| MF | 1 ¼ – 4<br>DN32 – DN100 | 300<br>2068<br>20 | 300<br>2068<br>20 |
| | 6<br>DN150 | 175<br>1205<br>12 | 175<br>1205<br>12 |
| MT | 1 ¼ – 2<br>DN32 – DN50 | 300<br>2068<br>20 | 300<br>2068<br>20 |
| MLT | 1 ¼ – 2<br>DN32 – DN50 | N/A | 300<br>2068<br>20 |
| TF | 2 ½ – 4<br>73.0 mm – DN100 | N/A | 300<br>2068<br>20 |
| WG5, WG5E, WF5, WG7, WG7E, WL7 | 1 ¼ – 4<br>DN32 – DN100 | 175<br>1205<br>12 | 300<br>2068<br>20 |
| WLS | 1 ¼ – 2<br>DN32 – DN50 | 300<br>2068<br>20 | 300<br>2068<br>20 |

**NOTES**

- EF = EDDY FLOW steel pipe manufactured by Bull Moose Tube Co.
- EL = EDDYLITE steel pipe manufactured by Bull Moose Tube Co.
- ET40 = Eddythread 40 steel pipe manufactured by Bull Moose Tube Co.
- EZF = EZ-Flow steel pipe manufactured by Northwest Pipe Co.
- EZT = EZ-Thread steel pipe manufactured by Youngstown Tube Co.
- FF = Fire-Flo steel pipe manufactured by Youngstown Tube Co.
- GL = GL steel pipe manufactured by Wheatland Tube Co.
- MF = Mega-Flow steel pipe manufactured by Wheatland Tube Co.
- MT = Mega-Thread steel pipe manufactured by Wheatland Tube Co.
- MLT = MLT steel pipe manufactured by Wheatland Tube Co
- TF = Tex-Flow steel pipe manufactured by Tex-Tube Co.
- WG5, WG5E, WF5 = WGalweld 5, WGalweld 5E, WFlow 5 steel pipe manufactured by Wuppermann Stahl GmbH.
- WG7, WG7E, WL7 = WGalweld 7, Wgalweld 7E, WLight 7 steel pipe manufactured by Wuppermann Stahl GmbH
- WLS = WLS steel pipe manufactured by Wheatland Tube Co.

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## 5.3 PERFORMANCE

### Specialty Pipe
### Style 109 One-Bolt *Installation-Ready* Coupling Listings/Approvals

| Pipe Type | Size<br>inches<br>DN | Pressure Rating<br>cULus<br>psi<br>kPa<br>bar | Pressure Rating<br>FM<br>psi<br>kPa<br>bar |
|---|---|---|---|
| EF | 1 ¼ – 2 ½<br>DN32 – 73.0 mm | N/A | 300<br>2068<br>20 |
| | 1 ½ – 2 ½<br>DN40 – 73.0 mm | 300<br>2068<br>20 | N/A |
| | 3 – 4<br>DN80 – DN100 | 300<br>2068<br>20 | 300<br>2068<br>20 |
| Easy-Flow | 1 ¼ – 2<br>DN32 – DN50 | N/A | 300<br>2068<br>20 |
| | 3 – 4<br>DN80 – DN100 | N/A | 300<br>2068<br>20 |
| EL | 1 ¼ – 2<br>DN32 – DN50 | N/A | 300<br>2068<br>20 |
| ET40 | 1 ¼ – 2<br>DN32 – DN50 | 300<br>2068<br>20 | 300<br>2068<br>20 |
| EZT | 1 ¼ – 2<br>DN32 – DN50 | N/A | 300<br>2068<br>20 |
| | 1 ½ – 2<br>DN40 – DN50 | 300<br>2068<br>20 | N/A |
| FF | 1 ½ – 4<br>DN40 – DN100 | 300<br>2068<br>20 | 300<br>2068<br>20 |
| GL | 1 ¼ – 2<br>DN32 – DN50 | N/A | 300<br>2068 |
| MF | 1 ¼ – 4<br>DN32 – DN100 | 300<br>2068<br>20 | 300<br>2068<br>20 |
| MT | 1 ¼ – 2<br>DN32 – DN50 | 300<br>2068<br>20 | 300<br>2068<br>20 |
| MLT | 1 ¼ – 2<br>DN32 – DN50 | 300<br>2068<br>20 | 300<br>2068<br>20 |

**NOTES**

- EF = EDDY FLOW steel pipe manufactured by Bull Moose Tube Co.
- Easy-Flow = Easy-Flow steel pipe manufactured by Borusan Mannesmann Boru.
- EL = EDDYLITE steel pipe manufactured by Bull Moose Tube Co.
- ET40 = Eddythread 40 steel pipe manufactured by Bull Moose Tube Co.
- EZT = EZ-Thread steel pipe manufactured by Youngstown Tube Co.
- FF = Fire-Flo steel pipe manufactured by Youngstown Tube Co.
- GL = GL steel pipe manufactured by Wheatland Tube Co.
- MF = Mega-Flow steel pipe manufactured by Wheatland Tube Co.
- MT = Mega-Thread steel pipe manufactured by Wheatland Tube Co.
- MLT = MLT steel pipe manufactured by Wheatland Tube Co.
- TF = Tex-Flow steel pipe manufactured by Tex-Tube Co.
- WG7, WG7E = WGalweld 7 and WGalweld 7E steel pipe manufactured by Wuppermann Stahl GmbH.
- WLS = WLS steel pipe manufactured by Wheatland Tube Co.

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## 5.3 PERFORMANCE (CONTINUED)

### Specialty Pipe
### Style 109 One-Bolt *Installation-Ready* Coupling Listings/Approvals

| Pipe Type | Size<br>inches<br>DN | Pressure Rating<br>cULus<br>psi<br>kPa<br>bar | Pressure Rating<br>FM<br>psi<br>kPa<br>bar |
|---|---|---|---|
| TF | 2½ – 4<br>73.00 mm – DN100 | N/A | 300<br>2068<br>20 |
| WG7, WG7E | 1¼ – 2<br>DN32 – DN50 | N/A | 300<br>2068<br>20 |
| | 3 – 4<br>DN80 – DN100 | N/A | 300<br>2068<br>20 |
| WLS | 1¼ – 2<br>DN32 – DN50 | N/A | 300<br>2068<br>20 |

**NOTES**

- EF = EDDY FLOW steel pipe manufactured by Bull Moose Tube Co.
- Easy-Flow = Easy-Flow steel pipe manufactured by Borusan Mannesmann Boru.
- EL = EDDYLITE steel pipe manufactured by Bull Moose Tube Co.
- ET40 = Eddythread 40 steel pipe manufactured by Bull Moose Tube Co.
- EZT = EZ-Thread steel pipe manufactured by Youngstown Tube Co.
- FF = Fire-Flo steel pipe manufactured by Youngstown Tube Co.
- GL = GL steel pipe manufactured by Wheatland Tube Co.
- MF = Mega-Flow steel pipe manufactured by Wheatland Tube Co.
- MT = Mega-Thread steel pipe manufactured by Wheatland Tube Co.
- MLT = MLT steel pipe manufactured by Wheatland Tube Co.
- TF = Tex-Flow steel pipe manufactured by Tex-Tube Co.
- WG7, WG7E = WGalweld 7 and WGalweld 7E steel pipe manufactured by Wuppermann Stahl GmbH.
- WLS = WLS steel pipe manufactured by Wheatland Tube Co.

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## 6.0 NOTIFICATIONS

**⚠ WARNING**



- **Read and understand all instructions before attempting to install any Victaulic products.**
- **Always verify that the piping system has been completely depressurized and drained immediately prior to installation, removal, adjustment, or maintenance of any Victaulic products.**
- **Wear safety glasses, hardhat, and foot protection.**

**Failure to follow these instructions could result in death or serious personal injury and property damage.**

- **These products shall be used only in fire protection systems that are designed and installed in accordance with current, applicable National Fire Protection Association (NFPA 13, 13D, 13R, etc.) standards, or equivalent standards, and in accordance with applicable building and fire codes. These standards and codes contain important information regarding protection of systems from freezing temperatures, corrosion, mechanical damage, etc.**
- **The installer shall understand the use of this product and why it was specified for the particular application.**
- **The installer shall understand common industry safety standards and potential consequences of improper product installation.**
- **It is the system designer's responsibility to verify suitability of materials for use with the intended fluid media within the piping system and external environment.**
- **The material specifier shall evaluate the effect of chemical composition, pH level, operating temperature, chloride level, oxygen level, and flow rate on materials to confirm system life will be acceptable for the intended service.**

**Failure to follow installation requirements and local and national codes and standards could compromise system integrity or cause system failure, resulting in death or serious personal injury and property damage.**

**NOTICE**

- **Victaulic does not recommend the use of any furnace butt-welded pipe with sizes 2"/DN50 and smaller Victaulic gasketed joint products. This includes, but is not limited to, ASTM A53 Type F pipe.**

## 7.0 REFERENCE MATERIALS

05.01: Seal Selection Guide
25.01: Original Groove System (OGS) Groove Specifications
I-009N: Installation Instructions FireLock EZ™ Rigid Coupling Style 009N
I-100: Victaulic Field Installation Handbook
I-109: Installation Instructions FireLock™ One-Bolt Rigid Coupling Style 109
I-ENDCAP: Victaulic End Caps Installation Instructions
I-IMPACT: Impact Tool Usage Guidelines
AN-001: Application Notification - Potential Incompatibility of Type F Pipe, Sizes NPS 2" | DN50 and Smaller

**User Responsibility for Product Selection and Suitability**
Each user bears final responsibility for making a determination as to the suitability of Victaulic products for a particular end-use application, in accordance with industry standards and project specifications, and the applicable building codes and related regulations as well as Victaulic performance, maintenance, safety, and warning instructions. Nothing in this or any other document, nor any verbal recommendation, advice, or opinion from any Victaulic employee, shall be deemed to alter, vary, supersede, or waive any provision of Victaulic Company's standard conditions of sale, installation guide, or this disclaimer.

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**Note**
This product shall be manufactured by Victaulic or to Victaulic specifications. All products to be installed in accordance with current Victaulic installation/assembly instructions. Victaulic reserves the right to change product specifications, designs and standard equipment without notice and without incurring obligations.

**Installation**
Reference should always be made to the Victaulic installation handbook or installation instructions of the product you are installing. Handbooks are included with each shipment of Victaulic products, providing complete installation and assembly data, and are available in PDF format on our website at www.victaulic.com.

**Warranty**
Refer to the Warranty section of the current Price List or contact Victaulic for details.

**Trademarks**
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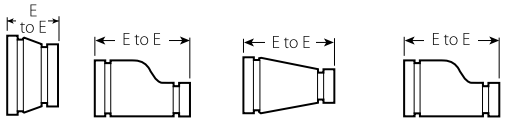
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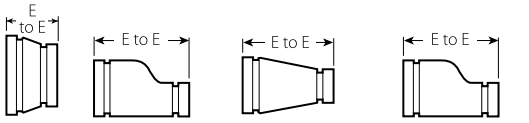
## 4.15 DIMENSIONS

### Concentric/Eccentric Reducer

**No. 50** Concentric
**No. 51** Eccentric




No. 50 | No. 51 | Fabricated Steel No. 50 | Fabricated Steel No. 51




No. 50 | No. 51 | Fabricated Steel No. 50 | Fabricated Steel No. 51

| Size | | | No. 50 Concentric Reducer | | No. 51 Eccentric Reducer | |
|---|---|---|---|---|---|---|
| Nominal inches DN | | | E to E inches mm | Approx. Weight (Each) lb kg | E to E inches mm | Approx. Weight (Each) lb kg |
| 1¼ DN32 | x | ¾ DN20 | + | 1.9 0.9 | — | — |
| | | 1 DN25 | + | 1.9 0.9 | — | — |
| 1½ DN40 | x | ¾ DN20 | + | 1.4 0.6 | — | — |
| | | 1 DN25 | 2.50 64 | 0.8 0.4 | 8.50 (sw) 216 | 4.5 2.0 |
| | | 1¼ DN32 | 2.50 64 | 1.0 0.5 | — | — |
| 2 DN50 | x | ¾ DN20 | 2.50 64 | 0.9 0.3 | 9.00 (sw) 229 | 2.0 0.9 |
| | | 1 DN25 | 2.50 64 | 0.7 0.3 | 9.00 (sw) 229 | 2.3 1.0 |
| | | 1¼ DN32 | 2.50 64 | 1.2 0.5 | 9.00 (sw) 229 | 4.6 2.1 |
| | | 1½ DN40 | 2.50 64 | 1.0 0.5 | 3.50 89 | 1.1 0.5 |
| 2½ | x | ¾ DN20 | + | 1.3 0.6 | + | 3.3 1.5 |
| | | 1 DN25 | 2.50 64 | 1.1 0.5 | 9.50 241 | 3.5 1.6 |
| | | 1¼ DN32 | 3.50 89 | 3.3 1.5 | 3.50 89 | 1.4 0.6 |
| | | 1½ DN40 | 2.50 64 | 3.6 1.6 | 9.50 (sw) 241 | 3.7 1.7 |
| | | 2 DN50 | 2.50 64 | 3.9 1.8 | 3.50 89 | 4.3 2.0 |
| 3 DN80 | x | ¾ DN20 | + | 1.5 0.7 | + | 4.5 2.0 |
| | | 1 DN25 | 2.50 64 | 1.3 0.6 | 9.50 (sw) 241 | 4.8 2.2 |
| | | 1¼ DN32 | 2.50 64 | 1.4 0.6 | + | 4.8 2.2 |
| | | 1½ DN40 | 2.50 64 | 5.1 2.3 | 9.50 (sw) 241 | 5.1 2.3 |
| | | 2 DN50 | 2.50 64 | 1.6 0.7 | 3.50 89 | 6.0 2.7 |
| | | 2½ | 2.50 64 | 1.8 0.8 | 3.50 89 | 7.0 3.2 |
| | | DN65 | 2.50 64 | 2.1 1.0 | — | — |
| 3½ DN90 | x | 3 DN80 | 2.50 64 | 2.0 0.9 | 9.50 (sw) 241 | 7.0 3.2 |
| 4 DN100 | x | 1 DN25 | 3.00 76 | 3.0 1.4 | 13.00 (sw) 330 | 6.5 2.9 |

| Size | | | No. 50 Concentric Reducer | | No. 51 Eccentric Reducer | |
|---|---|---|---|---|---|---|
| Nominal inches DN | | | E to E inches mm | Approx. Weight (Each) lb kg | E to E inches mm | Approx. Weight (Each) lb kg |
| | | 1¼ DN32 | + | 4.6 2.1 | — | — |
| | | 1½ DN40 | 3.00 (sw) 76 | 2.6 1.2 | 10.00 (sw) 254 | 8.1 3.7 |
| | | 2 DN50 | 3.00 76 | 2.4 1.1 | 4.00 102 | 3.3 1.5 |
| | | 2½ | 3.00 76 | 2.7 1.2 | 4.00 102 | 3.4 1.5 |
| | | 3 DN80 | 3.00 76 | 3.2 1.4 | 4.00 102 | 3.5 1.6 |
| | | 3½ DN90 | 3.00 76 | 2.9 1.3 | 10.00 (sw) 254 | 8.0 3.6 |
| 5 | x | 2 DN50 | 11.00 (sw) 279 | 9.0 4.1 | 11.00 (sw) 279 | 5.2 2.4 |
| | | 2½ | 4.00 102 | 4.3 2.0 | 11.00 (sw) 279 | 10.8 4.9 |
| | | 3 DN80 | 4.00 102 | 5.5 2.5 | 11.00 (sw) 279 | 11.1 5.0 |
| | | 4 DN100 | 3.50 89 | 4.3 1.9 | 5.00 127 | 12.0 5.4 |
| 6 DN150 | x | 1 DN25 | 4.00 102 | 5.0 2.3 | 11.50 (sw) 292 | 14.5 6.6 |
| | | 1½ DN40 | + | 5.5 2.5 | + | + |
| | | 2 DN50 | 4.00 102 | 6.6 3.0 | 11.50 (sw) 292 | 14.5 6.6 |
| | | 2 ½ | 4.00 102 | 6.4 2.9 | 11.50 (sw) 292 | 14.2 6.4 |
| | | 3 DN80 | 4.00 102 | 6.4 2.9 | 5.50 140 | 15.0 6.8 |
| | | 4 DN100 | 4.00 102 | 6.5 2.9 | 5.50 140 | 17.0 7.7 |
| | | 5 | 4.00 102 | 6.4 2.9 | 5.50 140 | 17.0 7.7 |
| 8 DN200 | x | 2½ | 16.00 406 | 7.9 3.6 | 12.00 (sw) 305 | 26.1 11.8 |
| | | 3 DN80 | 5.00 127 | 9.3 4.2 | 12.00 (sw) 305 | 22.0 10.0 |
| | | 4 DN100 | 5.00 127 | 10.4 4.8 | 12.00 (sw) 305 | 23.0 10.4 |
| | | 5 | 5.00 127 | 11.6 5.2 | 12.00 (sw) 305 | 23.0 10.4 |
| | | 6 DN150 | 5.00 127 | 11.9 5.4 | 6.00 152 | 24.0 10.9 |

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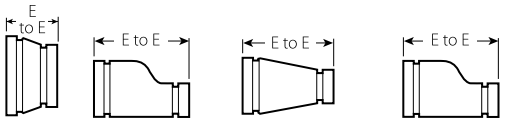
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## 4.15 DIMENSIONS (Continued)

### Concentric/Eccentric Reducer

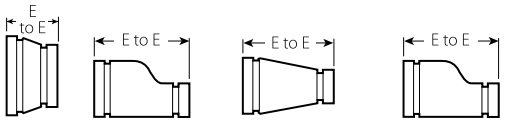
**No. 50** Concentric
**No. 51** Eccentric




No. 50 | No. 51 | Fabricated Steel No. 50 | Fabricated Steel No. 51

| Size | | | No. 50 Concentric Reducer | | No. 51 Eccentric Reducer | |
|---|---|---|---|---|---|---|
| Nominal inches DN | | | E to E inches mm | Approx. Weight (Each) lb kg | E to E inches mm | Approx. Weight (Each) lb kg |
| 10 DN250 | x | 4 DN100 | 6.00 152 | 19.7 8.9 | 13.00 (sw) 330 | 32.0 14.5 |
| | | 5 | + | 33.0 15.0 | + | 34.6 15.7 |
| | | 6 DN150 | 6.00 152 | 20.0 9.1 | 13.00 (sw) 330 | 36.9 16.7 |
| | | 8 DN200 | 6.00 152 | 22.0 10.0 | 7.00 178 | 21.6 9.8 |
| 12 DN300 | x | 4 DN100 | + | 44.0 20.0 | 14.00 (sw) 356 | 48.0 21.8 |
| | | 6 DN150 | 7.00 178 | 24.6 11.2 | 14.00 (sw) 356 | 50.0 22.7 |
| | | 8 DN200 | 7.00 178 | 52.0 23.6 | 14.00 (sw) 356 | 53.5 24.3 |
| | | 10 DN250 | 7.00 178 | 39.0 17.7 | 14.00 (sw) 356 | 57.0 25.9 |
| 14[2] DN350 | x | 6 DN150 | 13.00 330 | 65.0 29.5 | 13.00 330 | 60.0 27.2 |
| | | 8 DN200 | 13.00 330 | 65.0 29.5 | 13.00 330 | 60.0 27.2 |
| | | 10 DN250 | 13.00 330 | 66.0 29.9 | 13.00 330 | 65.0 29.5 |
| | | 12 DN300 | 13.00 330 | 68.0 30.8 | 13.00 330 | 66.0 29.9 |
| 16[2] DN400 | x | 8 DN200 | 14.00 356 | 73.0 33.1 | 14.00 355 | 73.0 33.1 |
| | | 10 DN250 | 14.00 356 | 73.0 33.1 | 14.00 355 | 73.0 33.1 |
| | | 12 DN300 | 14.00 356 | 73.0 33.1 | 14.00 355 | 73.0 33.1 |
| | | 14 DN350 | 14.00 356 | 73.0 33.1 | 14.00 355 | 73.0 33.1 |
| 18[2] DN450 | x | 10 DN250 | 15.00 381 | 91.0 41.3 | 15.00 381 | 91.0 41.3 |
| | | 12 DN300 | 15.00 381 | 91.0 41.3 | 15.00 381 | 91.0 41.3 |
| | | 14 DN350 | 15.00 381 | 91.0 41.3 | 15.00 381 | 91.0 41.3 |
| | | 16 DN400 | 15.00 381 | 91.0 41.3 | 15.00 381 | 91.0 41.3 |

[2] For 14"/DN350 and larger roll grooved systems, Victaulic offers the Advanced Groove System (AGS). For pricing and availability of cut groove fittings in this size, contact your nearest Victaulic sales representative.




No. 50 | No. 51 | Fabricated Steel No. 50 | Fabricated Steel No. 51

| Size | | | No. 50 Concentric Reducer | | No. 51 Eccentric Reducer | |
|---|---|---|---|---|---|---|
| Nominal inches DN | | | E to E inches mm | Approx. Weight (Each) lb kg | E to E inches mm | Approx. Weight (Each) lb kg |
| 20[2] DN500 | x | 10 DN250 | 20.00 508 | 110.0 49.9 | 20.00 508 | 177.0 80.3 |
| | | 12 DN300 | 20.00 508 | 120.0 54.4 | 20.00 508 | 120.0 54.4 |
| | | 14 DN350 | 20.00 508 | 149.0 67.9 | 20.00 508 | 149.0 67.9 |
| | | 16 DN400 | 20.00 508 | 120.0 54.4 | 20.00 508 | 120.0 54.4 |
| | | 18 DN450 | 20.00 508 | 136.0 61.7 | 20.00 508 | 136.0 61.7 |
| 24[2] DN600 | x | 10 DN250 | 20.00 508 | 142.0 64.4 | 20.00 508 | 142.0 64.4 |
| | | 12 DN300 | 20.00 508 | 150.0 68.0 | 20.00 508 | 150.0 68.0 |
| | | 14 DN350 | 20.00 508 | 162.0 73.5 | 20.00 508 | 162.0 73.5 |
| | | 16 DN400 | 20.00 508 | 162.0 73.5 | 20.00 508 | 162.0 73.5 |
| | | 18 DN450 | 20.00 508 | 162.0 73.5 | 20.00 508 | 162.0 73.5 |
| | | 20 DN500 | 20.00 508 | 151.0 68.5 | 20.00 508 | 190.0 86.2 |
| 14 – 60 DN350 – DN1500 | | | For AGS fitting information, see publication 20.05 AGS™ | | | |

[2] For 14"/DN350 and larger roll grooved systems, Victaulic offers the Advanced Groove System (AGS). For pricing and availability of cut groove fittings in this size, contact your nearest Victaulic sales representative.

(s) = Carbon Steel Direct Roll Groove (OGS)

(sw) = Carbon Steel Segmentally Welded

+ Contact Victaulic for details.

**NOTES**

- Available with male threaded small end No. 52.
- Cast fitting available for JIS size. Contact Victaulic for details.
- Steel eccentric reducers available through 30"/DN750, contact Victaulic for dimensions.
- All fittings are ductile iron unless otherwise noted with an (sw) or (s).

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# Vic®-End II End of Run Fitting
# No. 67





## 1.0 PRODUCT DESCRIPTION

**Available Sizes**

- 1 ¼ – 3"/DN32 – DN80 with ½/DN15, ¾"/DN20 or 1"/DN25 female threaded NPT or BSPT outlet.

**Pipe Material**

- Carbon Steel, Schedule 10, Schedule 40. For use with alternative materials and wall thicknesses please contact Victaulic.

**Maximum Working Pressure**

- Up to 365 psi/2500 kPa.

**Function**

- End of branchline elbow fitting for sprinkler connection.

## 2.0 CERTIFICATION/LISTINGS

FM c UL us LISTED

## 3.0 SPECIFICATIONS – MATERIAL

**Housing:**

Ductile iron conforming to ASTM A-536, grade 65-45-12, painted Orange Enamel. Ductile iron conforming to ASTM A-395, grade 65-45-15, is available upon special request.

☐ Optional: Hot dipped galvanized.

**Outlet:** NPT

☐ Optional: BSPT

**ALWAYS REFER TO ANY NOTIFICATIONS AT THE END OF THIS DOCUMENT REGARDING PRODUCT INSTALLATION, MAINTENANCE OR SUPPORT.**

| | | | |
|---|---|---|---|
| System No. | | Location | |
| Submitted By | | Date | |

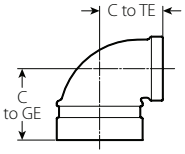
| | | | |
|---|---|---|---|
| Spec Section | | Paragraph | |
| Approved | | Date | |


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## 4.0 DIMENSIONS

### No.67




| Nominal Size inches DN | | | C to GE inches mm | C to TE inches mm | Approximate Weight (Each) lb kg |
|---|---|---|---|---|---|
| 1 ¼ DN32 | x | ½ DN15 | 1.875 48 | 1.38 35 | 0.6 0.3 |
| | | ¾ DN20 | 1.875 48 | 1.38 35 | 0.5 0.2 |
| | | 1 DN25 | 2 51 | 1.75 44 | 0.6 0.3 |
| 1 ½ DN40 | x | ½ DN15 | 1.875 48 | 1.5 38 | 0.7 0.3 |
| | | ¾ DN20 | 1.875 48 | 1.5 38 | 0.7 0.3 |
| | | 1 DN25 | 2 51 | 1.625 41 | 0.7 0.3 |
| 2 DN50 | x | ½ DN15 | 1.875 48 | 1.75 44 | 0.7 0.3 |
| | | ¾ DN20 | 1.875 48 | 1.75 44 | 0.7 0.3 |
| | | 1 DN25 | 2 51 | 1.75 44 | 0.9 0.4 |
| 2 ½ DN65 | x | ½ DN15 | 1.875 48 | 2 51 | 1.3 0.6 |
| | | ¾ DN20 | 1.875 48 | 2 51 | 1.2 0.6 |
| | | 1 DN25 | 2 51 | 2 51 | 1.3 0.6 |
| 3 DN80 | x | ¾ DN20 | 2 51 | 2.375 60 | 2.0 0.9 |
| | | 1 DN25 | 2 51 | 2.375 60 | 1.9 0.9 |

## 5.0 PERFORMANCE

Please see applicable coupling publication for performance, or contact Victaulic for more information.

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## 6.0 NOTIFICATIONS

**⚠ WARNING**



- **This product must be installed by an experienced, trained installer, in accordance with the instructions provided with each valve. These instructions contain important information.**

**Failure to follow these instructions may result in serious personal injury, property damage, or valve leakage.**

**If you need additional copies of this product literature or the valve installation instructions, or if you have any questions about the safe installation and use of this device, contact Victaulic Company, P.O. Box 31, Easton, PA 18044-0031 U SA, Telephone: 001-610-559-3300.**

## 7.0 REFERENCE MATERIALS

10.64: FireLock EZ™ Style 009N Rigid Coupling

**User Responsibility for Product Selection and Suitability**
Each user bears final responsibility for making a determination as to the suitability of Victaulic products for a particular end-use application, in accordance with industry standards and project specifications, and the applicable building codes and related regulations as well as Victaulic performance, maintenance, safety, and warning instructions. Nothing in this or any other document, nor any verbal recommendation, advice, or opinion from any Victaulic employee, shall be deemed to alter, vary, supersede, or waive any provision of Victaulic Company's standard conditions of sale, installation guide, or this disclaimer.

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**Note**
This product shall be manufactured by Victaulic or to Victaulic specifications. All products to be installed in accordance with current Victaulic installation/assembly instructions. Victaulic reserves the right to change product specifications, designs and standard equipment without notice and without incurring obligations.

**Installation**
Reference should always be made to the Victaulic installation handbook or installation instructions of the product you are installing. Handbooks are included with each shipment of Victaulic products, providing complete installation and assembly data, and are available in PDF format on our website at www.victaulic.com.

**Warranty**
Refer to the Warranty section of the current Price List or contact Victaulic for details.

**Trademarks**
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# Victaulic® Standard Flexible Coupling Style 77





¾ – 12"/DN20 – DN300 sizes



14 – 24"/DN350 – DN600 sizes

## 1.0 PRODUCT DESCRIPTION

### Available Sizes

- ¾ – 24"/DN20 – DN600

### Maximum Working Pressure

- Accommodates pressures ranging from full vacuum (29.9 in Hg/760 mm Hg) up to 1000 psi/6894 kPa.
- Working pressure dependent on material, wall thickness and size of pipe.

### Application

- Joins standard roll grooved and cut grooved pipe, as well as grooved fittings, valves and accessories.
- Provides a flexible pipe joint which allows for expansion, contraction and deflection.
- Operating temperature dependent upon gasket and/or seal selection - see Section 3.0.
- Exclusively for use with pipe and Victaulic products which feature ends formed with the Victaulic OGS groove profile (See section 7.0 for Reference Materials).

### Pipe Material

- Carbon steel.
- For use with stainless steel pipe, refer to Victaulic publication 17.09 for pressure ratings and end loads.

## 2.0 CERTIFICATION/LISTINGS

EN 10311
CPR (EU)
No. 305/2011

BS EN 10311
CPR (UK)
2019 No. 465

**NOTE**

- See publication 02.06: Victaulic Potable Water Approvals ANSI/NSF for potable water approvals if applicable.

**ALWAYS REFER TO ANY NOTIFICATIONS AT THE END OF THIS DOCUMENT REGARDING PRODUCT INSTALLATION, MAINTENANCE OR SUPPORT.**


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## 3.0 MATERIAL SPECIFICATIONS

**Housing:** Ductile iron conforming to ASTM A536, Grade 65-45-12. Ductile iron conforming to ASTM A395, Grade 65-45-15, is available upon special request.

**Housing Coating: (specify choice)**

- ☐ Standard: Orange enamel.
- ☐ Optional: Hot dipped galvanized and others.
- ☐ Optional: Contact Victaulic with your requirements for other coatings.

**Gasket: (specify choice[1])**

☐ **Grade "E" EPDM**

EPDM (Green stripe color code). Temperature range –30°F to +230°F/–34°C to +110°C. May be specified for cold and hot water service within the specified temperature range plus a variety of dilute acids, oil-free air and many chemical services. UL Classified in accordance with ANSI/NSF 61 for cold +73°F/+23°C and hot +180°F/+82°C potable water service and ANSI/NSF 372. NOT COMPATIBLE FOR PETROLEUM SERVICES OR STEAM SERVICES.

☐ **Grade "T" Nitrile**

Nitrile (Orange stripe color code). Temperature range -20°F to +180°F/-29°C to +82°C. May be specified for petroleum products, air with oil vapors, vegetable and mineral oils within the specified temperature range. Not compatible for hot water services over +150°F/+66°C or for hot dry air over +140°F/+60°C.

☐ **Others**

For alternate gasket selection, reference publication 05.01: Victaulic Seal Selection Guide - Elastomeric Seal Construction.

[1] Services listed are General Service Guidelines only. It should be noted that there are services for which these gaskets are not compatible. Reference should always be made to the latest Victaulic Seal Selection Guide for specific gasket service guidelines and for a listing of services which are not compatible.

**Bolts/Nuts: (specify choice[2])**

- ☐ Standard: Carbon steel oval neck track bolts meeting the mechanical property requirements of ASTM A449 (imperial) and ISO 898-1 Class 9.8 (M10-M16) Class 8.8 (M20 and greater). Carbon steel hex nuts meeting the mechanical property requirements of ASTM A563 Grade B (imperial - heavy hex nuts) and ASTM A563M Class 9 (metric - hex nuts). Track bolts and hex nuts are zinc electroplated per ASTM B633 ZN/FE5, finish Type III (imperial) or Type II (metric).
- ☐ Optional: Stainless steel oval neck track bolts meeting the mechanical property requirements of ASTM F593, Group 2 (316 stainless steel), condition CW. Stainless steel heavy hex nuts meeting the mechanical property requirements of ASTM F594, Group 2 (316 stainless steel), condition CW, with galling reducing coating.

[2] Optional bolts/nuts are available in imperial size only.

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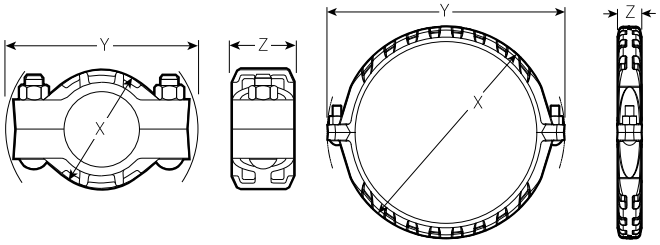
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## 4.0 DIMENSIONS

### Style 77




¾ – 12"/DN20 – DN300 sizes  14 – 24"/DN350 – DN600 sizes

| Size | | Pipe End Separation[3] | Deflection from Centerline[3] | | Bolt/Nut | | Dimensions | | | Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| Nominal<br>inches<br>DN | Actual Outside Diameter<br>inches<br>mm | Allowable<br>inches<br>mm | Per Cplg.<br>Degrees | Pipe<br>inches/ft.<br>mm/m | Qty. | Size<br>inches | X<br>inches<br>mm | Y<br>inches<br>mm | Z<br>inches<br>mm | Approx. (Each)<br>lb<br>kg |
| ¾<br>DN20 | 1.050<br>26.7 | 0–0.06<br>0–1.6 | 3°–24′ | 0.72<br>60 | 2 | ⅜ x 2 | 2.13<br>54 | 4.00<br>102 | 1.75<br>44 | 1.1<br>0.5 |
| 1<br>DN25 | 1.315<br>33.7 | 0–0.06<br>0–1.6 | 2°–43′ | 0.57<br>48 | 2 | ⅜ x 2 | 2.38<br>61 | 4.12<br>105 | 1.75<br>44 | 1.2<br>0.5 |
| 1¼<br>DN32 | 1.660<br>42.2 | 0–0.06<br>0–1.6 | 2°–10′ | 0.45<br>38 | 2 | ½ x 2½ | 2.65<br>67 | 5.00<br>127 | 1.88<br>48 | 2.0<br>0.9 |
| 1½<br>DN40 | 1.900<br>48.3 | 0–0.06<br>0–1.6 | 1°–56′ | 0.40<br>33 | 2 | ½ x 2½ | 3.13<br>79 | 5.38<br>137 | 1.88<br>48 | 2.1<br>1.0 |
| 2<br>DN50 | 2.375<br>60.3 | 0–0.06<br>0–1.6 | 1°–31′ | 0.32<br>26 | 2 | ½ x 2½ | 3.63<br>92 | 5.88<br>149 | 1.88<br>48 | 2.6<br>1.2 |
| | 2.664<br>57.0 | 0–0.06<br>0–1.6 | 1°–34′ | 0.33<br>27 | 2 | ½ x 2½ | 3.43<br>87 | 5.73<br>146 | 1.90<br>48 | 3.0<br>1.4 |
| 2½ | 2.875<br>73.0 | 0–0.06<br>0–1.6 | 1°–15′ | 0.26<br>22 | 2 | ½ x 2¾ | 4.25<br>108 | 6.50<br>165 | 1.88<br>48 | 3.1<br>1.4 |
| DN65 | 3.000<br>76.1 | 0–0.06<br>0–1.6 | 1°–12′ | 0.26<br>22 | 2 | ½ x 2¾ | 4.38<br>111 | 6.63<br>168 | 1.88<br>48 | 3.2<br>1.5 |
| 3<br>DN80 | 3.500<br>88.9 | 0–0.06<br>0–1.6 | 1°–2′ | 0.22<br>18 | 2 | ½ x 2¾ | 5.00<br>127 | 7.13<br>181 | 1.88<br>48 | 3.7<br>1.7 |
| 3½<br>DN90 | 4.000<br>101.6 | 0–0.06<br>0–1.6 | 0°–54′ | 0.19<br>16 | 2 | ⅝ x 3¼ | 5.63<br>143 | 8.25<br>210 | 1.88<br>48 | 5.6<br>2.5 |
| 4<br>DN100 | 4.500<br>114.3 | 0–0.13<br>0–3.2 | 1°–36′ | 0.34<br>28 | 2 | ⅝ x 3¼ | 6.13<br>156 | 8.88<br>226 | 2.13<br>54 | 6.7<br>3.0 |
| | 4.250<br>108.0 | 0–0.13<br>0–3.2 | 1°–41′ | 0.35<br>29 | 2 | 16 x 82.5 | 6.00<br>152 | 8.63<br>219 | 2.13<br>54 | 11.0<br>5.0 |
| 5 | 5.563<br>141.3 | 0–0.13<br>0–3.2 | 1°–18′ | 0.27<br>23 | 2 | 2– ¾ x 4¼ | 7.75<br>197 | 10.65<br>270 | 2.13<br>54 | 10.6<br>4.8 |

[3] Allowable Pipe End Separation and Deflection figures show the maximum nominal range of movement available at each joint for standard **roll** grooved pipe. Figures for standard **cut** grooved pipe may be doubled. These figures are maximums; for design and installation purposes these figures should be reduced by: 50% for ¾ – 3 ½"/DN20 – DN90; 25% for 4"/DN100 and larger.

**NOTE**

- Metric thread size bolts are available (color coded gold) for all coupling sizes upon request. Contact Victaulic for details.

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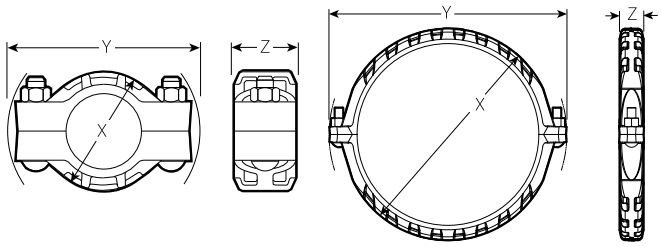
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## 4.0 DIMENSIONS (CONTINUED)

### Style 77




¾ – 12"/DN20 – DN300 sizes  14 – 24"/DN350 – DN600 sizes

| Size | | Pipe End Separation[3] | Deflection from Centerline[3] | | Bolt/Nut | | Dimensions | | | Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| Nominal<br>inches<br>DN | Actual Outside Diameter<br>inches<br>mm | Allowable<br>inches<br>mm | Per Cplg.<br>Degrees | Pipe<br>inches/ft.<br>mm/m | Qty. | Size<br>inches | X<br>inches<br>mm | Y<br>inches<br>mm | Z<br>inches<br>mm | Approx. (Each)<br>lb<br>kg |
| | 5.250<br>133.0 | 0–0.13<br>0–3.2 | 1°–21′ | 0.28<br>24 | 2 | 20 x 108 | 7.63<br>194 | 10.38<br>264 | 2.13<br>54 | 10.0<br>4.5 |
| DN125 | 5.500<br>139.7 | 0–0.13<br>0–3.2 | 1°–18′ | 0.28<br>24 | 2 | 20 x 108 | 8.63<br>219 | 10.65<br>270 | 2.13<br>54 | 10.0<br>4.5 |
| 6<br>DN150 | 6.625<br>168.3 | 0–0.13<br>0–3.2 | 1°–5′ | 0.23<br>18 | 2 | ¾ x 4¼ | 8.63<br>219 | 11.88<br>302 | 2.13<br>54 | 12.0<br>5.4 |
| | 6.250<br>159.0 | 0–0.13<br>0–3.2 | 1°–9′ | 0.24<br>20 | 2 | 20 x 108 | 8.63<br>219 | 11.50<br>292 | 2.13<br>54 | 13.2<br>6.0 |
| | 6.500<br>165.1 | 0–0.13<br>0–3.2 | 1°–6′ | 0.23<br>19 | 2 | ¾ x 4¼ | 8.88<br>226 | 11.63<br>295 | 2.13<br>54 | 13.2<br>6.0 |
| 8[4]<br>DN200 | 8.625<br>219.1 | 0–0.13<br>0–3.2 | 0°–50′ | 0.18<br>14 | 2 | ⅞ x 5 | 11.00<br>279 | 14.75<br>375 | 2.50<br>63 | 20.8<br>9.4 |
| 10[4]<br>DN250 | 10.750<br>273.0 | 0–0.13<br>0–3.2 | 0°–40′ | 0.14<br>12 | 2 | 1 x 6 | 13.63<br>346 | 17.13<br>435 | 2.63<br>67 | 27.8<br>12.6 |
| 12[4]<br>DN300 | 12.750<br>323.9 | 0–0.13<br>0–3.2 | 0°–34′ | 0.12<br>9 | 2 | 1 x 6½ | 15.63<br>397 | 19.25<br>489 | 2.63<br>67 | 31.1<br>14.1 |
| 14[5]<br>DN350 | 14.000<br>355.6 | 0–0.13<br>0–3.2 | 0°–31′ | 0.11<br>9 | 2 | 1 x 3½ | 16.75<br>425 | 20.25<br>514 | 3.00<br>76 | 39.2<br>17.8 |
| | 14.842<br>377.0 | 0–0.13<br>0–3.2 | 0°–31′ | 0.11<br>9 | 2 | 1 x 3½ | 17.39<br>442 | 20.96<br>531 | 2.80<br>71 | 48.8<br>22.1 |
| 16[5]<br>DN400 | 16.000<br>406.4 | 0–0.13<br>0–3.2 | 0°–27′ | 0.10<br>9 | 2 | 1 x 3½ | 18.75<br>476 | 22.25<br>565 | 3.00<br>76 | 45<br>20.4 |
| | 16.772<br>426.0 | 0–0.13<br>0–3.2 | 0°–27′ | 0.10<br>9 | 2 | 1 x 3½ | 19.69<br>500 | 22.92<br>581 | 2.92<br>74 | 56.7<br>25.7 |
| 18[5]<br>DN450 | 18.000<br>457.2 | 0–0.13<br>0–3.2 | 0°–24′ | 0.08<br>7 | 2 | 1⅛ x 4 | 21.56<br>548 | 25.00<br>635 | 3.13<br>80 | 64.1<br>29.1 |
| | 18.898<br>480.0 | 0–0.13<br>0–3.2 | 0°–24′ | 0.08<br>7 | 2 | 1⅛ x 4 | 22.38<br>569 | 25.86<br>655 | 3.04<br>77 | 77.2<br>35 |

3 Allowable Pipe End Separation and Deflection figures show the maximum nominal range of movement available at each joint for standard **roll** grooved pipe. Figures for standard **cut** grooved pipe may be doubled. These figures are maximums; for design and installation purposes these figures should be reduced by: 50% for ¾ – 3 ½"/DN20 – DN90; 25% for 4"/DN100 and larger.

4 Couplings 8, 10, 12"/DN200, DN250, DN300 sizes available to JIS standards. Refer to Victaulic publication 06.17 for details.

5 For 14 – 72"/DN350 – DN1800 Roll Groove systems Victaulic offers the Advanced Groove System (AGS) line of products. Refer to Victaulic publication 20.03 for information on the Style W77 flexible AGS coupling.

**NOTE**

- Metric thread size bolts are available (color coded gold) for all coupling sizes upon request. Contact Victaulic for details.

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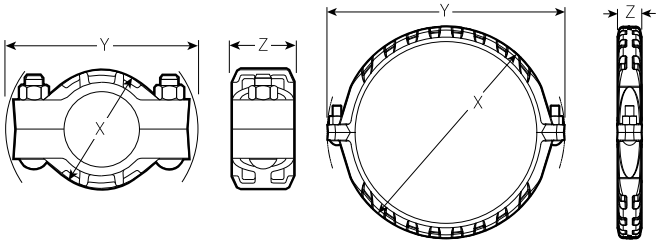
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## 4.0 DIMENSIONS (CONTINUED)

### Style 77




¾ – 12"/DN20 – DN300 sizes  14 – 24"/DN350 – DN600 sizes

| Size | | Pipe End Separation[3] | Deflection from Centerline[3] | | Bolt/Nut | | Dimensions | | | Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| Nominal<br>inches<br>DN | Actual Outside Diameter<br>inches<br>mm | Allowable<br>inches<br>mm | Per Cplg.<br>Degrees | Pipe<br>inches/ft.<br>mm/m | Qty. | Size<br>inches | X<br>inches<br>mm | Y<br>inches<br>mm | Z<br>inches<br>mm | Approx. (Each)<br>lb<br>kg |
| 20[5]<br>DN500 | 20.000<br>508.0 | 0–0.13<br>0–3.2 | 0º–22′ | 0.08<br>7 | 2 | 1⅛ x 4 | 23.63<br>600 | 27.00<br>686 | 3.13<br>80 | 74.8<br>34 |
| 22[5]<br>DN550 | 22.000<br>559.0 | 0–0.13<br>0–3.2 | 0º–19′ | 0.07<br>6 | 2 | 1⅛ x 4 | 25.63<br>651 | 29.13<br>740 | 3.13<br>80 | 82.6<br>37.5 |
| | 20.866<br>530.0 | 0–0.13<br>0–3.2 | 0º–22′ | 0.08<br>7 | 2 | 1⅛ x 4 | 24.29<br>617 | 27.80<br>704 | 3.07<br>77 | 91.7<br>41.6 |
| | 22.835<br>580.0 | 0–0.13<br>0–3.2 | 0º–19′ | 0.07<br>6 | 2 | 1⅛ x 4 | 26.76<br>680 | 30.01<br>762 | 3.12<br>79 | 92.8<br>42.2 |
| 24[5]<br>DN600 | 24.000<br>609.6 | 0–0.13<br>0–3.2 | 0º–18′ | 0.07<br>6 | 2 | 1⅛ x 4 | 27.75<br>705 | 31.00<br>787 | 3.19<br>81 | 89.6<br>40.7 |
| | 24.803<br>630.0 | 0–0.13<br>0–3.2 | 0º–18′ | 0.07<br>6 | 2 | 1⅛ x 4 | 28.42<br>722 | 32.16<br>817 | 3.12<br>79 | 96.8<br>44 |
| 14–72<br>DN350–<br>DN1800 | **AGS See Style W77, refer to Victaulic** publication 20.03 AGS™ | | | | | | | | | |

[3] Allowable Pipe End Separation and Deflection figures show the maximum nominal range of movement available at each joint for standard **roll** grooved pipe. Figures for standard **cut** grooved pipe may be doubled. These figures are maximums; for design and installation purposes these figures should be reduced by: 50% for ¾ – 3 ½"/DN20 – DN90; 25% for 4"/DN100 and larger.

[5] For 14 – 72"/DN350 – DN1800 Roll Groove systems Victaulic offers the Advanced Groove System (AGS) line of products. Refer to Victaulic publication 20.03 for information on the Style W77 flexible AGS coupling.

**NOTE**

- Metric thread size bolts are available (color coded gold) for all coupling sizes upon request. Contact Victaulic for details.

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## 5.0 PERFORMANCE

### Style 77

| Size | | Working Pressure[6] | End Load[6] |
|---|---|---|---|
| Nominal<br>inches<br>DN | Actual Outside Diameter<br>inches<br>mm | Maximum<br>psi<br>kPa | Maximum<br>lb<br>N |
| ¾<br>DN20 | 1.050<br>26.7 | 1000<br>6894 | 865<br>3,850 |
| 1<br>DN25 | 1.315<br>33.4 | 1000<br>6894 | 1360<br>6,050 |
| 1¼<br>DN32 | 1.660<br>42.2 | 1000<br>6894 | 2160<br>9,610 |
| 1½<br>DN40 | 1.900<br>48.3 | 1000<br>6894 | 2835<br>12,615 |
| 2<br>DN50 | 2.375<br>60.3 | 1000<br>6894 | 4430<br>19,715 |
| | 2.664<br>57.0 | 1000<br>6894 | 3955<br>17,592 |
| 2½ | 2.875<br>73.0 | 1000<br>6894 | 6490<br>28,880 |
| DN65 | 3.000<br>76.1 | 1000<br>6894 | 7070<br>31,460 |
| 3<br>DN80 | 3.500<br>88.9 | 1000<br>6894 | 9620<br>42,810 |
| 3½<br>DN90 | 4.000<br>101.6 | 1000<br>6894 | 12565<br>55,915 |
| 4<br>DN100 | 4.500<br>114.3 | 1000<br>6894 | 15900<br>70,755 |
| | 4.250<br>108.0 | 1000<br>6894 | 14180<br>63,100 |
| 5 | 5.563<br>141.3 | 1000<br>6894 | 24300<br>108,135 |

[6] Working Pressure and End Load are total, from all internal and external loads, based on standard weight (ANSI) steel pipe, standard **roll** or **cut** grooved in accordance with Victaulic specifications. Contact Victaulic for performance on other pipe.

**NOTE**

- WARNING: FOR ONE TIME FIELD TEST ONLY, the Maximum Joint Working Pressure may be increased to 1½ times the figures shown.

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## 5.0 PERFORMANCE (CONTINUED)

### Style 77

| Size | | Working Pressure[6] | End Load[6] |
|---|---|---|---|
| **Nominal**<br>inches<br>DN | **Actual Outside Diameter**<br>inches<br>mm | **Maximum**<br>psi<br>kPa | **Maximum**<br>lb<br>N |
| | 5.250<br>133.0 | 1000<br>6894 | 21635<br>96,275 |
| DN125 | 5.500<br>139.7 | 1000<br>6894 | 23745<br>105,665 |
| 6<br>DN150 | 6.625<br>168.3 | 1000<br>6894 | 34470<br>153,390 |
| | 6.250<br>159.0 | 1000<br>6894 | 30665<br>136,460 |
| | 6.500<br>165.1 | 1000<br>6894 | 33185<br>147,660 |
| 8[4]<br>DN200 | 8.625<br>219.1 | 800<br>5515 | 46740<br>207,995 |
| 10[4]<br>DN250 | 10.750<br>273.0 | 800<br>5515 | 73280<br>326,100 |
| 12[4]<br>DN300 | 12.750<br>323.9 | 800<br>5515 | 102000<br>453,900 |
| 14[5]<br>DN350 | 14.000<br>355.6 | 300<br>2068 | 46180<br>205,500 |
| | 14.842<br>377.0 | 300<br>2068 | 51875<br>230,845 |
| 16[5]<br>DN400 | 16.000<br>406.4 | 300<br>2068 | 60320<br>268,425 |
| | 16.772<br>426.0 | 300<br>2068 | 66245<br>294,795 |
| 18[5]<br>DN450 | 18.000<br>457.2 | 300<br>2068 | 76340<br>339,710 |
| | 18.898<br>480.0 | 300<br>2068 | 84105<br>374,265 |
| 20[5]<br>DN500 | 20.000<br>508.0 | 300<br>2068 | 94000<br>418,300 |
| 22[5]<br>DN550 | 22.000<br>559.0 | 300<br>2068 | 114000<br>507,300 |
| | 20.866<br>530.0 | 300<br>2068 | 102535<br>456,280 |
| | 22.835<br>580.0 | 300<br>2068 | 102380<br>455,591 |
| 24[5]<br>DN600 | 24.000<br>609.6 | 250<br>1723 | 113000<br>502,850 |
| | 24.803<br>630.0 | 250<br>1723 | 102790<br>457,416 |
| 14–72<br>DN350–DN1800 | **AGS See Style W77, refer to Victaulic** publication 20.03<br>AGS™ | | |

4 Couplings 8, 10, 12"/DN200, DN250, DN300 sizes available to JIS standards. Refer to Victaulic publication 06.17 for details.

5 For 14 – 72"/DN350 – DN1800 Roll Groove systems Victaulic offers the Advanced Groove System (AGS) line of products. Refer to Victaulic publication 20.03 for information on the Style W77 flexible AGS coupling.

6 Working Pressure and End Load are total, from all internal and external loads, based on standard weight (ANSI) steel pipe, standard **roll** or **cut** grooved in accordance with Victaulic specifications. Contact Victaulic for performance on other pipe.

**NOTE**

- WARNING: FOR ONE TIME FIELD TEST ONLY, the Maximum Joint Working Pressure may be increased to 1½ times the figures shown.

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## 6.0 NOTIFICATIONS

- For 14 – 72"/DN350 – DN1800 flexible roll groove systems, Victaulic recommends Style W77 AGS couplings. For more information, refer to Victaulic publication 20.03.

**⚠WARNING**

- **Victaulic RX roll sets must be used when grooving light-wall/thin-wall stainless steel pipe for use with Victaulic Couplings.**

**Failure to use Victaulic RX roll sets when grooving light-wall/thin-wall stainless steel pipe may cause joint failure, resulting in serious personal injury and/or property damage.**

**NOTICE**

- **Victaulic RX grooving rolls must be ordered separately. They are identified by a silver color and the designation RX on the front of the roll sets.**

## 7.0 REFERENCE MATERIALS

I-100: Victaulic Field Installation Handbook
02.06: Victaulic Potable Water Approvals ANSI/NSF
05.01: Victaulic Seal Selection Guide
06.15: Victaulic Pressure Ratings and End Loads for Victaulic® Couplings on Steel Pipe
06.17: Victaulic Couplings and Fittings for JIS Pipe
10.01: Victaulic Products for Fire Protection Piping Systems - Regulatory Approval
17.01: Victaulic Pipe Preparation for Use on Stainless Steel Pipe With Victaulic Products
17.09: Victaulic Ductile Iron Grooved Couplings Performance Data for Stainless Steel Pipe
20.03: Victaulic AGS Flexible Coupling Style W77
25.01: Victaulic Original Groove System (OGS) Groove Specifications
26.01: Victaulic Design Data
26.04: Victaulic Couplings Vibration Attenuation Characteristics
29.01: Victaulic Terms and Conditions of Sale
I-ENDCAP: Victaulic End Caps Installation Instructions

**User Responsibility for Product Selection and Suitability**
Each user bears final responsibility for making a determination as to the suitability of Victaulic products for a particular end-use application, in accordance with industry standards and project specifications, and the applicable building codes and related regulations as well as Victaulic performance, maintenance, safety, and warning instructions. Nothing in this or any other document, nor any verbal recommendation, advice, or opinion from any Victaulic employee, shall be deemed to alter, vary, supersede, or waive any provision of Victaulic Company's standard conditions of sale, installation guide, or this disclaimer.

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**Note**
This product shall be manufactured by Victaulic or to Victaulic specifications. All products to be installed in accordance with current Victaulic installation/assembly instructions. Victaulic reserves the right to change product specifications, designs and standard equipment without notice and without incurring obligations.

**Installation**
Reference should always be made to the Victaulic installation handbook or installation instructions of the product you are installing. Handbooks are included with each shipment of Victaulic products, providing complete installation and assembly data, and are available in PDF format on our website at www.victaulic.com.

**Warranty**
Refer to the Warranty section of the current Price List or contact Victaulic for details.

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# Mechanical-T® Bolted Branch Outlets

SEE VICTAULIC PUBLICATION 10.01 FOR DETAILS

## STYLES 920 AND 920N



STYLES 920 AND 920N



STYLE 920 CROSS

PATENTED

Victaulic Mechanical-T® Outlet provides a direct branch connection at any location a hole can be cut in pipe. The hole is cut oversize to receive a "holefinder" locating collar which secures the outlet in position permanently. A pressure responsive gasket seals on the pipe O.D.

Cross-type connections can be achieved by utilizing two upper housings of the same style and size, with the same or differing branch size connections. NOTE: Style 920 and Style 920N housings cannot be mated to each other to achieve a cross connection.

Style 920 and Style 920N Mechanical-T outlets are available with grooved or female threaded outlet. Specify choice on order. Units are supplied painted with plated bolts. Galvanized housings are available, supplied with plated bolts.

All sizes of Style 920 and 920N are rated at 500 psi/3450 kPa working pressure on Schedule 10 and 40 carbon steel pipe. They may also be used on high density polyethylene or polybutylene (HDPE) pipe. Pressure ratings on HDPE are dependent on the pipe rating. Contact Victaulic for ratings on other pipe. **Style 920 and 920N are not recommended for use on PVC plastic pipe.**

Standard piping practices dictate that the Mechanical-T Styles 920 and 920N must be installed so that the main and branch connections are a true 90° angle when permanently attached to the pipeline surface.

Additionally, the Vic-Tap II® hole cutting tool, which allows for hole cutting capabilities on pressurized systems, utilizes the Style 920 Mechanical-T in conjunction with the Series 726 Vic-Ball Valve to create the Style 931 Vic-Tap II Mechanical-T unit. See page 8 for further information.

## MATERIAL SPECIFICATIONS

**Housing/Coating:** Ductile iron conforming to ASTM A-536, grade 65-45-12, with orange enamel coating. Ductile iron conforming to ASTM A-395, grade 65-45-15, is available upon special request.

- **Optional:** Hot dipped galvanized

**Gasket: (Specify choice*)**

- **Grade "E" EPDM**
  EPDM (Green color code). Temperature range –30°F to +230°F/–34°C to +110°C. Recommended for cold and hot water service within the specified temperature range plus a variety of dilute acids, oil-free air and many chemical services. UL Classified in accordance with ANSI/NSF 61 for cold +86°F/+30°C and hot +180°F/+82°C. NOT RECOMMENDED FOR PETROLEUM SERVICES.

- **Grade "T" nitrile**
  Nitrile (Orange color code). Temperature range –20°F to +180°F/–29°C to +82°C. Recommended for petroleum products, air with oil vapors, vegetable and mineral oils within the specified temperature range. Not recommended for hot water services over +150°F/+66°C or for hot dry air over +140°F/+60°C.

*Services listed are General Service Recommendations only. It should be noted that there are services for which these gaskets are not recommended. Reference should always be made to the latest Victaulic Gasket Selection Guide for specific gasket service recommendations and for a listing of services which are not recommended.

**Bolts/Nuts:** Heat-treated plated carbon steel, trackhead meeting the physical and chemical requirements of ASTM A-449 and physical requirements of ASTM A-183.

**JOB/OWNER**

System No. _____

Location _____

**CONTRACTOR**

Submitted By _____

Date _____

**ENGINEER**

Spec Sect _____ Para _____

Approved _____

Date _____



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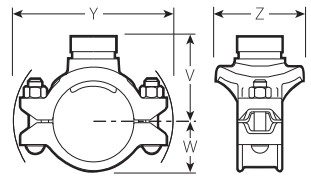
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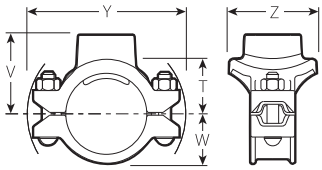
# Mechanical-T® Bolted Branch Outlets

**STYLES 920 AND 920N**

## DIMENSIONS




GROOVED OUTLET




FEMALE THREADED OUTLET

- Provides a direct branch connection at any location where a hole can be cut in the pipe
- A pressure responsive gasket provides the seal
- Request Publication 11.03 for Mechanical-T cross assemblies
- Pressure rated up to 500 psi/3450 kPa on steel pipe; also available for use with HDPE pipe
- Sizes from 2 × ½"/50 × 15 mm through 8 × 4"/200 × 100 mm

**IMPORTANT NOTES:**

Style 920 and Style 920N housings cannot be mated to one another to achieve cross connections.

| Size | | Style No. | Max. Work Pressure@ | Dimensions | | | | | | | Approx. Weight Each | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Run × Branch Nominal Size Inches mm | | 920 or 920N | psi kPa | Hole Diameter +0.13 -0.00 | T** Inches mm | V ‡ # Thd. Inches mm | V ‡ Grv. Inches mm | W Inches mm | Y Inches mm | Z Inches mm | Female Thd. Lbs. kg | Grv. Lbs. kg |
| 2 50 | × ½ (a) ¤ 15 | 920N | 500 3450 | 1.50 38.1 | 2.00 51 | 2.53 64 | — | 1.61 41 | 5.35 136 | 2.75 70 | 3.1 1.5 | — |
| | ¾ (a) ¤ 20 | 920N | 500 3450 | 1.50 38.1 | 1.97 50 | 2.53 64 | — | 1.61 41 | 5.35 136 | 2.75 70 | 3.1 1.5 | — |
| | 1 (a) ¤ 25 | 920N | 500 3450 | 1.50 38.1 | 1.85 47 | 2.53 64 | — | 1.61 41 | 5.35 136 | 2.75 70 | 3.0 1.4 | — |
| | 1 ¼ (a) †¤ 32 | 920N | 500 3450 | 1.75 44.5 | 2.05 52 | 2.75 70 | 3.00 76 | 1.61 41 | 5.35 136 | 3.00 76 | 3.5 1.7 | 3.2 1.5 |
| | 1 ½ (a) †¤ 40 | 920N | 500 3450 | 1.75 44.5 | 2.03 52 | 2.75 70 | 3.12 79 | 1.61 41 | 5.35 136 | 3.25 83 | 3.6 1.7 | 3.2 1.5 |
| 2 ½ 65 | × ½ (a) §¤ 15 | 920N | 500 3450 | 1.50 38.1 | 2.21 56 | 2.74 70 | — | 1.82 46 | 5.64 143 | 2.75 70 | 3.0 1.4 | — |
| | ¾ (a) §¤ 20 | 920N | 500 3450 | 1.50 38.1 | 2.18 55 | 2.74 70 | — | 1.82 46 | 5.64 143 | 2.75 70 | 3.0 1.4 | — |
| | 1 (a) §¤ 25 | 920N | 500 3450 | 1.50 38.1 | 2.06 52 | 2.74 70 | — | 1.82 46 | 5.64 143 | 2.75 70 | 2.9 1.4 | — |
| | 1 ¼ † (a) ¤ 32 | 920N | 500 3450 | 1.75 44.5 | 2.30 58 | 3.00 76 | 3.25 83 | 1.82 46 | 6.29 160 | 3.00 76 | 3.5 1.7 | 3.2 1.5 |
| | 1 ½ † (a) ¤ 40 | 920N | 500 3450 | 2.00 50.8 | 2.28 58 | 3.00 76 | 3.25 83 | 1.82 46 | 6.26 159 | 3.25 83 | 3.6 1.7 | 3.3 1.6 |
| 76.1 | × ½ (a) 15 | 920N | 300 2065 | 1.50 38.1 | 2.22 56 | 2.75 70 | — | 2.25 57 | 6.46 164 | 3.18 81 | 3.9 1.8 | — |
| | ¾ (a) 20 | 920N | 300 2065 | 1.50 38.1 | 2.19 56 | 2.75 70 | — | 2.25 57 | 6.46 164 | 3.18 81 | 3.9 1.8 | — |
| | 1 (a) 25 | 920N | 300 2065 | 1.50 38.1 | 2.07 53 | 2.75 70 | — | 2.25 57 | 6.46 164 | 3.18 81 | 3.8 1.7 | — |
| | 1 ¼ (a) ¤ 32 | 920N | 500 3450 | 1.75 44.5 | 2.30 58 | 3.00 76 | 3.31 84 | 1.92 49 | 6.29 160 | 3.00 76 | 3.5 1.6 | 3.2 1.5 |
| | 1 ½ (a) ¤ 40 | 920N | 500 3450 | 2.00 50.8 | 2.28 58 | 3.00 76 | 3.31 84 | 1.92 49 | 6.29 160 | 3.25 83 | 3.5 1.6 | 3.3 1.5 |
| 3 80 | × ½ (a) ¤ 15 | 920N | 500 3450 | 1.50 38.1 | 2.52 64 | 3.05 78 | — | 2.28 58 | 6.15 156 | 2.75 70 | 3.4 1.6 | — |
| | ¾ (a) ¤ 20 | 920N | 500 3450 | 1.50 38.1 | 2.49 63 | 3.05 78 | — | 2.28 58 | 6.15 156 | 2.75 70 | 3.4 1.6 | — |
| | 1 (a) 25 | 920N | 500 3450 | 1.50 38.1 | 2.38 61 | 3.06 78 | — | 2.28 58 | 6.15 156 | 2.75 70 | 3.3 1.6 | — |
| | 1 ¼ (a) †¤ 32 (b) | 920N | 500 3450 | 1.75 44.5 | 2.55 65 | 3.25 83 | 3.56 90 | 2.28 58 | 6.15 156 | 3.00 76 | 3.8 1.8 | 3.7 1.8 |
| | 1 ½ (a) †¤ 40 (b) | 920N | 500 3450 | 2.00 50.8 | 2.78 71 | 3.50 89 | 3.56 90 | 2.28 58 | 6.15 156 | 3.25 83 | 4.1 1.9 | 3.8 1.8 |
| | 2 (a) ¤ 50 | 920N | 500 3450 | 2.50 63.5 | 2.75 70 | 3.50 89 | 3.56 90 | 2.28 58 | 6.75 172 | 3.88 99 | 4.9 2.3 | 4.6 2.1 |
| 3 ½ 90 | × 2 50 | 920N | 500 3450 | 2.50 63.5 | 3.00 76 | — | 3.75 95 | 2.44 62 | 6.72 171 | 3.88 99 | — | 3.8 1.8 |

TABLE CONTINUED ON PG. 3

** Center of run to engaged pipe end, female threaded outlet only (dimensions approximate).

† Available with grooved or female threaded outlet. Specify choice on order.

‡ Center of run to end of fitting.

# Female threaded outlets are available to NPT and BSPT specifications.

@ See page 7 for Fire Protection approvals and pressure ratings.

(a) British Standard female pipe threaded outlet is available as listed. Specify "BSPT" clearly on order.

(b) For 76.1 mm threaded outlet, specify 2½" BSPT clearly on order.

§ Vds approved for fire protection services

¤ LPCB approved for fire protection services

Ø Approved for use in China by Tianjin Approvals Company.



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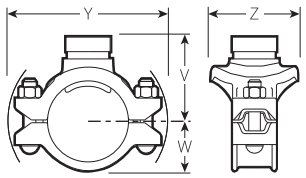
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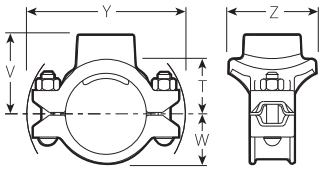
# Mechanical-T® Bolted Branch Outlets

**STYLES 920 AND 920N**

## DIMENSIONS




GROOVED OUTLET




FEMALE THREADED OUTLET

- Provides a direct branch connection at any location where a hole can be cut in the pipe
- A pressure responsive gasket provides the seal
- Request Publication 11.03 for Mechanical-T cross assemblies
- Pressure rated up to 500 psi/3450 kPa on steel pipe; also available for use with HDPE pipe
- Sizes from 2 × ½"/50 × 15 mm through 8 × 4"/200 × 100 mm

| Size | | | Style No. | Max. Work Pressure@ | Dimensions | | | | | | | Approx. Weight Each | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Run × Branch Nominal Size Inches mm | | | 920 or 920N | psi kPa | Hole Diameter +0.13 -0.00 | T** Inches mm | V ‡ # Thd. Inches mm | V ‡ Grv. Inches mm | W Inches mm | Y Inches mm | Z Inches mm | Female Thd. Lbs. kg | Grv. Lbs. kg |
| TABLE CONTINUED FROM PAGE 2 | | | | | | | | | | | | | |
| 4 100 | × | ½ (a) ¤ 15 | 920N | 500 3450 | 1.50 38.1 | 3.03 77 | 3.56 90 | — | 2.69 68 | 7.01 178 | 2.75 70 | 3.7 1.8 | — |
| | | ¾ (a) ¤ 20 | 920N | 500 3450 | 1.50 38.1 | 3.00 76 | 3.56 90 | — | 2.69 68 | 7.01 178 | 2.75 70 | 3.7 1.8 | — |
| | | 1 (a) ¤ 25 | 920N | 500 3450 | 1.50 38.1 | 2.88 73 | 3.56 90 | — | 2.69 68 | 7.01 178 | 2.75 70 | 3.6 1.8 | — |
| | | 1 ¼ (a) †¤ 32 (b) | 920N | 500 3450 | 1.75 44.5 | 3.08 78 | 3.78 96 | 4.00 102 | 2.69 68 | 7.01 178 | 3.00 76 | 4.0 1.9 | 3.6 1.8 |
| | | 1 ½ (a) †¤ 40 (b) | 920N | 500 3450 | 2.00 50.8 | 3.28 83 | 4.00 102 | 4.00 102 | 2.69 68 | 7.01 178 | 3.25 83 | 4.2 2.0 | 3.9 1.9 |
| | | 2 (a) †¤ 50 | 920N | 500 3450 | 2.50 63.5 | 3.25 83 | 4.00 102 | 4.00 102 | 2.69 68 | 7.01 178 | 3.88 99 | 5.0 2.3 | 4.6 2.1 |
| | | 2½ (a) † 65 | 920 | 500 3450 | 2.75 69.9 | 2.88 73 | 4.00 102 | 4.00 102 | 2.69 68 | 7.34 186 | 4.63 118 | 5.8 2.6 | 5.0 2.3 |
| | | 76.1 mm | 920 | 500 3450 | 2.75 69.9 | 2.88 73 | — | 4.00 102 | 2.69 68 | 7.34 186 | 4.63 118 | — | 6.4 2.9 |
| | | 3 (a) † 80 | 920 | 500 3450 | 3.50 88.9 | 3.31 84 | 4.50 114 | 4.12 105 | 2.69 68 | 7.73 196 | 5.12 130 | 8.4 3.8 | 6.4 2.9 |
| 108.0 | × | 1 ¼ (a)¤ 32 | 920N | 500 3450 | 1.75 44.5 | 3.08 78 | 3.78 96 | — | 2.63 67 | 7.64 194 | 3.05 78 | 5.0 2.3 | — |
| | | 1 ½ (a)¤ 40 | 920N | 500 3450 | 2.00 50.8 | 3.28 83 | 4.00 102 | — | 2.63 67 | 7.64 194 | 3.25 83 | 5.0 2.3 | — |
| | | 2 (a) 50 | 920N | 500 3450 | 2.50 63.5 | 3.25 83 | 4.00 102 | — | 2.63 67 | 7.64 194 | 4.00 102 | 4.0 1.9 | — |
| | | 76.1 mm | 920 | 500 3450 | 2.75 69.9 | 2.88 73 | 4.00 102 | 4.00 102 | 2.63 67 | 7.64 194 | 4.29 109 | 8.0 3.6 | 7.8 3.5 |
| | | 3 (a) 80 | 920 | 500 3450 | 3.50 88.9 | 3.31 84 | 4.50 114 | 4.50 114 | 2.63 67 | 7.63 194 | 4.88 124 | 6.8 3.1 | 6.5 3.0 |
| 5 125 | × | 1 ½ (a) † 40 | 920 | 500 3450 | 2.00 50.8 | 4.03 102 | 4.75 121 | 4.75 121 | 3.16 80 | 9.70 246 | 3.69 94 | 7.4 3.4 | 7.6 3.4 |
| | | 2 (a) † 50 | 920 | 500 3450 | 2.50 63.5 | 4.00 102 | 4.75 121 | 4.75 121 | 3.16 80 | 9.70 246 | 4.38 111 | 8.2 3.7 | 8.0 3.6 |
| | | 2½ (a) † 65 | 920 | 500 3450 | 2.75 69.9 | 3.63 92 | 4.75 121 | 4.75 121 | 3.16 80 | 9.70 246 | 4.63 118 | 8.3 3.8 | 7.9 3.6 |
| | | 76.1 mm ¤ | 920 | 500 3450 | 2.75 69.9 | 3.75 95 | — | 4.75 121 | 3.16 80 | 9.70 246 | 4.63 118 | — | 8.0 3.6 |
| | | 3 (a) † 80 | 920 | 500 3450 | 3.50 88.9 | 3.81 97 | 5.00 127 | 4.63 118 | 3.16 80 | 9.70 246 | 5.31 135 | 8.4 3.8 | 8.8 4.0 |
| 133.0 | × | 2 50 | 920N | 500 3450 | 2.50 63.5 | 3.75 95 | 4.50 114 | — | 3.17 81 | 8.00 203 | 3.88 99 | 8.0 3.6 | — |
| | | 3 80 | 920 | 500 3450 | 3.50 88.9 | 3.81 97 | 5.00 127 | — | 3.00 76 | 9.46 240 | 5.31 135 | 8.0 3.6 | — |
| TABLE CONTINUED ON PG. 4 | | | | | | | | | | | | | |

**IMPORTANT NOTES:**

Style 920 and Style 920N housings cannot be mated to one another to achieve cross connections.

** Center of run to engaged pipe end, female threaded outlet only (dimensions approximate).

† Available with grooved or female threaded outlet. Specify choice on order.

‡ Center of run to end of fitting.

# Female threaded outlets are available to NPT and BSPT specifications.

@ See page 7 for Fire Protection approvals and pressure ratings.

(a) British Standard female pipe threaded outlet is available as listed. Specify "BSPT" clearly on order.

(b) For 76.1 mm threaded outlet, specify 2½" BSPT clearly on order.

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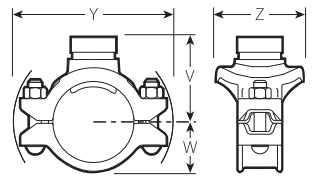
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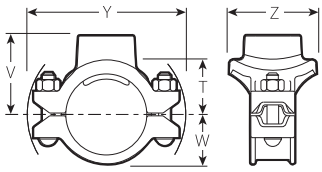
# Mechanical-T® Bolted Branch Outlets

**STYLES 920 AND 920N**

## DIMENSIONS




GROOVED OUTLET




FEMALE THREADED OUTLET

- Provides a direct branch connection at any location where a hole can be cut in the pipe
- A pressure responsive gasket provides the seal
- Request Publication 11.03 for Mechanical-T cross assemblies
- Pressure rated up to 500 psi/3450 kPa on steel pipe; also available for use with HDPE pipe
- Sizes from 2 × ½"/50 × 15 mm through 8 × 4"/200 × 100 mm

**IMPORTANT NOTES:**

Style 920 and Style 920N housings cannot be mated to one another to achieve cross connections.

| Size | | Style No. | Max. Work Pressure@ | Dimensions | | | | | | | Approx. Weight Each | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Run × Branch Nominal Size Inches mm | | 920 or 920N | psi kPa | Hole Diameter +0.13 -0.00 | T** Inches mm | V ‡ # Thd. Inches mm | V ‡ Grv. Inches mm | W Inches mm | Y Inches mm | Z Inches mm | Female Thd. Lbs. kg | Grv. Lbs. kg |
| TABLE CONTINUED FROM PAGE 3 | | | | | | | | | | | | |
| 139.7 × | 1½ † 40 | 920N | 500 3450 | 2.00 50.8 | 3.78 96 | 4.50 114 | — | 3.30 84 | 8.23 209 | 3.25 83 | 7.0 3.2 | — |
| | 2 † 50 | 920N | 500 3450 | 2.50 63.5 | 3.75 95 | 4.50 114 | — | 3.30 84 | 8.23 209 | 3.88 99 | 9.0 4.1 | — |
| 6 150 × | 1¼ (a) 32 (b) | 920N | 500 3450 | 1.75 44.5 | 4.43 112 | 5.13 130 | 5.13 130 | 3.79 96 | 9.15 232 | 3.25 83 | 5.1 2.3 | 4.8 2.2 |
| | 1½ (a) †¤ 40 (b) | 920N | 500 3450 | 2.00 50.8 | 4.40 112 | 5.13 130 | 5.13 130 | 3.79 96 | 9.15 232 | 3.25 83 | 5.4 2.4 | 5.1 2.3 |
| | 2 (a) †¤ 50 | 920N | 500 3450 | 2.50 63.5 | 4.38 111 | 5.13 130 | 5.13 130 | 3.79 96 | 9.15 232 | 3.88 99 | 6.0 2.7 | 5.6 2.5 |
| | 2½ 65 | 920 | 500 3450 | 2.75 69.9 | 4.01 110 | 5.13 130 | 5.12 130 | 3.69 94 | 10.51 267 | 4.63 118 | 8.3 3.8 | 7.6 3.4 |
| | 76.1 mm ¤ | 920 | 500 3450 | 2.75 69.9 | 4.15 105 | — | 5.21 132 | 3.69 94 | 10.51 267 | 4.63 118 | — | 8.4 3.8 |
| | 3 (a) † 80 | 920 | 500 3450 | 3.50 88.9 | 4.31 110 | 5.50 140 | 5.13 130 | 3.69 94 | 10.51 267 | 5.31 135 | 9.9 4.5 | 8.4 3.8 |
| | 4 (a) †¤ 100 | 920 | 500 3450 | 4.50 114.3 | 3.81 97 | 5.75 146 | 5.38 137 | 3.69 94 | 10.51 267 | 6.25 159 | 10.1 4.6 | 10.1 4.6 |
| 159.0 × | 1½ (a) 40 | 920N | 500 3450 | 2.00 50.8 | 4.41 112 | 5.13 130 | — | 3.63 92 | 9.40 239 | 3.25 83 | 7.8 3.5 | — |
| | 2 (a) 50 | 920N | 500 3450 | 2.50 63.5 | 4.38 111 | 5.13 130 | — | 3.63 92 | 9.40 239 | 3.88 99 | 8.0 3.6 | — |
| | 76.1 mm | 920 | 500 3450 | 2.75 69.9 | 4.38 111 | 5.50 140 | 5.13 130 | 3.63 92 | 9.40 239 | 4.63 118 | 9.5 4.3 | 9.5 4.3 |
| | 3 80 | 920 | 500 3450 | 3.50 88.9 | 4.31 110 | 5.50 140 | 5.13 130 | 3.63 92 | 9.40 239 | 5.31 135 | 8.1 3.7 | 14.0 6.4 |
| | 108.0 mm | 920 | 500 3450 | 4.50 114.3 | 4.45 113 | — | 5.38 137 | 3.63 92 | 9.40 239 | 6.12 155 | — | 10.0 4.5 |
| | 4 100 | 920 | 500 3450 | 4.50 114.3 | 3.81 96.80 | 5.75 146 | — | 3.63 92 | 9.40 239 | 6.25 159 | 18.0 8.2 | — |
| TABLE CONTINUED ON PG. 5 | | | | | | | | | | | | |

** Center of run to engaged pipe end, female threaded outlet only (dimensions approximate).

† Available with grooved or female threaded outlet. Specify choice on order.

‡ Center of run to end of fitting.

# Female threaded outlets are available to NPT and BSPT specifications.

@ See page 7 for Fire Protection approvals and pressure ratings.

(a) British Standard female pipe threaded outlet is available as listed. Specify "BSPT" clearly on order.

(b) For 76.1 mm threaded outlet, specify 2½" BSPT clearly on order.

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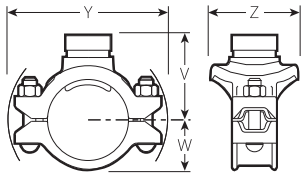
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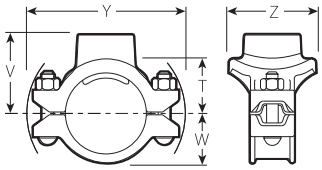
# Mechanical-T® Bolted Branch Outlets

**STYLES 920 AND 920N**

## DIMENSIONS




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- Request Publication 11.03 for Mechanical-T cross assemblies
- Pressure rated up to 500 psi/3450 kPa on steel pipe; also available for use with HDPE pipe
- Sizes from 2 × ½"/50 × 15 mm through 8 × 4"/200 × 100 mm

| Size | | Style No. | Max. Work Pressure@ | Dimensions | | | | | | | Approx. Weight Each | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Run × Branch Nominal Size Inches mm | | 920 or 920N | psi kPa | Hole Diameter +0.13 -0.00 | T** Inches mm | V ‡ # Thd. Inches mm | V ‡ Grv. Inches mm | W Inches mm | Y Inches mm | Z Inches mm | Female Thd. Lbs. kg | Grv. Lbs. kg |
| TABLE CONTINUED FROM PAGE 4 | | | | | | | | | | | | |
| 165.1 × | 1 25 | 920N | 500 3450 | 1.50 38.1 | 3.88 99 | 4.56 116 | — | 3.79 96 | 9.34 237 | 2.75 70 | 8.0 3.6 | — |
| | 1 ¼ ¤ 32 | 920N | 500 3450 | 1.75 44.5 | 4.43 113 | 5.13 130 | — | 3.79 96 | 9.34 237 | 3.25 83 | 8.4 3.8 | — |
| | 1 ½ (a) †¤ 40 | 920N | 500 3450 | 2.00 50.8 | 4.41 112 | 5.13 130 | 5.13 130 | 3.79 96 | 9.34 237 | 3.25 83 | 8.4 3.8 | 5.4 2.4 |
| | 2 (a) † 50 | 920N | 500 3450 | 2.50 63.5 | 4.38 111 | 5.13 130 | 5.13 130 | 3.79 96 | 9.34 237 | 3.88 99 | 8.5 3.9 | 6.0 2.7 |
| | 76.1 mm | 920 | 500 3450 | 2.75 69.9 | 4.01 110 | 5.13 130 | 5.21 132 | 3.63 92 | 10.51 267 | 4.63 118 | 8.6 3.9 | 7.6 3.4 |
| | 3 (a) † ø 80 | 920 | 500 3450 | 3.50 88.9 | 4.31 110 | 5.50 140 | 5.13 130 | 3.63 92 | 10.51 267 | 5.31 135 | 10.2 4.6 | 8.4 3.8 |
| | 4 (a) †¤ 100 | 920 | 500 3450 | 4.50 114.3 | 3.81 97 | 5.75 146 | 5.38 137 | 3.63 92 | 10.51 267 | 6.25 159 | 10.5 4.8 | 8.4 3.8 |
| 8 200 × | 2 (a) † 50 | 920 | 500 3450 | 2.75 69.9 | 5.44 138 | 6.19 157 | 6.25 159 | 4.81 122 | 12.42 316 | 4.50 114 | 11.6 5.3 | 11.6 5.3 |
| | 2½ (a) † 65 | 920 | 500 3450 | 2.75 69.9 | 5.07 129 | 6.19 157 | 6.19 157 | 4.81 122 | 12.42 316 | 4.50 114 | 11.6 5.3 | 11.6 5.3 |
| | 76.1 mm ¤ | 920 | 500 3450 | 2.75 69.9 | 5.25 133 | — | 6.25 159 | 4.81 122 | 12.42 316 | 4.56 116 | — | 11.6 5.3 |
| | 3 (a) †¤ 80 | 920 | 500 3450 | 3.50 88.9 | 5.31 135 | 6.50 165 | 6.50 165 | 4.81 122 | 12.42 316 | 5.31 135 | 12.6 5.7 | 11.6 5.3 |
| | 4 (a) †¤ 100 | 920 | 500 3450 | 4.50 114.3 | 4.81 122 | 6.75 171 | 6.38 162 | 4.81 122 | 12.42 316 | 6.25 159 | 15.3 6.9 | 12.5 5.7 |

** Center of run to engaged pipe end, female threaded outlet only (dimensions approximate).

† Available with grooved or female threaded outlet. Specify choice on order.

‡ Center of run to end of fitting.

# Female threaded outlets are available to NPT and BSPT specifications.

@ See page 7 for Fire Protection approvals and pressure ratings.`

(a) British Standard female pipe threaded outlet is available as listed. Specify "BSPT" clearly on order.

(b) For 76.1 mm threaded outlet, specify 2½" BSPT clearly on order.

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Ø Approved for use in China by Tianjin Approvals Company.

**IMPORTANT NOTES:**

Style 920 and Style 920N housings cannot be mated to each other to achieve cross connections.



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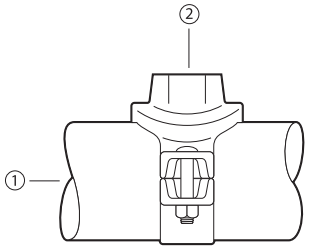
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# Mechanical-T® Bolted Branch Outlets

**STYLES 920 AND 920N**

## FLOW DATA




*Exaggerated for clarity*

Flow test data has shown that the total head loss between point (1) and (2) for the Style 920, 920N and 929 Mechanical-T® fittings can best be expressed in terms of the pressure difference across the inlet and branch. The pressure difference can be obtained from the relationship below.

### $C_V$ and Kv Values

Values for flow of water at +60°F/+16°C are shown in the table below.

### Formulas for $C_V$ /$K_V$ Values:

$$\Delta P = \frac{Q^2}{C_v^2}$$

$$Q = C_v \times \sqrt{\Delta P}$$

**Where:**
Q = Flow (GPM)
ΔP = Pressure Drop (psi)
$C_v$ = Flow Coefficient

$$\Delta P = \frac{Q^2}{K_v^2}$$

$$Q = K_v \times \sqrt{\Delta P}$$

**Where:**
Q = Flow ($m^3$/hr)
ΔP = Pressure Drop (Bar)
$K_v$ = Flow Coefficient

| OUTLET SIZE | | Equivalent Length of Outlet Size Schedule 40 Carbon Steel Pipe (per UL 213, Sec. 16) (C = 120)ŧ FT | | $C_V/K_V$ Values | |
|---|---|---|---|---|---|
| NOMINAL DIAMETER In/mm | ACTUAL O.D. In/mm | GROOVED | THREADED | GROOVED | THREADED |
| ½<br>15 | 0.840<br>21.3 | - | 2 | - | 11<br>9.4 |
| ¾<br>20 | 1.050<br>26.7 | - | 4 | - | 16<br>13.7 |
| 1<br>25 | 1.315<br>33.7 | 3** | 8 | - | 21<br>1.8 |
| 1 ¼<br>32 | 1.660<br>42.7 | 5 ½ | 6 | 50<br>42.9 | 48<br>41.1 |
| 1 ½<br>40 | 1.900<br>48.3 | 11 | 11 | 53<br>45.4 | 53<br>45.4 |
| 2<br>50 | 2.375<br>60.3 | 9 | 10 ½ | 112<br>96 | 104<br>89.1 |
| 2 ½<br>65 | 2.875<br>73.0 | 20 | 12 ½ | 119<br>102 | 150<br>128.5 |
| 76.1 mm | 3.000<br>76.1 | 16* | - | 161<br>138.1 | - |
| 3<br>80 | 3.500<br>88.9 | 14 | 15 ½ | 249<br>213.4 | 237<br>203.1 |
| 4<br>100 | 4.500<br>114.3 | 20 | 22 | 421<br>360.8 | 401<br>343.6 |

ŧ Hazen-Williams coefficient of friction is 120.
* Pipe with a wall thickness of 0.165in./4.2mm.
** 1" FireLock™ Innovative Groove System (IGS) outlet



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# Mechanical-T® Bolted Branch Outlets

**STYLES 920 AND 920N**

## FIRE PROTECTION APPROVALS AND PRESSURE RATINGS

The information provided below is based on the latest listing and approval data at the time of publication. Listings/Approvals are subject to change and/or additions by the approvals agencies. Contact Victaulic for performance on other pipe and the latest listings and approvals.

| Run Size | | Outlet Size | Pipe | Approval Agency Rated Working Pressures – psi/kPa | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Vds | |
| Nominal Size Inches/mm | Actual Outside Diameter Inches/mm | Inches/mm | Schedule | UL | ULC | FM | LPCB | (Style 920) | (Style 920N) |
| 21/2 - 6<br>65 - 150 | 2.875 - 6.625<br>73.0 - 168.3 | All | 10, 40 | 400<br>2755 | 400<br>2755 | 400<br>2755 | 290<br>1999 | 232<br>1599 | 362<br>2496 |
| 21/2 - 4<br>65 - 100 | 2.875 - 4.500<br>73.0 - 114.3 | All | DF | 300<br>2065 | 300<br>2065 | 300<br>2065 | 290<br>1999 | 232<br>1599 | 362<br>2496 |
| 21/2 - 4<br>65 - 100 | 2.875 - 4.500<br>73.0 - 114.3 | All | SF | 300<br>2065 | 300<br>2065 | 300<br>2065 | 290<br>1999 | 232<br>1599 | 362<br>2496 |
| 6<br>150 | 6.625<br>168.3 | 3, 4 | 10 | 300<br>2065 | 300<br>2065 | 250<br>1724 | 290<br>1999 | 232<br>1599 | 362<br>2496 |
| 6<br>150 | 6.625<br>168.3 | 3,4 | 30, 40 | 300<br>2065 | 300<br>2065 | 300<br>2065 | 290<br>1999 | 232<br>1599 | 362<br>2496 |
| 8<br>200 | 8.625<br>219.1 | 21/2 | 10, 40 | 400<br>2755 | — | — | — | 145<br>1000 | — |
| 8<br>200 | 8.625<br>219.1 | 3,4 | 10 | 300<br>2065 | — | 250<br>1724 | — | 145<br>1000 | — |
| 8<br>200 | 8.625<br>219.1 | 3,4 | 30, 40 | 300<br>2065 | — | 300<br>2065 | — | 145<br>1000 | — |

NOTES:

10 refers to Listed/Approved Schedule 10 steel sprinkler pipe.

40 refers to Listed/Approved Schedule 40 steel sprinkler pipe.

DF refers to Listed/Approved Dyna-Flow steel sprinkler pipe manufactured by American Tube Company.

SF refers to Listed/Approved Super-Flo steel sprinkler pipe manufactured by Allied Tube and Conduit Corporation.

## VIC-TAP II HOLE CUTTING TOOL FOR 4 - 8"/100 - 200 MM CARBON STEEL PIPE



The Vic-Tap II hole cutting tool is designed for use with the Style 931 Vic-Tap II Mechanical-T unit, which is a combination of the Style 920 Mechanical-T and Series 726 Vic-Ball Valve. The Vic-Tap II is capable of tapping into carbon steel pipe systems under pressures up to 500 psi/3450 kPa.

The Style 931 Vic-Tap II Mechanical-T unit is a full port ball valve which can be mounted on 4"/100 mm, 5"/125 mm, 6"/150 mm and 8"/200 mm diameter pipe. The Style 931 comes with a 2 ½"/65 mm grooved outlet.

The drill motor is an electric motor with ground fault circuit interrupter (GFCI) in accordance with safety codes.

For more information, refer to publication 24.01.



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PERMIT #2026 2513934 - CM 04 | RSN:1975523



# Mechanical-T® Bolted Branch Outlets

**STYLES 920 AND 920N**

**INSTALLATION**

Reference should always be made to the I-100 Victaulic Field Installation Handbook for the product you are installing. Handbooks are included with each shipment of Victaulic products for complete installation and assembly data, and are available in PDF format on our website at www.victaulic.com.

**WARRANTY**

Refer to the Warranty section of the current Price List or contact Victaulic for details.

**NOTE**

This product shall be manufactured by Victaulic or to Victaulic specifications. All products to be installed in accordance with current Victaulic installation/assembly instructions. Victaulic reserves the right to change product specifications, designs and standard equipment without notice and without incurring obligations.



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# Victaulic® Drain Elbow No. 10-DR

10.05



## Approvals/Listings

See Victaulic publication 10.01 for details

## Product Description

No. 10-DR drain elbows are specifically designed for use on fire protection standpipes. The drain is drilled and tapped for a 1"/25 mm NPT outlet.

Constructed of durable ductile iron all sizes conform to the ratings of Style 77 couplings. No.10-DR elbows are supplied with grooves or shoulders. These fittings are not intended for use with Victaulic Plain End couplings.

When connecting wafer or lug-type butterfly valves directly to Victaulic drain elbows with Style 741 or 743 Vic-Flange® Adapters or Style 744 FireLock® Flange Adapters, check disc clearance dimensions with the I.D. dimension of the fitting.

## Material Specifications

**Housing:**

Ductile iron conforming to ASTM A-536, grade 65-45-12.

**Housing Coating: (specify choice)**

Standard: Orange enamel.

☐ Optional: Hot dipped galvanized and others.

**Job/Owner**

| | |
|---|---|
| System No. | |
| Location | |

**Contractor**

| | |
|---|---|
| Submitted By | |
| Date | |

**Engineer**

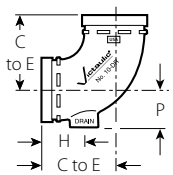
| | |
|---|---|
| Spec Section | |
| Paragraph | |
| Approved | |
| Date | |



**10.05** 1509 Rev E Updated 11/2013 © 2013 Victaulic Company. All rights reserved.

## Dimensions

### No 10-DR




| Fitting Size | | Dimensions | | | Approximate Weight Each |
|---|---|---|---|---|---|
| Nominal Size<br>inches<br>mm | Actual Outside Diameter<br>inches<br>mm | C - E<br>inches<br>mm | H<br>inches<br>mm | P<br>inches<br>mm | lbs.<br>kg |
| 2 ½<br>65 | 2.875<br>73.0 | 3.75<br>95 | 2.75<br>70 | 1.68<br>43 | 5.2<br>2.4 |
| 3<br>80 | 3.500<br>88.9 | 4.25<br>108 | 2.75<br>70 | 2.10<br>53 | 5.3<br>2.4 |
| 4<br>100 | 4.500<br>114.3 | 5.00<br>127 | 2.75<br>70 | 2.60<br>66 | 8.8<br>4.0 |
| 6<br>150 | 6.625<br>168.3 | 6.50<br>165 | 2.75<br>70 | 3.65<br>93 | 18.7<br>8.5 |

**Installation**
Reference should always be made to the I-100 Victaulic Field Installation Handbook for the product you are installing. Handbooks are included with each shipment of Victaulic products for complete installation and assembly data, and are available in PDF format on our website at www.victaulic.com.

**Warranty**
Refer to the Warranty section of the current Price List or contact Victaulic for details.

**Note**
This product shall be manufactured by Victaulic or to Victaulic specifications. All products to be installed in accordance with current Victaulic installation/assembly instructions. Victaulic reserves the right to change product specifications, designs and standard equipment without notice and without incurring obligations.

**Trademarks**
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# SPRINKLERS

VIKING®

TECHNICAL DATA SHEET

# VK2001 Standard Response Upright Sprinkler K8.0 (115)

## 1. PRODUCT IDENTIFICATION

This document covers the following product, hereafter referred to as "sprinkler":

VK2001: Standard Response, Standard Coverage, Upright, K8.0 (115) Sprinkler.



## 2. INTENDED USE

The sprinkler is intended to be used in automatic fire sprinkler systems as allowed by applicable approval authorities. The sprinkler must be used in accordance with:

1. the sprinkler's Listings, Approvals, and associated design requirements.
2. the recognized design and installations standards issued, for example NFPA, FM, EN, VdS, or LPCB.
3. the latest revisions of all applicable manufacturer's documentation.

Governmental codes, ordinances, and standards may apply and may differ from one another.

**⚠ WARNING**

**Cancer and Reproductive Harm www.P65Warnings.ca.gov**

## 3. LISTING AND APPROVALS

Refer to section 5 for details and requirements that must be followed.

- **cULus Listed**
- **VdS Approved**
- **FM Approved**
- **UKCA Approved**
- **CE**
- **MED Approved**
- **LPCB Approved**
- **China Approved**

VIKING® TECHNICAL DATA SHEET **VK2001 Standard Response Upright Sprinkler K8.0 (115)**

## 4. TECHNICAL SPECIFICATIONS

### 4.1 Definitions

**Standard Upright Sprinkler:** A sprinkler intended to be oriented with the deflector above the frame so water flows upward through the orifice, striking the deflector and forming an umbrella-shaped spray pattern downward. These sprinklers are marked "SSU" (Standard Spray Upright) or "UPRIGHT" on the deflector.

**Corrosion Resistant Sprinkler:** A special service sprinkler with non-corrosive protective coatings, or that is fabricated from non-corrosive material, for use in atmospheres that would normally corrode sprinklers. Sprinklers can be ordered as corrosion resistant sprinklers and can be used with escutcheons when allowed by the approval body.

### 4.2 Ratings and Physical Characteristics

| Parameter | Value |
|---|---|
| Minimum operating pressure | 7 psi (0.5 bar) |
| Maximum rated pressure | 175 psi (12 bar) |
| Factory tested pressure | 500 psi (35 bar) |
| Thread size | 3/4" NPT or 20 mm BSPT |
| Nominal K–factor | 8.0 U.S. (115) |
| Minimum temperature rating (glass bulb) | –65 °F (–55 °C) |

### 4.3 Markings and Dimensions

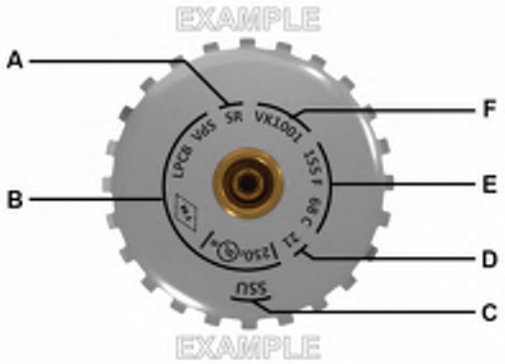



Figure – 1: Markings

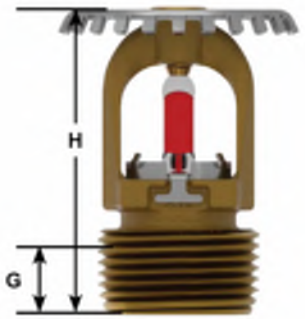



Figure – 2: Dimensions

| Ref | Description | Value |
|---|---|---|
| A | Response type | SR: Standard Response |
| B | Listings and Approvals | See sections 3 and 5 |
| C | Sprinkler type | SSU: Standard Spray Upright |
| D | Manufacture date (year) | See marking |
| E | Nominal temperature rating | See marking |
| F | Manufacturers Sprinkler Identification Number (SIN) | VK2001 |
| G | Nominal pipe engagement | 7/16" (11 mm) |
| H | Height | 2" (51 mm) |

VIKING® TECHNICAL DATA SHEET VK2001 Standard Response Upright Sprinkler K8.0 (115)

### 4.4 Materials of Construction

**NOTICE: Do not disassemble the sprinkler.**

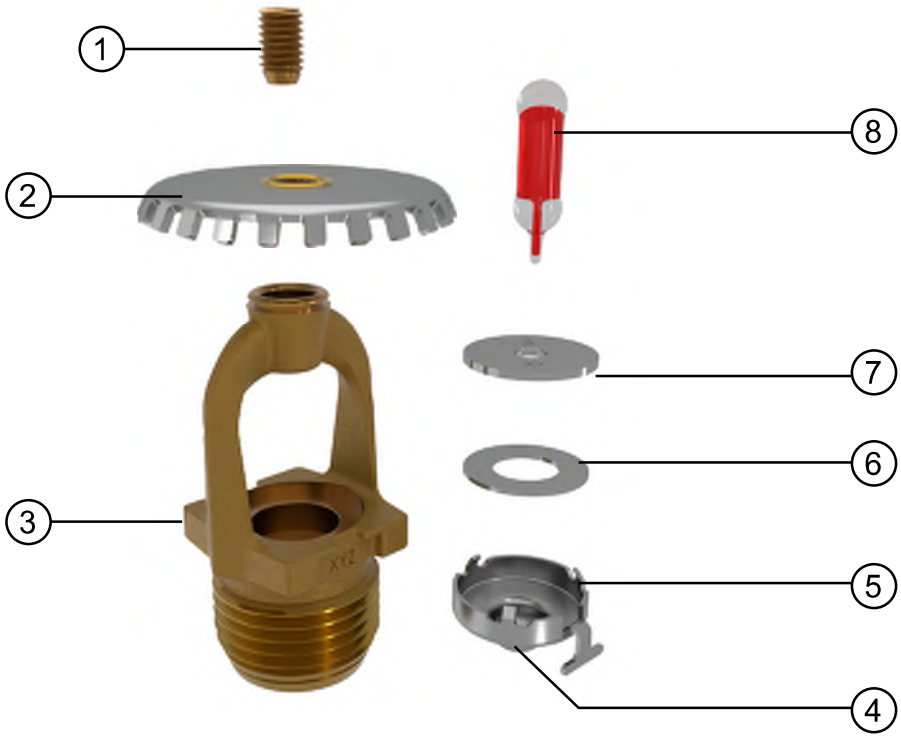



**Figure – 3 Sprinkler Components**

| Ref | Description | Material |
|---|---|---|
| 1 | Compression screw | Brass CW612N, CW508L, UNS–C36000 or UNS–C26000 |
| 2 | Deflector | Stainless steel UNS S30400 |
| 3 | Sprinkler body | CW602N, UNS–C84400 or QM brass |
| 4 | Pip cap seal | Polytetrafluoroethylene (PTFE) |
| 5 | Pip cap shell | Stainless steel UNS–S44400 |
| 6 | Belleville spring | Nickel alloy |
| 7 | Pip cap disc | Stainless steel UNS–S30100 |
| 8 | Bulb | Glass, nominal 0.20" (5 mm) diameter |

## 5. LISTING AND APPROVAL DESIGN REQUIREMENTS

### 5.1 Listing and Approval Specifications

| Sprinkler Base Part Number[1] | Thread Size | | Approval Body | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | NPT | BSPT | cULus | FM | CE | LPCB | VdS | UKCA | MED | China |
| Maximum WWP PSI (bar) ⟶ | | | 175 (12) | | | | | | | |
| 23875 | 3/4" | — | A1 | A1 | A1 | A1 | A1 | A1 | A1 | — |
| 23887 | — | 20 mm | A1 | A1 | A1 | A1 | A1 | A1 | A1 | — |
| 26757 | — | 20 mm | B2 | B2 | — | — | — | — | — | B2 |

**Approval Specification (Temperature Ratings) Key:**

**A** = 135 °F (57 °C), 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C) and 286 °F (141 °C)

**B =** 155 °F (68 °C), 200 °F (93 °C) and 286 °F (141 °C)

**Approval Specification (Finishes) Key:**

**1** = Brass, chrome, white polyester [2,3], black polyester[2,3], and ENT [3,4]

**2** = Chrome

1 For complete part number, refer to Viking's current price list.

2 For white polyester and black polyester, other colors are available upon request and will carry the same Listings and Approvals as the standard colors.

3 cULus Listed as corrosion-resistant.

4 FM Approved as corrosion-resistant.

### 5.2 cULus Listing Requirements and Details

The sprinkler is cULus Listed as indicated in Table 5.1 for installation in accordance with the latest edition of NFPA 13 for standard spray sprinklers. This sprinkler is designed for use in light, ordinary, and extra hazard occupancies.

### 5.3 FM Approval Requirements and Details

The sprinkler is FM Approved as standard response Non–Storage upright sprinkler as indicated in the FM Approval Guide. The sprinkler is also approved for use in FM Approved vacuum dry sprinkler systems with a maximum supervisory vacuum pressure of –3 psi (–207 mbar). FM Global Loss Prevention Data Sheets contain guidelines relating to, but not limited to: minimum water supply requirements, hydraulic design, ceiling slope and obstructions, minimum and maximum allowable spacing, and deflector distance below the ceiling. For specific application and installation requirements, refer to the latest applicable FM Loss Prevention Data Sheets (including Data Sheet 2–0).

### 5.4 Additional Approval Requirements and Details

Refer to Table 5.1 for approved configurations allowed by each of the following approvals.

- CE CPR: Standard EN 12259-1:1999 +A3:2006; Declaration of Performance DOP_VK2001.
- LPCB: Standard EN 12259-1:1999 +A3:2006; Certificate Number 096m.
- VdS: Standard EN 12259-1:1999 +A3:2006; Certificate Number G 422011.
- UKCA: Standard EN12259-1:1999 +A3:2006; Declaration of Conformity UKCA DOC_S5048.
- MED: Standard EN 12259-1:1999 +A3:2006; Declaration of Conformity DOC_MED_XT1.
- China Approval: Approved according to China GB standard.

For specific application and installation requirements, refer to the latest applicable governmental codes, ordinances, and standards for the installation location.

### 5.5 Corrosion-Resistant Coatings

The corrosion resistant coatings have passed the standard corrosion tests required by the approving agencies and are listed and approved as indicated in Table 5.1. These tests do not represent all possible corrosive environments. The Electro-less Nickel PTFE (ENT) finish passed the UL 199 thirty day corrosion test and is cULus listed and FM Approved as corrosion resistant. For automatic sprinklers, the ENT coating is applied to all exposed exterior surfaces, including the waterway.

Prior to installation, verify that the coatings are compatible with, or suitable for, the proposed environment. The ENT finish has not been evaluated for environments containing chlorine, such as indoor swimming pools. It is not recommended for these applications.

### 5.6 Sprinkler Guards and Water Shields

The sprinkler is approved for use with the Model XG Sprinkler Guard and the Model XWU upright water shield. Refer to the Guards and Water Shields for XT1 Sprinklers technical data sheet for more information.

### 5.7 Available Temperature Ratings

Viking sprinklers are available in several temperature ratings that relate to a specific temperature classification. Applicable installation rules mandate the use and limitations of each temperature classification. In selecting the appropriate temperature classification, the maximum expected ceiling temperature must be known. When there is doubt as to the maximum temperature at the sprinkler location, a maximum-reading thermometer should be used to determine the temperature under conditions that would show the highest readings to be expected. In addition, recognized installation rules may require a higher temperature classification, depending upon sprinkler location, occupancy classification, commodity classification, storage height, and other hazards. In all cases, the maximum expected ceiling temperature dictates the lowest allowable temperature classification. Sprinklers located immediately adjacent to a heat source may require a higher temperature rating.

## 6. ORDERING PROCEDURE

### 6.1 Sprinkler

1. Choose a sprinkler base part number with the required thread size and listing or approval (refer to section 5):
2. Add the suffix for the desired finish.
3. Add the suffix for the desired temperature rating.

***NOTE: For Polyester, insert the desired temperature rating suffix where the dash (–) is shown.***

**EXAMPLE: 23875MB/W** = VK2001 with white polyester finish and 155 °F (68 °C) nominal temperature rating. This sprinkler is to be installed into an area with a maximum ambient temperature of 100 °F (38 °C).

***NOTE: When ordering sprinklers that will be installed into InstaSeal® IS-W2 fittings, refer to Form No. F_021123 for installation instructions. Use the InstaSeal® alignment tool and NOT the sprinkler wrench for InstaSeal® sprinkler installations.***

| 1. Sprinkler Base Part Number | |
|---|---|
| See Section 5 | |
| 23875 | 3/4" NPT |
| 23887 | 20 mm BSPT |
| 26757* | 20 mm BSPT |

*Only for China

| 2. Finish | |
|---|---|
| Description | Suffix |
| Brass | A |
| Chrome | F |
| White Polyester | M–/W |
| Black Polyester | M–/B |
| ENT | JN |
| | |

| 3. Temperature Rating | | | |
|---|---|---|---|
| Nominal Temperature Rating | Bulb Color | Maximum Ambient Ceiling Temperature | Suffix |
| 135 °F (57 °C) | Orange | 100 °F (38 °C) | A |
| 155 °F (68 °C) | Red | 100 °F (38 °C) | B |
| 175 °F (79 °C) | Yellow | 150 °F (65 °C) | D |
| 200 °F (93 °C) | Green | 150 °F (65 °C) | E |
| 286 °F (141 °C) | Blue | 225 °F (107 °C) | G |
| OPEN | — | — | Z |

### 6.2 Sprinkler Accessories




**Figure – 4: Sprinkler Accessories**

| Image Reference | Part Number | Description |
|---|---|---|
| 1 | 23559MB | Straight wrench: required for proper installation |
| 2 | 01724A | Sprinkler cabinet: holds up to 6 sprinklers |
| 3 | 01725A | Sprinkler cabinet: holds up to 12 sprinklers (not shown) |
| 4 | 26676 | InstaSeal® alignment tool |

## 7. CONTACT

The sprinkler and accessories are available through Viking distributors only. Contact your local Viking sales office which can be found on our website:

Americas and Asia: www.vikinggroupinc.com/locations OR Europe, Middle East, Africa (EMEA): www.viking-emea.com/contact

**Manufacturer:**

The Viking Corporation
5150 Beltway SE
Caledonia, MI 49316
Tel.: (800) 968–9501
Fax: 269–818–1680
Technical Services: 1–877–384–5464
techsvcs@vikingcorp.com

**Importer EU:**

Viking S.A.
21, Z.I, Haneboesch
L–4562 Differdange / Niederkorn
Tel.: +352 58 37 37 – 1
Fax: +352 58 37 36
vikinglux@viking–emea.com

**Asia Pacific (APAC) Main Office:**

The Viking Corporation (Far East) Pte. Ltd.
69 Tuas View Square
Westlink Techpark, Singapore 637621
Tel: (+65) 6 278 4061
Fax: (+65) 6 278 4609
vikingAPAC@vikingcorp.com

VIKING®

**Handling and Installation Instructions**

**Model XT-1 Upright Sprinklers**

| | | | | | |
|---|---|---|---|---|---|
| ⚠ | **bg** | Инсталирайте и пуснете продукта в експлоатация само ако следната инструкция е ясно разбрана. | | **lv** | Produkta iemontēšanu un ekspluatācijas sākšanau veikt tikai tad, ja dotā instrukcija ir pilnībā saprasta. |
| | **cs** | Namontujte a spusťte do provozu produkt pouze tehdy, když jste jasně pochopili tento návod. | | **lt** | Produktą montuokite ir pradėkite eksploatuoti tik tuomet, jei aiškiai suprantate šią instrukciją. |
| | **de** | Du må kun montere og idriftsætte produktet, hvis du har forstået følgende vejledning til fulde. | | **mt** | Installa u ħaddem il-prodott biss jekk l-istruzzjonijiet li ġejjin jinftiehmu b'mod ċar. |
| | **de** | Produkt nur einbauen und in Betrieb nehmen, wenn die nachfolgende Anleitung klar verstanden wird. | | **nl** | Product alleen installeren en in gebruik nemen, als de volgende instructies begrepen zijn. |
| | **el** | Η εγκατάσταση και θέση σε λειτουργία του προϊόντος επιτρέπονται μόνο εάν οι ακόλουθες οδηγίες έχουν γίνει κατανοητές. | | **no** | Ikke installer og ta i bruk produktet uten at følgende anvisninger er tydelig forstått. |
| | **en** | Do not install and commission the product unless you have clearly understood the instructions below. | | **pl** | Produkt należy montować i uruchamiać tylko wtedy, gdy poniższe instrukcje są w pełni zrozumiałe. |
| | **es** | Instalar el producto y ponerlo en funcionamiento solo cuando se hayan comprendido claramente las siguientes instrucciones. | | **pt** | Instalar e colocar o produto em funcionamento somente se as instruções a seguir forem claramente compreendidas. |
| | **et** | Paigaldage toode ja kasutage seda ainult siis, kui saate alljärgnevast juhendist selgelt aru. | | **ro** | Montați produsul și puneți-l în funcțiune numai dacă instrucțiunea următoare este înțeleasă clar. |
| | **fi** | Tuotteen saa asentaa ja ottaa käyttöön vain, jos jäljempänä oleva ohje ymmärretään selvästi. | | **ru** | Не устанавливайте и не принимайте оборудование в эксплуатацию, если вы четко не поняли инструкции ниже |
| | **fr** | N'installer et ne mettre en service le produit que si les instructions suivantes ont été clairement comprises. | | **sk** | Namontujte a spustite do prevádzky výrobok iba vtedy, pokiaľ ste jasne pochopili tento návod. |
| | **ga** | Ná déan an táirge a shuiteail agus a choimisiunu mura dtuigeann tu na treoracha thios go soileir. | | **sl** | Izdelek vgradite in zaženite samo, če ste dobro razumeli navodila v nadaljevanju. |
| | **hr** | Ne instalirajte i ne puštajte proizvod u rad ako niste jasno razumjeli donje upute. | | **sr** | Не инсталирајте и не пуштајте производ у рад ако нисте јасно разумели упутства у наставку. |
| | **hu** | Csak akkor építse be a terméket és helyezze üzembe, ha a következő útmutatót egyértelműen megértette. | | **sv** | Montera och driftsätt produkten endast om du förstår den efterföljande instruktionen. |
| | **Is** | Settu ekki upp eða taktu vöruna í notkun nema þú hafir skilið greinilega leiðbeiningarnar hér að neðan. | | **tr** | Aşağıdaki talimatları açıkça anlamadan ürünü kurmayın ve devreye almayın. |
| | **it** | Montare il prodotto e metterlo in funzione solo se si sono comprese appieno le seguenti istruzioni. | | | |

## 1. PRODUCT IDENTIFICATION

This document covers the following products, hereafter referred to as “sprinkler”:

- VK1001 Standard Response Upright Sprinkler K5.6 (80.6)
- VK2001 Standard Response Upright Sprinkler K8.0 (115)
- VK2002 Standard Response Upright Sprinkler K8.0 (115)
- VK3001 Quick Response Upright Sprinkler K5.6 (80.6)
- VK3501 Quick Response Upright Sprinkler K8.0 (115)
- VK3502 Quick Response Upright Sprinkler K8.0 (115)
- OTHER APPLICABLE DOCUMENTS

## 2. OTHER APPLICABLE DOCUMENTS

For intended use and relevant conditions for the safe use of the specific sprinkler refer to the appropriate *Technical Data Sheet*.

## 3. TRANSPORT AND HANDLING

**⚠ WARNING**

**A damaged or compromised sprinkler poses the risk of fatal consequences.**

Damaged or compromised sprinklers will not operate properly which could lead to loss of life.

- NEVER use a sprinkler that has been exposed to temperatures exceeding the maximum allowed ambient temperature.
- NEVER use a sprinkler with a loss of liquid from the glass bulb or damage to the fusible element. A small bubble should be visible within the glass bulb; rotate the sprinkler to a horizontal position while observing the bulb to see the bubble.
- NEVER use a sprinkler that has been dropped or damaged.
- ALWAYS Protect the sprinkler from mechanical damage during storage, transport, and handling.
- NEVER use sprinklers that have been painted by anyone other than the manufacturer.
- ALWAYS protect sprinklers from being painted during installation or replacement in accordance with the installation standards.
- NEVER clean sprinklers with anything other than 7 psi or lower compressed air.
- NEVER apply soap, water, ammonia, adhesives, solvents or any other fluids on sprinklers.
- Destroy every damaged or compromised sprinkler.

***NOTICE***

**Protect sprinklers during transport and handling.**

- ALWAYS handle the sprinkler with care.
- ALWAYS keep the protective cap on the sprinkler during transport and handling.
- NEVER remove the protective cap until the fire sprinkler system is placed in service and the potential for mechanical damage no longer exists.
- ALWAYS protect the sprinkler from direct sunlight during transport and handling.
- ALWAYS store sprinkler in a cool, dry, protected area.
- ALWAYS use original manufacturer's shipping containers.
- NEVER store a sprinkler loose in a box, bin, bucket, or other type of container.
- ALWAYS keep the sprinkler separated from other sprinklers.
- NEVER allow metal parts to contact the sprinkler operating elements.

***NOTE: If the glass bulb included on the sprinkler has been exposed to ultraviolet light, the color inside the bulb may fade. This color change does not affect the operation of the sprinkler.***



**CORRECT**
**(Bulb intact, bubble visible)**



**CORRECT**
**(Protective caps in place)**



**CORRECT**
**Container**



**INCORRECT**
**(bulb cracked, fluid missing)**



**INCORRECT**
**(Protective caps not in place)**



**INCORRECT**
**(Stored loose in a box)**

## 4. INSTALLATION

**⚠ WARNING**

**Installation by insufficiently qualified personnel poses the risk of fatal consequences.**

- This sprinkler must be installed properly by qualified personnel familiar with safe practices and applicable and recognized design and installation standards issued, for example, by NFPA, FM, VdS, or LPCB, and trained how to properly perform the installation procedures.

**⚠ CAUTION**

**Cutting Hazard.**

Sprinklers, accessories, cabinets, and packaging can have sharp edges that can cause cuts.

- Wear appropriate personal protective equipment (gloves) while handling product.

***NOTICE***

**If the sprinkler will be installed into an IS-W2 InstaSeal™ fitting, refer to F_021123 or F_032219 (CPVC InstaSeal™ adapter) for the proper installation instructions.**

Optional Guards, Shields, and Escutcheons: If the sprinkler shall be installed together with a guard, shield, or escutcheon refer to the applicable documents for the products used.

1. Install all required piping in the intended installation location.
2. Verify that the sprinkler model/style, K-factor, temperature rating, and response characteristics are appropriate for the intended installation location. See Table 1 and Figure 4.
3. Inspect the sprinkler for damage. Destroy every damaged or compromised sprinkler.
   The following are examples in which sprinklers are considered damaged or compromised. Replace the sprinkler in the following cases:
   - Sprinkler with a loss of fluid from the glass bulb or damage to the fusible element.
   - Sprinklers that have been field painted, caulked, or mechanically damaged.
   - Sprinklers showing signs of corrosion.
4. Verify that the sprinkler is protected with the protective cap or clip.
5. Apply a small amount of pipe-joint compound or tape to the external threads of the sprinkler only. Do not allow a build-up of compound inside the sprinkler inlet (Figure1).



Figure – 1

6. **NOTICE: Do not use the deflector to start threading the sprinkler into a fitting. Use ONLY the approved wrench to install the sprinkler. Refer to the sprinkler's *Technical Data Sheet.***

   Carefully slide the proper wrench onto the wrench flats (Figure 2).




**Figure – 2**

7. **NOTICE: Over-tightening the sprinkler can cause permanent damage. For 1/2" NPT (or 15 mm BSPT) sprinkler, tighten up to a maximum torque of 14 ft-lbs (19 Nm). For 3/4" NPT (or 20 mm BSPT) sprinkler, tighten up to a maximum of 20 ft-lbs (27,1 Nm).**
   Tighten the sprinkler as necessary (Figure 3). If applicable, install a sprinkler guard and water shield.

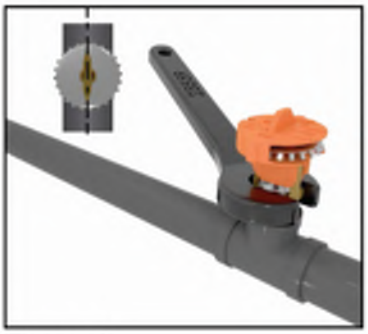


**Figure – 3**

8. **NOTICE: Sprinkler protective caps/clips must be removed from the sprinkler before placing the system in service. Test the entire sprinkler system.**
   Refer to the applicable system documentation, regulations, and standards to ensure compliance.

**Table 1: Sprinkler Markings**

| Ref | Parameter |
|---|---|
| A | Response type |
| B | Listings and approvals |
| C | Sprinkler type |
| D | Manufacture date |
| E | Nominal temperature rating |
| F | Manufacturer's Sprinkler Identification Number (SIN) |

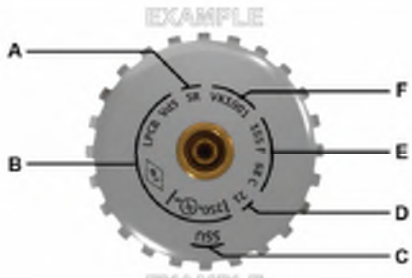



**Figure – 4**

## 5. CONTACT

The sprinkler and accessories are available through Viking distributors only. Contact your local Viking sales office which can be found on our website:

Americas and Asia: www.vikinggroupinc.com/locations OR Europe, Middle East, Africa (EMEA): www.viking-emea.com/contact

**Manufacturer:**

The Viking Corporation
5150 Beltway SE
Caledonia, MI 49316
Tel.: (800) 968–9501
Fax: 269–818–1680
Technical Services: 1–877–384–5464
techsvcs@vikingcorp.com

**Importer EU:**

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21, Z.I, Haneboesch
L–4562 Differdange / Niederkorn
Tel.: +352 58 37 37 – 1
Fax: +352 58 37 36
vikinglux@viking–emea.com

**Asia Pacific (APAC) Main Office:**

The Viking Corporation (Far East) Pte. Ltd.
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Westlink Techpark, Singapore 637621
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Fax: (+65) 6 278 4609
vikingAPAC@vikingcorp.com

VIKING®

Operation and Maintenance Instructions

# Model XT-1 Sprinklers

## 1. PRODUCT IDENTIFICATION

This document covers the following product, hereafter referred to as “sprinkler” (SR=Standard Response, QR=Quick Response):

- VK1001 SR Upright Sprinkler K5.6 (80.6)
- VK2001 SR Upright Sprinkler K8.0 (115)
- VK2002 SR Upright Sprinkler K8.0 (115)
- VK3001 QR Upright Sprinkler K5.6 (80.6)
- VK3501 QR Upright Sprinkler K8.0 (115)
- VK3502 QR Upright Sprinkler K8.0 (115)
- VK1021 SR Pendent Sprinkler K5.6 (80.6)
- VK2021 SR Pendent Sprinkler K8.0 (115)
- VK2022 SR Pendent Sprinkler K8.0 (115)
- VK3021 QR Pendent Sprinkler K5.6 (80.6)
- VK3521 QR Pendent Sprinkler K8.0 (115)
- VK3522 QR Pendent Sprinkler K8.0 (115)
- VK1181 SR Conventional Sprinkler K5.6 (80.6)
- VK1201 SR Conventional Sprinkler K8.0 (115)
- VK1202 SR Conventional Sprinkler K8.0 (115)
- VK3101 QR Conventional Sprinkler K5.6 (80.6)
- VK3541 QR Conventional Sprinkler K8.0 (115)
- VK3542 QR Conventional Sprinkler K8.0 (115)

**⚠ WARNING**

**Cancer and Reproductive Harm www.P65Warning.ca.gov**

## 2. OTHER APPLICABLE DOCUMENTS

For intended use and relevant conditions for the safe use of the specific sprinkler, refer to the appropriate Technical Data Sheet. In case an installed sprinkler needs to be replaced, refer to the appropriate Handling and Installation Instructions for the installation of the new sprinkler.

## 3. MAINTAINING OPERATIONAL READINESS

### Functionality

During fire conditions, the operating element fuses or shatters (depending on the type of sprinkler), releasing the pip cap and sealing assembly. Water flowing through the sprinkler orifice strikes the sprinkler deflector, forming a uniform spray pattern to control or extinguish the fire.

**⚠ WARNING**

**This section contains important safety information. Read and follow all information.**

### Damaged or Compromised Sprinklers

Damaged or compromised sprinklers will not operate properly which could lead to loss of life.

- NEVER clean, paint, or caulk sprinklers.
- NEVER apply soap, water, ammonia, adhesives, solvents or any other fluids on sprinklers.
- NEVER expose sprinklers to temperatures exceeding the maximum allowed ambient ceiling temperature. See the Technical Data Sheet.
- ALWAYS replace a compromised or damaged sprinkler.
- NEVER attempt to repair or reassemble a sprinkler.
- ALWAYS replace operated sprinklers and cover assemblies and sprinklers exposed to corrosive products of combustion.
- Replacement of sprinklers must only be performed following the instructions in section 4.

The following are examples in which sprinklers are considered damaged or compromised. Replace the sprinkler in the following cases:

- Sprinkler with a loss of fluid from the glass bulb or damage to the fusible element.
- Sprinklers or cover plate assemblies that have been field painted, caulked, or mechanically damaged.
- Sprinklers showing signs of extraordinary corrosion.

### Obstructions and obstacles

Obstructions and obstacles may compromise sprinkler discharge patterns which are critical for proper fire protection.

- NEVER attach items to sprinklers or hang items from the ceiling in an area protected with sprinklers.
- NEVER install walls in areas protected with sprinklers without having a specialized company verifying the design of the sprinkler system.
- ALWAYS remove obstructions and obstacles to sprinkler spray patterns.

### Sprinkler systems that have been subjected to a fire

Sprinkler systems that have been subjected to a fire must be returned to service as soon as possible.

- After an event of fire, the entire sprinkler system must be inspected for damage and repaired as necessary.
- Refer to the minimum requirements of the Authority Having Jurisdiction for replacement of sprinklers.
- Consider the employment of a fire patrol as long as the sprinkler system is out of service.

### Inspections and testing

The owner is responsible for having the sprinklers inspected and tested according to standards of the applicable approval body and to the requirements of the Authority Having Jurisdiction to maintain proper operating condition of the system.

- Sprinklers must be inspected on a regular basis for corrosion, mechanical damage, obstructions, paint, etc. Frequency of inspections may vary due to corrosive atmospheres, water supplies, and activity around the sprinkler.

The applicable approval body or Authority Having Jurisdiction may require sprinklers to be replaced after a specified term of service.

- Refer to the standards of the applicable approval body, such as NFPA, FM, VdS, or LPCB, and the requirements of the Authority Having Jurisdiction for detailed inspection, testing and replacements requirements.

Sprinklers removed from the system for testing or for any other purpose must be replaced according to section 4.

## 4. REMOVAL AND REPLACEMENT

**⚠ WARNING**

**Removal and replacement of sprinklers by insufficiently qualified personnel poses the risk of fatal consequences in case of fire.**

- Removal or replacement of sprinklers must be performed by qualified personnel familiar with safe practices and applicable and recognized design and installation standards issued, for example, by NFPA, FM, VdS, or LPCB, and trained how to properly perform the installation procedures.

**⚠ WARNING**

**Removal and replacement of sprinklers will temporarily eliminate the fire protection capabilities of the sprinkler system.**

- Consider the employment of a fire patrol in the affected area.
- Prior to proceeding, notify all Authorities Having Jurisdiction.

**⚠ WARNING**

**Re-installation of a removed sprinkler may compromise the operational safety of the sprinkler system.**

- NEVER reinstall a removed sprinkler.
- ALWAYS use new sprinklers for replacement.

1. Select new sprinklers with identical performance characteristics as well as respective accessories such as escutcheons, cover plates, and protective caps. A stocked spare sprinkler cabinet may be provided for this purpose on site.
2. According to appropriate system description and/or valve instructions, remove the system from service, drain all water, and relieve all pressure on the piping.
3. Only for flush and concealed style sprinklers: Remove the ceiling ring or cover plate assembly of the old sprinkler by gently unthreading or pulling it off the sprinkler body (depends on the sprinkler model used).
4. Use the proper sprinkler wrench for the old sprinkler according to its Technical Data Sheet.
5. Only for flush and concealed style sprinklers, but not for domed concealed sprinklers: Replace the plastic protective cap over the old sprinkler and fit the wrench over the cap.
6. Use the wrench to remove the old sprinkler by turning it counterclockwise to unthread it from the piping.
7. Install the new sprinkler by following its Handling and Installation Instructions.
8. Place the system back in service and secure all valves.
9. Check for and repair all leaks.

## 5. DISPOSAL

At end of use the product described here should be disposed of via the national recycling system.

## 6. CONTACT

The sprinkler and accessories are available through Viking distributors only. Contact your local Viking sales office which can be found on our website:

Americas and Asia: www.vikinggroupinc.com/locations OR Europe, Middle East, Africa (EMEA): www.viking-emea.com/contact

**Manufacturer:**

The Viking Corporation
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Tel.: (800) 968–9501
Fax: 269–818–1680
Technical Services: 1–877–384–5464
techsvcs@vikingcorp.com

**Importer EU:**

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21, Z.I, Haneboesch
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Tel.: +352 58 37 37 – 1
Fax: +352 58 37 36
vikinglux@viking–emea.com

**Asia Pacific (APAC) Main Office:**

The Viking Corporation (Far East) Pte. Ltd.
69 Tuas View Square
Westlink Techpark, Singapore 637621
Tel: (+65) 6 278 4061
Fax: (+65) 6 278 4609
vikingAPAC@vikingcorp.com

# VIKING®

**TECHNICAL DATA**

**STANDARD AND QUICK RESPONSE CONCEALED PENDENT SPRINKLER VK4621 (K5.6)**

**The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058**
**Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com**
**Visit the Viking website for the latest edition of this technical data page www.vikinggroupinc.com**

## 1. DESCRIPTION

Viking Standard and Quick Response Concealed Pendent Sprinkler VK4621 is a small thermosensitive, glass-bulb sprinkler designed for installation on concealed pipe systems where the appearance of a smooth ceiling is desired. The low-profile cover assemblies provide up to ½" (13 mm) of vertical adjustment.

**Features:**

- K5.6 (80.6 metric).
- Quick response glass bulb operating element.
- Integral threaded adapter cup accepts push-on or thread-on cover plates.
- Low-profile, small diameter, removeable cover plates offer almost flush appearance upon installation and allow ease of maintenance.
- Protective cap prevents damage during installation and finishing and keeps errant overspray from coating internal parts.
- Various finishes available to meet design requirements.
- Optional Electroless Nickel PTFE (ENT) coating provides corrosion resistance (see Approval Chart).



## 2. LISTINGS AND APPROVALS

**cULus Listed:** Category VNIV

**FM Approved:** Class 2015
Also approved for use in FM Approved vacuum dry sprinkler systems with a maximum supervisory vacuum pressure of -3 psi (-207mbar)

**VdS Approved:** Standard EN 12259-1:199 + A3:2006; Certificate Number G 422002

**LPCB Approved**: Standard EN 12259-1:199 + A3:2006; Certificate Number 096e

WARNING: Cancer and Reproductive Harm- www.P65Warnings.ca.gov

Refer to the Approval Charts and Design Criteria on for cULus Listing requirements that must be followed.

## 3. TECHNICAL DATA

**Specifications:**
Minimum Operating Pressure: 7 psi (0.5 bar)
Maximum Working Pressure: FM - 175 psi (12 bar). UL - 250 psi (17.2 bar)
Factory tested hydrostatically to 500 psi (34.5 bar).
Thread size: 1/2" NPT or BSPT
Nominal K-Factor: 5.6 U.S. (80.6 metric*)
Glass-bulb fluid temperature rated to -65 °F (-55 °C)

* Metric K-factor measurement shown is in Bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0.

**Material Standards:**
Sprinkler body: QM Brass or DZR Brass
Deflector: Phosphor Bronze UNS-C51000
Deflector pins: Stainless steel UNS-S43000
Pip cap: Copper UNS-C11000
Pip cap insert: stainless steel UNS-S30400
Pip cap T-hinge ring: Stainless steel UNS-S31600
Compression screw: UNS-C36000
Belleville spring sealing assembly: Nickel alloy, coated on both sides with PTFE tape
Cover adapter: Cold rolled steel JIS G3141 and carbon steel UNS-G10100 (per JIS G3141)
Shipping cap: High density polyethylene

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**Cover Plate Materials:**
Cover plate assembly: Copper UNS-C11000 and brass UNS-C26800 or stainless steel UNS-S30400
Spring: Beryllium nickel
Solder: Eutectic

**Ordering Information:** Refer to Tables 1 and 2.

## 4. INSTALLATION
Refer to appropriate NFPA Installation Standards and installation instructions in this document.

## 5. OPERATION
During fire conditions, when the temperature around the sprinkler approaches its operating temperature, the cover plate detaches, releasing the deflector. Continued heating of the exposed sprinkler causes the heat-sensitive liquid in the glass bulb to expand, causing the glass to shatter, releasing the pip cap and sealing spring assembly. Water flowing through the sprinkler orifice strikes the deflector, forming a uniform spray pattern over a specific area of coverage determined by the water supply pressure at the sprinkler to extinguish or control the fire.

## 6. INSPECTIONS, TESTS AND MAINTENANCE
Refer to NFPA 25 for Inspection, Testing and Maintenance requirements.

## 7. AVAILABILITY
Viking Sprinklers are available through a network of domestic and international distributors. See The Viking Corporation web site for the closest distributor contact The Viking Corporation.

## 8. GUARANTEE
For details of warranty, refer to Viking's current list price schedule or contact Viking directly.

# TECHNICAL DATA

# STANDARD AND QUICK RESPONSE CONCEALED PENDENT SPRINKLER VK4621 (K5.6)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com
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## TABLE 1: ORDERING INFORMATION

**Ordering Instructions:**

**(1) Select a Sprinkler Base Part Number**
**(2) Add the suffix for the desired Finish**
**(3) Add the suffix for the desired Sprinkler Temperature Rating**
**(4) Order a cover plate (refer to Table 2)**

**Example:**
**24682AE = 200 °F (93 °C) Temperature Rated Sprinkler with a standard Brass finish.**

| 1: Sprinkler Base Part Numbers | | | 2: Available Finishes | | 3: Available Temperature Ratings | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Size | | Description | Suffix[1] | Sprinkler Temperature Classification | Nominal Rating | Bulb Color | Max. Ambient Ceiling Temperature[2] | Suffix |
| | NPT | BSPT | | | | | | | |
| 24682 | 1/2” | -- | Brass | A | Ordinary | 155 °F (68 °C) | Red | 100 °F (38 °C) | B |
| 22962 | -- | 1/2” | ENT [3,4,6] | JN | Intermediate | 200 °F (93 °C) | Green | 150 °F (65 °C) | E |
| | | | | | | | | | |

**Accessories**

| Part number | Description |
|---|---|
| 23143[5] | Installation wrench[5,8] |
| 14412 | Concealed cover plate installer tool (available since 2007)[7] |
| 14867 | Large concealed cover plate installer tool (available since 2007)[7] |
| 01731A | Sprinkler cabinet; holds up to 6 sprinklers (available since 1971) |

**Footnotes**

1. Where a dash (-) is shown in the Finish suffix designation, insert the desired Temperature Rating suffix. See example above.
2. Based on NFPA 13, NFPA 13R, and NFPA 13D. Other limits may apply, depending on fire loading, sprinkler location, and other requirements of the Authority Having Jurisdiction. Refer to specific installation standards.
3. UL Listed as corrosion resistant.
4. The corrosion resistant coatings have passed the standard corrosion test required by the approving agencies indicated in the Approval Chart. These tests cannot and do not represent all possible corrosive environments. Prior to installation, verify through the end-user that the coatings are compatible with or suitable for the proposed environment. For automatic sprinklers, the ENT coating is applied to all exposed exterior surfaces, including the waterway.
5. Requires a 1/2” ratchet which is not available from Viking.
6. FM Approved as a decorative finish.
7. The installer tool is for push-on style cover plates only.
8. The installation wrench is intended to be used for a maximum of 500 sprinkler installations at a maximum torque of 14 ft-lbs (19 Nm).

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**TECHNICAL DATA**

# STANDARD AND QUICK RESPONSE CONCEALED PENDENT SPRINKLER VK4621 (K5.6)

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## TABLE 2: COVER PLATE ORDERING INFORMATION

**Instructions:**
**(1) Select a Cover Plate Base Part Number**
**(2) Add the suffix for the desired Finish**
**(3) Add the suffix for the required Cover Plate Nominal Rating.**

**Example:**
**23190MC/W = 165 °F (74 °C) Temperature Rated 2-3/4" (70 mm) diameter Round Cover Plate with a Painted White finish.**

| 1: Select a Cover Plate Base Part Number[3] | | | | | | 2: Select a Finish | |
|---|---|---|---|---|---|---|---|
| Thread-On Style | | | Push-On Style | | | | |
| Base Part Number | Size Inch (mm) | Type | Base Part Number | Size Inch (mm) | Type | Description | Suffix[5] |
| 23190 | 2-3/4 (70) | Round | 23447 | 2-3/4 (70) | Round | Polished Chrome | F |
| 23174 | 3-5/16 (84) | Round | 23463 | 3-5/16 (84) | Round | Brushed Chrome | F-/B |
| 23179 | 3-5/16 (84) | Square | 23482 | 3-5/16 (84) | Square | Bright Brass | B |
| 23193[4] | 2-3/4 (70) | Stainless Steel Round | 23455 | 2-3/4 (70) | Stainless Steel Round | Antique Brass | B-/A |
| | | | | | | Brushed Brass | B-/B |
| 23183[4] | 3-5/16 (84) | Stainless Steel Round | 23473 | 3-5/16 (84) | Stainless Steel Round | Brushed Copper | E-/B |
| | | | | | | Painted White | M-/W |
| 23174-/CR | 3-5/16 (84) | Clean Room | 23463-/CR | 3-5/16 (84) | Clean Room | Painted Ivory | M-/I |
| 23183-/CR | 3-5/16 (84) | Stainless Steel Round Clean Room | 23473-/CR | 3-5/16 (84) | Stainless Steel Round Clean Room | Painted Black | M-/B |

| 3: Temperature Rating Matrix[1,2] | | | | |
|---|---|---|---|---|
| Cover Plate Nominal Rating (Required) | Temperature Classification | Sprinkler Nominal Rating | Sprinkler Maximum Ambient Ceiling Temperature[2] | Suffix |
| 139 °F (59 °C) | Ordinary | 155 °F (68 °C) | 100 °F (38 °C) | **A** |
| 165 °F (74 °C) | Intermediate | 200 °F (93 °C) | 150 °F (65 °C) | **C** |

**Footnotes**

1. The sprinkler temperature rating is stamped on the deflector.
2. Based on NFPA-13. Other limits may apply, depending on fire loading, sprinkler location, and other requirements of the Authority Having Jurisdiction. Refer to specific installation standards.
3. Part number shown is the base part number. For complete part number, refer to current Viking price list schedule.
4. Stainless Steel versions are not available with any finishes or paint.
5. Where a dash (-) is shown in the Finish suffix designation, insert the desired Temperature Rating suffix. See example above.

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**TECHNICAL DATA**

# STANDARD AND QUICK RESPONSE CONCEALED PENDENT SPRINKLER VK4621 (K5.6)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com
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## Approval Chart

AW1◄ Sprinkler Temperature Rating / Cover Plate Temperature Rating / Cover Plate Finish KEY

**Concealed Pendent Sprinkler VK4621**
**1/2" NPT or 1/2" BSPT, Nominal K-factor 5.6 U.S. (80.6 metric[2])**

| Sprinkler Base Part No.[1] | Listings and Approvals[3] (Refer also to Design Criteria) | | | |
|---|---|---|---|---|
| | cULus[4] | FM | VdS | LPCB |
| | Maximum Water Working Pressure 250 psi (17.2 bar) | Maximum Water Working Pressure 175 psi (12 bar) | Maximum Water Working Pressure 175 psi (12 bar) | Maximum Water Working Pressure 175 psi (12 bar) |
| **Standard Response Applications** | | | | |
| 24682A | -- | AV1, BX1, AS2, BT2 | AV1, BX1 | AV1, BX1 |
| 24682JN[7,8] | -- | AV1, BX1, AS2, BT2 | -- | -- |
| 22962A | -- | AV1, BX1, AS2, BT2 | AV1, BX1 | AV1, BX1 |
| 22962JN[7,8] | -- | AV1, BX1, AS2, BT2 | -- | -- |
| **Quick Response Applications** | | | | |
| 24682A | AV1, BX1, AS2, BT2, AY3, BZ3 | -- | -- | -- |
| 24682JN[7,8] | AV1, BX1, AS2, BT2, AY3, BZ3 | -- | -- | -- |
| 22962A | AV1, BX1, AS2, BT2, AY3, BZ3 | -- | -- | -- |
| 22962JN[7,8] | AV1, BX1, AS2, BT2, AY3, BZ3 | -- | -- | -- |

| Approved Sprinkler Temperature Rating Key | Approved Cover Plate Assembly Finishes Key | Approved Cover Plate Finishes Key |
|---|---|---|
| A = 155 °F (68 °C)<br>B = 200 °F (93 °C) | S = 139 °F (59 °C) Stainless Steel covers (23193, 23455, 23183, and 23473)<br>T = 165 °F (74 °C) Stainless Steel covers (23193, 23455, 23183, and 23473)<br>V = 139 °F (59 °C) covers (23190, 23447, 23174, 23463, 23179, and 23482)<br>X = 165 °F (74 °C) covers (23190, 23447, 23174, and 23463)<br>Y = 139 °F (59 °C) Clean Room Covers (23174A-/CR and 23463A-/CR) or 139 °F (59 °C) Stainless Steel Clean Room Covers (23183A/CR and 23473A/CR)<br>Z = 165 °F (74 °C) Clean Room Cover (23174C-/CR and 23463C-/CR) | 1 = Polished Chrome, Brushed Chrome, Bright Brass, Antique Brass, Brushed Brass, Brushed Copper, Painted[5] White, Painted[5] Ivory, or Painted[5] Black<br>2 = Stainless Steel<br>3 = Polished Chrome, Painted White, Painted Ivory, or Painted Black |

### Footnotes

1. Part number shown is the base part number. For complete part number, refer to current Viking price list schedule.
2. Metric K-factor measurement shown is when pressure is measured in Bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0.
3. This chart shows the listings and approvals available at the time of printing. Other approvals may be in process. Check with the manufacturer for any additional approvals.
4. Listed by Underwriter's Laboratories for use in the U.S. and Canada.
5. The 139 °F (59 °C) covers have an orange label. The 165 °F (74 °C) covers have a white label.
6. Other paint colors are available on request with the same listings as the standard paint colors. Listings and approvals apply for any paint manufacturer. Contact Viking for additional information.
7. cULus Listed as corrosion resistant.
8. FM Approved as a decorative finish.

**NOTE: Custom colors are indicated on a label inside the cover assembly. Refer to Figure 2.**



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| VIKING® | TECHNICAL DATA | STANDARD AND QUICK RESPONSE CONCEALED PENDENT SPRINKLER VK4621 (K5.6) |
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## DESIGN CRITERIA - UL

(Also refer to Approval Chart)

**cULus Listing Requirements:**

Concealed Pendent Sprinkler VK4621 is cULus Listed as quick response for installation in accordance with the latest edition of NFPA 13 for standard coverage pendent spray sprinklers as indicated below.

- For hazard occupancies up to and including Ordinary Hazard, Group II.
- Protection areas and maximum spacing shall be in accordance with the tables provided in NFPA 13. Maximum spacing allowed is 15 ft. (4.6 m).
- Minimum spacing allowed is 6 ft. (1.8 m) unless baffles are installed in accordance with NFPA 13.
- Minimum distance from walls is 4 in. (102 mm).
- Maximum distance from walls shall be no more than one-half of the allowable distance between sprinklers. The distance shall be measured perpendicular to the wall.
- The sprinkler obstruction rules contained in NFPA 13 for standard coverage pendent spray sprinklers must be followed.

**NOTE: Concealed sprinklers must be installed in neutral or negative pressure plenums only.**

**IMPORTANT: Always refer to Bulletin Form No. F_091699 - Care and Handling of Sprinklers. Also refer to Form No. F_080614 for general care, installation, and maintenance information. Viking sprinklers are to be installed in accordance with the latest edition of Viking technical data, the appropriate standards of NFPA, LPCB, APSAD, VdS or other similar organizations, and also with the provisions of governmental codes, ordinances, and standards, whenever applicable.**

## DESIGN CRITERIA - FM

(Also refer to Approval Chart)

**FM Approval Requirements:**

Viking Concealed Pendent Sprinkler VK4621 is FM Approved as a standard response **Non-Storage** concealed pendent sprinkler as indicated in the FM Approval Guide. For specific application and installation requirements, reference the latest applicable FM Loss Prevention Data Sheets (including Data Sheet 2-0). FM Global Loss Prevention Data Sheets contain guidelines relating to, but not limited to: minimum water supply requirements, hydraulic design, ceiling slope and obstructions, minimum and maximum allowable spacing, and deflector distance below the ceiling.

**NOTE: The FM installation guidelines may differ from cULus and/or NFPA criteria.**

**IMPORTANT: Always refer to Bulletin Form No. F_091699 - Care and Handling of Sprinklers. Also refer to Form No. F_080614 for general care, installation, and maintenance information. Viking sprinklers are to be installed in accordance with the latest edition of Viking technical data, the appropriate standards of NFPA, LPCB, APSAD, VdS or other similar organizations, and also with the provisions of governmental codes, ordinances, and standards, whenever applicable.**

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TECHNICAL DATA

STANDARD AND QUICK RESPONSE CONCEALED PENDENT SPRINKLER VK4621 (K5.6)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com
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Figure 1: Installation Wrench




All custom color painted cover plates will have an identifying label affixed to the inside of the cover that indicates the custom color and will have a representative sample (a paint dot) of the paint on the label.

Figure 2: Identification of Custom Paint



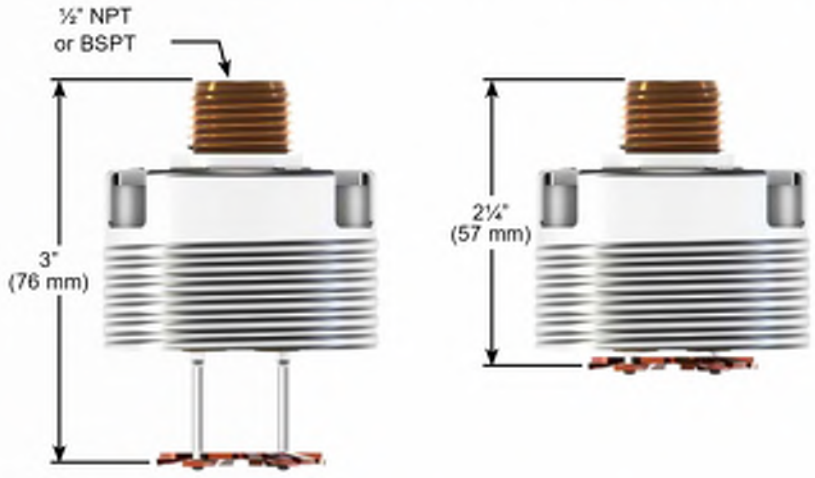

Figure 3: Square Cover Assembly

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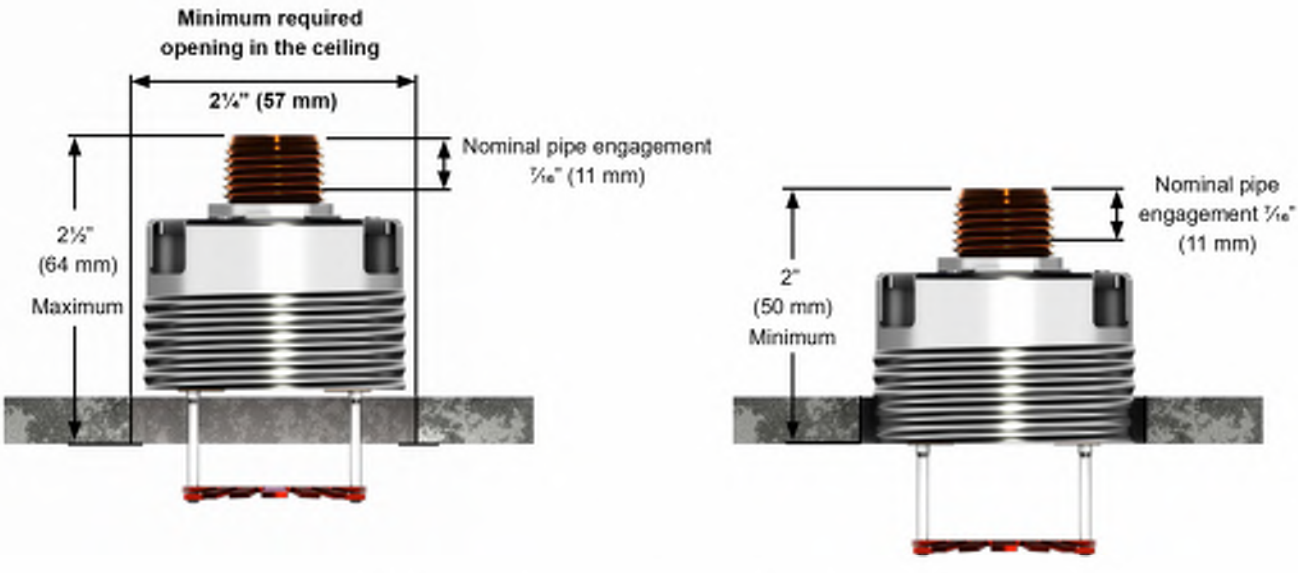
# STANDARD AND QUICK RESPONSE CONCEALED PENDENT SPRINKLER VK4621 (K5.6)

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NOTE: *Image is representative only. Actual product may vary.*

**Figure 4: Sprinkler Dimensions**




NOTE: *Image is representative only. Actual product may vary.*

**Figure 5: Sprinkler Installation Dimensions**

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**NOTICE: USE ONLY the designated sprinkler wrenches shown in this document. Permanent damage to the sprinkler assembly can occur if the proper wrench is not used. Other sprinkler wrenches available from Viking may fit into the sprinkler adapter cup; however, only the wrenches shown here are designed to properly install this sprinkler.**

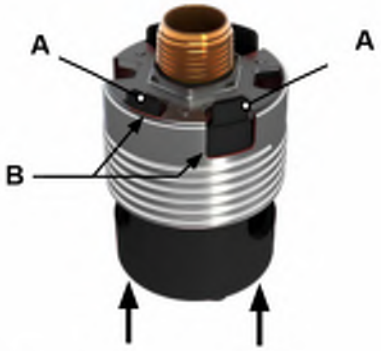
Step 1:
Remove the protective cap.



Step 2:
Insert the wrench into the sprinkler adapter.



Step 3:
Rotate the wrench slightly in either direction until the tines on the wrench (A) line up with the vent openings (B) on the adapter cup and lock into place. NOTE: A leak tight seal must be achieved. Turn the sprinkler clockwise 1 to 1-½ turns past finger-tight.



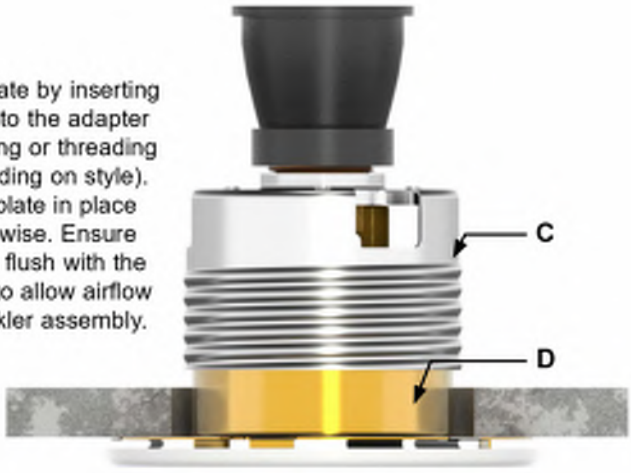

NOTE: *Image is representative only. Actual product may vary.*

**Figure 6: Using the Sprinkler Wrench**

Install the cover plate by inserting the adpater (D) into the adapter cup (C) and pushing or threading into place (depending on style). Snug the cover plate in place by rotating clockwise. Ensure the cover plate is flush with the ceiling as shown to allow airflow through the sprinkler assembly.



**Minimum**




**Maximum**

NOTE: *Image is representative only. Actual product may vary.*

**Figure 7: Installing the Cover Plate**

# BULLETIN

# CARE AND HANDLING OF SPRINKLERS

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

## SPRINKLERS ARE FRAGILE - HANDLE WITH CARE!

### General Handling and Storage:

- Store sprinklers in a cool, dry place.
- Protect sprinklers during storage, transport, handling, and after installation.
- Use the original shipping containers. DO NOT place sprinklers loose in boxes, bins, or buckets.
- Keep sprinklers separated at all times. DO NOT allow metal parts to contact sprinkler operating elements.

### For Pre-Assembled Drops:

- Protect sprinklers during handling and after installation.
- For recessed assemblies, use the protective sprinkler cap (Viking Part Number 10364).

### Sprinklers with Protective Shields or Caps:

- DO NOT remove shields or caps until after sprinkler installation and there no longer is potential for mechanical damage to the sprinkler operating elements.
- **Sprinkler shields or caps MUST be removed BEFORE placing the system in service!**
- Remove the sprinkler shield by carefully pulling it apart where it is snapped together.
- Remove the cap by turning it slightly and pulling it off the sprinkler.

### Sprinkler Installation:

- DO NOT use the sprinkler deflector or operating element to start or thread the sprinkler into a fitting.
- **Use only the designated sprinkler head wrench!** Refer to the current sprinkler technical data page to determine the correct wrench for the model of sprinkler used.
- DO NOT install sprinklers onto piping at the floor level.
- Install sprinklers after the piping is in place to prevent mechanical damage.
- DO NOT allow impacts such as hammer blows directly to sprinklers or to fittings, pipe, or couplings in close proximity to sprinklers. Sprinklers can be damaged from direct or indirect impacts.
- DO NOT attempt to remove drywall, paint, etc., from sprinklers.
- **Take care not to over-tighten the sprinkler and/or damage its operating parts!**

**Maximum Torque:**

| | |
|---|---|
| **1/2" NPT:** | **14 ft-lbs. (19.0 N-m)** |
| **3/4" NPT:** | **20 ft-lbs. (27.1 N-m)** |
| **1" NPT:** | **30 ft-lbs. (40.7 N-m)** |



CORRECT (Original container used)



INCORRECT (Placed loose in box)



CORRECT (Protected with caps)



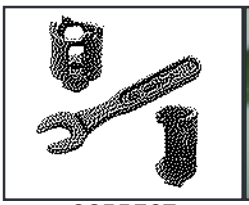
INCORRECT (Protective caps not used)



CORRECT (Piping is in place at the ceiling)



INCORRECT (Sprinkler at floor level)



CORRECT (Special installation wrenches)



INCORRECT (Designated wrench not used)

**WARNING**: Cancer and Reproductive Harm- www.P65Warnings.ca.gov

**⚠ WARNING**

Any sprinkler with a loss of liquid from the glass bulb or damage to the fusible element should be destroyed. Never install sprinklers that have been dropped, damaged, or exposed to temperatures exceeding the maximum ambient temperature allowed. Sprinklers that have been painted in the field must be replaced per NFPA 13. Protect sprinklers from paint and paint overspray in accordance with the installation standards. Do not clean sprinklers with soap and water, ammonia, or any other cleaning fluid. Do not use adhesives or solvents on sprinklers or their operating elements.

**Refer to the appropriate technical data page and NFPA standards for complete care, handling, installation, and maintenance instructions. For additional product and system information Viking data pages and installation instructions are available on the Viking Web site at www.vikinggroupinc.com.**

VIKING | BULLETIN | CARE AND HANDLING OF SPRINKLERS

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# PROTECTIVE SPRINKLER SHIELDS AND CAPS

**General Handling and Storage:**

Many Viking sprinklers are available with a plastic protective cap or shield temporarily covering the operating elements. The snap-on shields and caps are factory installed and are intended to help protect the operating elements from mechanical damage during shipping, storage, and installation. NOTE: It is still necessary to follow the care and handling instructions on the appropriate sprinkler technical data sheets* when installing sprinklers with bulb shields or caps.

**WHEN TO REMOVE THE SHIELDS AND CAPS:**

NOTE: SHIELDS AND CAPS MUST BE REMOVED FROM SPRINKLERS BEFORE PLACING THE SYSTEM IN SERVICE!

Remove the shield or cap from the sprinkler only after checking all of the following:

- The sprinkler has been installed*.
- The wall or ceiling finish work is completed where the sprinkler is installed and there no longer is a potential for mechanical damage to the sprinkler operating elements.

SHIELDS AND CAPS MUST BE REMOVED FROM SPRINKLERS BEFORE PLACING THE SYSTEM IN SERVICE!

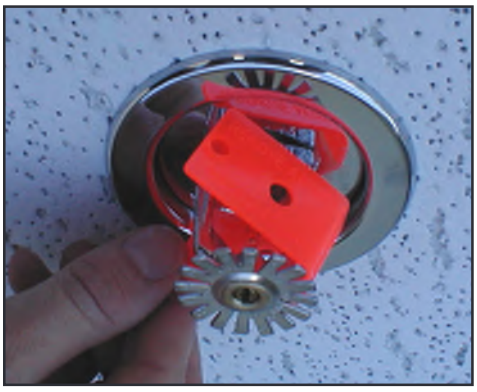


**Figure 1: Sprinkler shield being removed from a pendent sprinkler.**



**Figure 2: Sprinkler cap being removed from a pendent sprinkler.**



**Figure 3: Sprinkler cap being removed from and upright sprinkler.**

## HOW TO REMOVE SHIELDS AND CAPS:

No tools are necessary to remove the shields or caps from sprinklers. DO NOT use any sharp objects to remove them! **Take care not to cause mechanical damage to sprinklers when removing the shields or caps.** When removing caps from fusible element sprinklers, use care to prevent dislodging ejector springs or damaging fusible elements. NOTE: Squeezing the sprinkler cap excessively could damage sprinkler fusible elements.

- To remove the shield, simply pull the ends of the shield apart where it is snapped together. Refer to Figure 1.
- To remove the cap, turn it slightly and pull it off the sprinkler. Refer to Figures 2 and 3.

**NOTICE** Refer to the current sprinkler technical data page to determine the correct sprinkler wrench for the model of sprinkler used.

**WARNING** Never install sprinklers that have been dropped, damaged, or exposed to temperatures in excess of the maximum ambient temperature allowed.

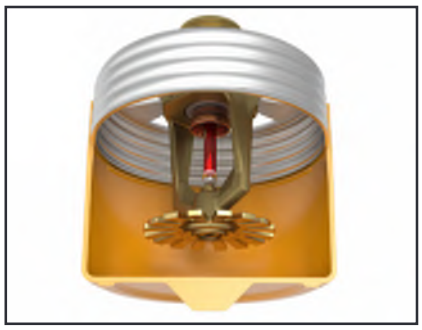
*** Refer to the appropriate current technical data pages for complete care, handling, and installation instructions. Data pages are included with each shipment from Viking or Viking distributors. They can also be found on the Web site at www.vikinggroupinc.com.**

# BULLETIN

# CARE AND HANDLING OF SPRINKLERS

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

**CAUTION CONCEALED COVER ASSEMBLIES ARE FRAGILE!**
**TO ASSURE SATISFACTORY PERFORMANCE OF THE PRODUCT, HANDLE WITH CARE.**

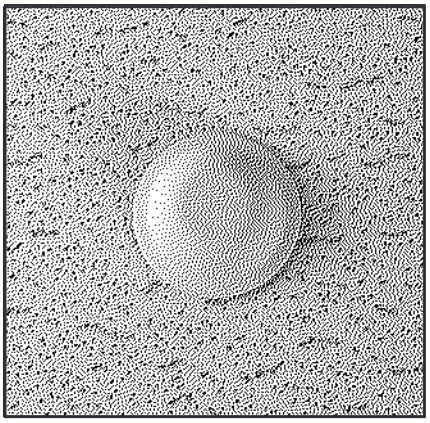


**Concealed Sprinkler and Adapter Assembly with Protective Cap**

**Concealed Sprinkler and Adapter Assembly (Protective Cap Removed)**



**Cover Plate Assembly (Pendent Cover 12381 shown)**



**GENERAL HANDLING AND STORAGE INSTRUCTIONS:**

- Do not store in temperatures exceeding 100 °F (38 °C). Avoid direct sunlight and confined areas subject to heat.
- Protect sprinklers and cover assemblies during storage, transport, handling, and after installation.
  -- Use original shipping containers.
  -- Do not place sprinklers or cover assemblies loose in boxes, bins, or buckets.
- Keep the sprinkler bodies covered with the protective sprinkler cap any time the sprinklers are shipped or handled, during testing of the system, and while ceiling finish work is being completed.
- Use only the designated Viking recessed sprinkler wrench (refer to the appropriate sprinkler data page) to install these sprinklers. **NOTE:** The protective cap is temporarily removed during installation and then placed back on the sprinkler for protection until finish work is completed.
- Do not over-tighten the sprinklers into fittings during installation.
- Do not use the sprinkler deflector to start or thread the sprinklers into fittings during installation.
- Do not attempt to remove drywall, paint, etc., from the sprinklers.
- Remove the plastic protective cap from the sprinkler before attaching the cover plate assembly. **PROTECTIVE CAPS MUST BE REMOVED FROM SPRINKLERS BEFORE PLACING THE SYSTEM IN SERVICE!**

**Refer to the appropriate current technical data pages for complete care, handling, and installation instructions. Data pages are included with each shipment from Viking or Viking distributors. They can also be found on the Web site at www.vikinggroupinc.com.**

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BULLETIN

# CARE AND HANDLING OF SPRINKLERS

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## USE THE FOLLOWING PRECAUTIONS WHEN HANDLING WAX-COATED SPRINKLERS

Many of Viking's sprinklers are available with factory-applied wax coating for corrosion resistance. These sprinklers MUST receive appropriate care and handling to avoid damaging the wax coating and to assure satisfactory performance of the product.

**General Handling and Storage of Wax-Coated Sprinklers:**

- Store the sprinklers in a cool, dry place (in temperatures below the maximum ambient temperature allowed for the sprinkler temperature rating. Refer to Table 1 below.)
- Store containers of wax-coated sprinklers separate from other sprinklers.
- Protect the sprinklers during storage, transport, handling, and after installation.
- Use original shipping containers.
- Do not place sprinklers in loose boxes, bins, or buckets.

**Installation of Wax-Coated Sprinklers:**

Use only the special sprinkler head wrench designed for installing wax-coated Viking sprinklers (any other wrench may damage the unit).

- Take care not to crack the wax coating on the units.
- For touching up the wax coating after installation, wax is available from Viking in bar form. Refer to Table 1 below. The coating MUST be repaired after sprinkler installation to protect the corrosion-resistant properties of the sprinkler.
- Use care when locating sprinklers near fixtures that can generate heat. Do not install sprinklers where they would be exposed to temperatures exceeding the maximum recommended ambient temperature for the temperature rating used.
- Inspect the coated sprinklers frequently soon after installation to verify the integrity of the corrosion resistant coating. Thereafter, inspect representative samples of the coated sprinklers in accordance with NFPA 25. Close up visual inspections are necessary to determine whether the sprinklers are being affected by corrosive conditions.

**TABLE 1**

| Sprinkler Temperature Rating (Fusing Point) | Wax Part Number | Wax Melting Point | Maximum Ambient Ceiling Temperature[1] | Wax Color |
|---|---|---|---|---|
| 155 °F (68 °C) / 165 °F (74 °C) | 02568A | 148 °F (64 °C) | 100 °F (38 °C) | Light Brown |
| 175 °F (79 °C) | 04146A | 161 °F (71 °C) | 150 °F (65 °C) | Brown |
| 200 °F (93 °C) | 04146A | 161 °F (71 °C) | 150 °F (65 °C) | Brown |
| 220 °F (104 °C) | 02569A | 170 °F (76 °C) | 150 °F (65 °C) | Dark Brown |
| 286 °F (141 °C) | 02569A | 170 °F (76 °C) | 150 °F (65 °C) | Dark Brown |

[1] Based on NFPA-13. Other limits may apply, depending on fire loading, sprinkler location, and other requirements of the Authority Having Jurisdiction. Refer to specific installation standards.

**WARNING** Never install sprinklers that have been dropped, damaged, or exposed to temperatures in excess of the maximum ambient temperature allowed.

**Refer to the appropriate current technical data pages for complete care, handling, and installation instructions. Data pages are included with each shipment from Viking or Viking distributors. They can also be found on the Web site at www.vikinggroupinc.com.**

| VIKING | TECHNICAL DATA | SPRINKLER OVERVIEW |
|---|---|---|

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## 1. DESCRIPTION

Viking fire sprinklers consist of a threaded frame with a specific waterway or orifice size and a deflector for distributing water in a specified pattern. A closed or sealed sprinkler refers to a complete assembly, including the thermosensitive operating element. An open sprinkler does not use an operating element and is open at all times. The distribution of water is intended to extinguish a fire or to control its spread.

Viking sprinklers are available in several models and styles. Refer to specific sprinkler technical data pages for available styles, finishes, temperature ratings, thread sizes, and nominal K-Factors for the particular model selected.

## 2. LISTINGS AND APPROVALS

Refer to the Approval Charts on the appropriate sprinkler technical data page(s) and/or approval agency listings.

**WARNING**: Cancer and Reproductive Harm- www.P65Warnings.ca.gov

## 3. TECHNICAL DATA

**Pressure Ratings:**

Maximum allowable water working pressure is 175 psig (12 Bar) unless rated and specified for high water working pressure [250 psig (17.2 bar)].

**Sprinkler Identification:**

Viking sprinklers are identified and marked with the word “Viking”, the sprinkler identification number (SIN) consisting of “VK” plus a three digit number*, the model letter, and the year of manufacture.

**Available Finishes:**

Viking sprinklers are available in several decorative finishes. Some models are available with corrosion-resistant coatings or are fabricated from non-corrosive material. Refer to the sprinkler technical data page for additional information.

**Available Temperature Ratings:**

Viking sprinklers are available in several temperature ratings that relate to a specific temperature classification. Applicable installation rules mandate the use and limitations of each temperature classification. In selecting the appropriate temperature classification, the maximum expected ceiling temperature must be known. When there is doubt as to the maximum temperature at the sprinkler location, a maximum-reading thermometer should be used to determine the temperature under conditions that would show the highest readings to be expected. In addition, recognized installation rules may require a higher temperature classification, depending upon sprinkler location, occupancy classification, commodity classification, storage height, and other hazards. In all cases, the maximum expected ceiling temperature dictates the lowest allowable temperature classification. Sprinklers located immediately adjacent to a heat source may require a higher temperature rating.

**K-Factors:**

Viking sprinklers are available in several orifice sizes with related K-Factors. The orifice is a tapered waterway and, therefore, the K-Factor given is nominal. Nominal U.S. K-Factors are provided in accordance with the 1999 edition of NFPA 13, Section 3-2.3. Refer to the specific data page for appropriate K-Factor information.

**Available Styles:**

Viking sprinklers are available for installation in several positions as indicated by a stamping on the deflector. The deflector style dictates the appropriate installation position of the sprinkler; it breaks the solid stream of water issuing from the sprinkler orifice to form a specific spray pattern. The following list indicates the various styles and identification of Viking sprinklers.

UPRIGHT SPRINKLER: A sprinkler intended to be installed with the deflector above the frame so water flows upward through the orifice, striking the deflector and forming an umbrella-shaped spray pattern downward. Marked “SSU” (Standard Sprinkler Upright) or “UPRIGHT” on the deflector.

PENDENT SPRINKLER: A sprinkler intended to be oriented with the deflector below the frame so water flows downward through the orifice, striking the deflector and forming an umbrella-shaped spray pattern downward. Marked “SSP” (Standard Sprinkler Pendent) or “PENDENT” on the deflector.

**Viking Technical Data may be found on The Viking Corporation’s Web site at http://www.vikinggroupinc.com. The Web site may include a more recent edition of this Technical Data Page.**

CONVENTIONAL SPRINKLER: An “old style” sprinkler intended to be installed with the deflector in either the upright or pendent position. The deflector provides a spherical type pattern with 40 to 60 percent of the water initially directed downward and a proportion directed upward. Must be installed in accordance with installation rules for conventional or old style sprinklers. DO NOT USE AS A REPLACEMENT FOR STANDARD SPRAY SPRINKLERS. Marked “C U/P” (Conventional Upright/Pendent) on the deflector.

VIKING | TECHNICAL DATA | SPRINKLER OVERVIEW

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VERTICAL SIDEWALL (VSW) SPRINKLER: A sprinkler intended for installation near the wall and ceiling. The deflector provides a water spray pattern outward in a quarter-spherical pattern and can be installed in the upright or pendent position with the flow arrow in the direction of discharge. Marked “SIDEWALL” on the deflector with an arrow and the word “FLOW”. (Note: Some vertical sidewall sprinklers can only be installed in the upright or pendent position—in this case, the sprinkler will also be marked “UPRIGHT” or “PENDENT”.)

HORIZONTAL SIDEWALL (HSW) SPRINKLER: A sprinkler intended for installation near the wall and ceiling. The special deflector provides a water spray pattern outward in a quarter-spherical pattern. Most of the water is directed away from the nearby wall with a small portion directed at the wall behind the sprinkler. The top of the deflector is oriented parallel with the ceiling or roof. The flow arrows point in the direction of discharge. Marked “SIDEWALL” and “TOP” with an arrow and the word “FLOW”.

EXTENDED COVERAGE (EC) SPRINKLER: A spray sprinkler designed to discharge water over an area having the maximum dimensions indicated in the individual listings. Maximum area of coverage, minimum flow rate, orifice size, and nominal K-Factor are specified in the individual listings. EC sprinklers are intended for Light-Hazard occupancies with smooth, flat, horizontal ceilings unless otherwise specified. In addition to the above markings, the sprinkler is marked “EC”.

QUICK RESPONSE (QR) SPRINKLER: A spray sprinkler with a fast- actuating operating element. The use of quick response sprinklers may be limited due to occupancy and hazard. Refer to the Authority Having Jurisdiction (AHJ) prior to installing.

QUICK RESPONSE EXTENDED COVERAGE (QREC) SPRINKLER: A spray sprinkler designed to discharge water over an area having the maximum dimensions indicated in the individual listing. This is a sprinkler with an operating element that meets the criteria for quick response. QREC sprinklers are only intended for Light Hazard occupancies. The sprinkler is marked “QREC”.

FLUSH SPRINKLER: A decorative spray sprinkler intended for installation with a concealed piping system. The unit is mounted flush with the ceiling or wall, with the fusible link exposed. Upon actuation, the deflector extends beyond the ceiling or wall to distribute water discharge. The sprinkler is marked “SSP”, “PEND”, or “SIDEWALL” and “TOP”.

CONCEALED SPRINKLER: A decorative spray sprinkler intended for installation with a concealed piping system. The sprinkler is hidden from view by a cover plate installed flush with the ceiling or wall. During fire conditions, the cover plate detaches, and upon sprinkler actuation, the deflector extends beyond the ceiling or wall to distribute water discharge. The sprinkler is marked “SSP”, “PEND”, or “SIDEWALL” and “TOP”.

RECESSED SPRINKLER: A spray sprinkler assembly intended for installation with a concealed piping system. The assembly consists of a sprinkler installed in a decorative adjustable recessed escutcheon that minimizes the protrusion of the sprinkler beyond the ceiling or wall without adversely affecting the sprinkler distribution or sensitivity. Refer to the appropriate technical data page for allowable sprinkler models, temperature ratings, and occupancy classifications. DO NOT RECESS ANY SPRINKLER NOT LISTED FOR USE WITH THE ESCUTCHEON.

CORROSION-RESISTANT SPRINKLER: A special service sprinkler with non-corrosive protective coatings, or that is fabricated from non-corrosive material, for use in atmospheres that would normally corrode sprinklers.

DRY SPRINKLER: A special-service sprinkler intended for installation on dry pipe systems or wet pipe systems where the sprinkler is subject to freezing temperatures. The unit consists of a sprinkler permanently secured to an extension nipple with a sealed inlet end to prevent water from entering the nipple until the sprinkler operates. The unit MUST be installed in a tee fitting. Dry upright sprinklers are marked with the “B” dimension [distance from the face of the fitting (tee) to the top of the deflector]. Dry pendent and sidewall sprinklers are marked with the “A” dimension [the distance from the face of fitting (tee) to the finished surface of the ceiling or wall].

LARGE DROP SPRINKLER: A type of special application sprinkler used to provide fire control of specific high-challenge fire hazards. Large drop sprinklers are designed to produce an umbrella-shaped spray pattern downward with a higher percentage of “large” water droplets than standard spray sprinklers. The sprinkler has an extra-large orifice with a nominal K-Factor of 11.2. Marked “HIGH CHALLENGE” and “UPRIGHT”.

EARLY SUPPRESSION FAST-RESPONSE (ESFR) SPRINKLER: A sprinkler intended to provide fire suppression of specific high-challenge fire hazards through the use of a fast response fusible link, 14.0, 16.8, or 25.2 nominal K-Factor, and special deflector. ESFR sprinklers are designed to produce high-momentum water droplets in a hemispherical pattern below the deflector. This permits penetration of the fire plume and direct wetting of the burning fuel surface while cooling the atmosphere early in the development of a high-challenge fire. Marked “ESFR” and “UPRIGHT” or “PEND”.

INTERMEDIATE LEVEL/RACK STORAGE SPRINKLER: A standard spray sprinkler assembly designed to protect its operating element from the spray of sprinklers installed at higher elevations. The assembly consists of a standard or large orifice upright or pendent sprinkler with an integral upright or pendent water shield and guard assembly. Use only those sprinklers that have been tested and listed for use with the assembly. Refer to the technical data page for allowable sprinkler models.

RESIDENTIAL SPRINKLER: A sprinkler intended for use in the following occupancies: one- and two-family dwellings with the fire protection sprinkler system installed in accordance with NFPA 13D; residential occupancies up to four stories in height with the fire protection system installed in accordance with NFPA 13R; and where allowed by the Authority Having Jurisdiction in residential portions of any occupancy with the fire protection system installed in accordance with NFPA 13.

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Residential sprinklers have a unique distribution pattern and utilize a “fast response” heat sensitive operating element. They enhance survivability in the room of fire origin and are designed to provide a life safety environment for a minimum of ten minutes. For this reason, residential sprinklers must not be used to replace standard sprinklers unless tested for and approved by the Authority Having Jurisdiction. In addition to standard markings, the unit is identified as “RESIDENTIAL SPRINKLER” or “RES”.

## 4. INSTALLATION

Refer to appropriate NFPA Installation Standards.

## 5. OPERATION

Refer to the appropriate sprinkler technical data page(s).

## 6. INSPECTIONS, TESTS AND MAINTENANCE

Refer to NFPA 25 for Inspection, Testing and Maintenance requirements.

## 7. AVAILABILITY

Viking sprinklers are available through a network of domestic and international distributors. See The Viking Corporation web site for the closest distributor or contact The Viking Corporation.

## 8. GUARANTEE

For details of warranty, refer to Viking’s current list price schedule or contact Viking directly.

**IMPORTANT: Always refer to Bulletin Form No. F_091699 - Care and Handling of Sprinklers and the appropriate sprinkler general care, installation, and maintenance guide. Viking sprinklers are to be installed in accordance with the latest edition of Viking technical data, the appropriate standards of NFPA, FM Global, LPCB, APSAD, VdS or other similar organizations, and also with the provisions of governmental codes, ordinances, and standards, whenever applicable. The sprinkler technical data page may contain installation requirements specific for the sprinkler model selected. The use of certain types of sprinklers may be limited due to occupancy and hazard. Refer to the Authority Having Jurisdiction prior to installation.**

VIKING®

BULLETIN

# REGULATORY AND HEALTH WARNINGS

**The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058**
**Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com**
**Visit the Viking website for the latest edition of this technical data page www.vikinggroupinc.com**

## 1. DESCRIPTION

Regulatory and Health Warnings applying to materials used in the manufacture and construction of fire protection products are provided herin as they relate to legally mandated jurisdictional regions.

| ⚠ WARNING |
|---|
| **STATE OF CALIFORNIA, USA**<br>Installing or servicing fire protection products such as sprinklers, valves, piping etc. can expose you to chemicals including, but not limited to, lead, nickel, butadiene, titaninum dioxide, chromium, carbon black, and acrylonitrile which are known to the State of California to cause cancer or birth defects or other reproductive harm. |
| For more information, go to **www.P65Warnings.ca.gov** |

## 2. WARRANTY TERMS AND CONDITIONS

For details of warranty, refer to Viking's current list price schedule at **www.vikinggroupinc.com** or contact Viking directly.

# MICROFAST® QUICK RESPONSE HORIZONTAL SIDEWALL SPRINKLER VK305 (K5.6)

TECHNICAL DATA

**The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058**
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## 1. DESCRIPTION

The Viking Microfast® Quick Response Horizontal Sidewall Sprinkler VK305 is a small thermosensitive glass bulb spray sprinkler available with various finishes and temperature ratings to meet design requirements. The special Polyester and Electroless Nickel PTFE (ENT) coatings can be used in decorative applications where colors are desired. In addition, these coatings have been investigated for installation in corrosive atmospheres and are listed/approved as corrosion resistant as indicated in Approval Charts.



WARNING: Cancer and Reproductive Harm- www.P65Warnings.ca.gov

## 2. LISTINGS AND APPROVALS

cULus Listed: Category VNIV

FM Approved: Class 2020

China Approval: Approved according to China GB Standard

Refer to Approval Charts and Design Criteria for listing and approval requirements that must be followed.

## 3. TECHNICAL DATA

**Specifications:**

Minimum Operating Pressure: 7 psi (0.5 bar)
Rated to 175 psi (12 bar) water working pressure
Factory tested hydrostatically to 500 psi (34.5 bar)
Nominal K-Factor: 5.6 U.S. (80.6 metric*)

* Metric K-factor measurement shown is when pressure is measured in Bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0.

Overall Length: 2-3/4" (68 mm)

**Material Standards:**

Frame Casting: Brass UNS-C84400 or QM Brass
Deflector: Copper UNS-C19500
Bulb: Glass, nominal 3 mm diameter
Belleville Spring Sealing Assembly: Nickel Alloy, coated on both sides with PTFE Tape
Screw: Brass UNS-C36000
Pip Cap and Insert Assembly: Copper UNS-C11000 and Stainless Steel UNS-S30400
For Polyester Coated Sprinklers: Belleville Spring-Exposed
For ENT Coated Sprinklers: Belleville Spring - Exposed, Screw and Pip cap - ENT plated.

**Ordering Information:** (Also refer to the current Viking price list.)

Order Viking Microfast® Quick Response Horizontal Sidewall Sprinkler VK305 by first adding the appropriate suffix for the sprinkler finish and then the appropriate suffix for the temperature rating to the sprinkler base part number.
Finish Suffix: Brass = A, Chrome = F, White Polyester = M-/W, Black Polyester = M-/B, and ENT = JN
Temperature Suffix: 135 °F / 57 °C = A, 155 °F / 68 °C = B, 175 °F / 79 °C = D, 200 °F / 93 °C = E, and 286 °F / 141 °C = G
For example, sprinkler 12997 with a Brass finish and a 155 °F / 68 °C temperature rating = Part No. 12997AB

**Available Finishes And Temperature Ratings:** Refer to Table 1.

**Accessories:** (Also refer to the Viking website.)

**Sprinkler Wrenches:**

A. Standard Wrench: Part No. 21475M/B (available since 2017).
B. Wrench for recessed and/or wax coated sprinklers: Part No. 13655W/B** (available since 2006)
**A ½" ratchet is required (not available from Viking).

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**Sprinkler Cabinets:**

A. Six-head capacity: Part No. 01724A (available since 1971)
B. Twelve-head capacity: Part No. 01725A (available since 1971)

## 4. INSTALLATION

Refer to appropriate NFPA Installation Standards.

## 5. OPERATION

During fire conditions, the heat-sensitive fusible link disengages, the pip cap and spring are released, and the waterway is opened. Water flowing through the sprinkler orifice strikes the sprinkler deflector, forming a uniform spray pattern to extinguish or control the fire.

## 6. INSPECTIONS, TESTS AND MAINTENANCE

Refer to NFPA 25 for Inspection, Testing and Maintenance requirements.

## 7. AVAILABILITY

Viking Microfast® Quick Response Horizontal Sidewall Sprinkler VK305 is available through a network of domestic and international distributors. See The Viking Corporation web site for the closest distributor or contact The Viking Corporation.

## 8. GUARANTEE

For details of warranty, refer to Viking's current list price schedule or contact Viking directly.

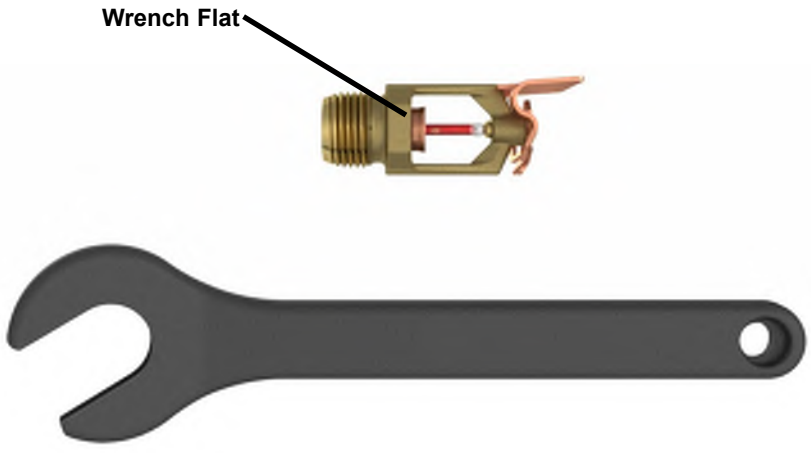



**Figure 1:**
**Standard Sprinkler Wrench 21475M/B**

| VIKING | TECHNICAL DATA | MICROFAST® QUICK RESPONSE HORIZONTAL SIDEWALL SPRINKLER VK305 (K5.6) |
|---|---|---|

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**TABLE 1: AVAILABLE SPRINKLER TEMPERATURE RATINGS AND FINISHES**

| Sprinkler Temperature Classification | Sprinkler Nominal Temperature Rating[1] | Maximum Ambient Ceiling Temperature[2] | Bulb Color |
|---|---|---|---|
| Ordinary | 135 °F (57 °C) | 100 °F (38 °C) | Orange |
| Ordinary | 155 °F (68 °C) | 100 °F (38 °C) | Red |
| Intermediate | 175 °F (79 °C) | 150 °F (65 °C) | Yellow |
| Intermediate | 200 °F (93 °C) | 150 °F (65 °C) | Green |
| High | 286 °F (141 °C) | 225 °F (107 °C) | Blue |

**Sprinkler Finishes:** Brass, Chrome, White Polyester, Black Polyester, and ENT
**Corrosion-Resistant Coatings[3]:** White Polyester, Black Polyester, and ENT

**Footnotes**

[1] The sprinkler temperature rating is stamped on the deflector.

[2] Based on NFPA-13. Other limits may apply, depending on fire loading, sprinkler location, and other requirements of the Authority Having Jurisdiction. Refer to specific installation standards.

[3] The corrosion-resistant coatings have passed the standard corrosion test required by the approving agencies indicated in the Approval Charts. These tests cannot and do not represent all possible corrosive environments. Prior to installation, verify through the end-user that the coatings are compatible with or suitable for the proposed environment. For automatic sprinklers, the coatings indicated are applied to the exposed exterior surfaces only. For ENT coated sprinklers, the waterway is coated. Note that the spring is exposed on sprinklers with Polyester, and ENT coatings.

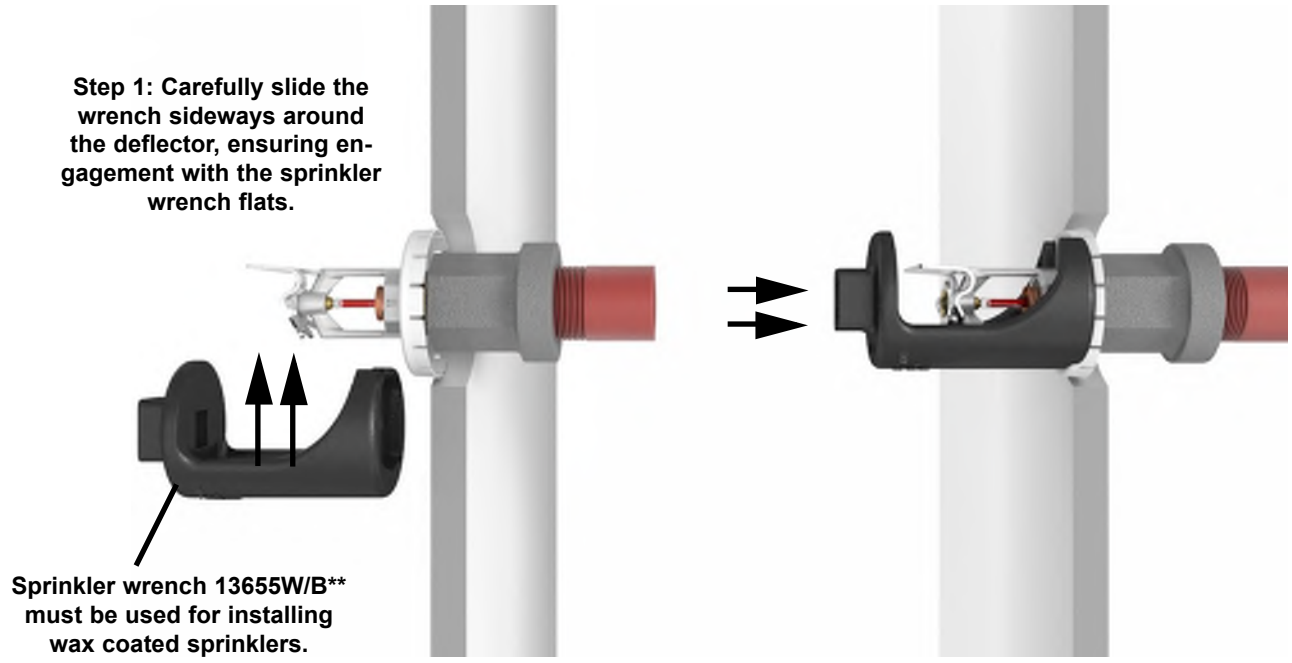


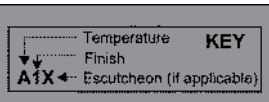

**Figure 2: Wrench 13655W/B for Recessed Sprinklers**

# MICROFAST® QUICK RESPONSE HORIZONTAL SIDEWALL SPRINKLER VK305 (K5.6)

TECHNICAL DATA

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## Approval Chart 1 (UL)




**Microfast® Quick Response Horizontal Sidewall Sprinkler VK305**
**For Light or Ordinary Hazard Occupancies**
**Maximum 175 PSI (12 Bar) WWP**
**Deflector must be located 4" to 12" (102 mm to 305 mm) below the ceiling.**

| Sprinkler Base Part Number[1] | SIN | Thread Size | | Nominal K-Factor | | Overall Length | | Listings and Approvals[3] (Refer also to UL Design Criteria.) | |
|---|---|---|---|---|---|---|---|---|---|
| | | NPT | BSPT | U.S. | metric[2] | Inches | mm | cULus[4] | China Approval |
| 12997 | VK305 | 1/2" | 15 mm | 5.6 | 80.6 | 2-11/16 | 68 | A1W, B1X, C2W, D2Z | -- |
| 19782[7] | VK305 | 1/2" | -- | 5.6 | 80.6 | 2-11/16 | 68 | E3 | E3 |
| *NOTICE - Product Below - Limited Availability (Contact Local Viking Office)* | | | | | | | | | |
| 12121 | VK305 | 1/2" | 15 mm | 5.6 | 80.6 | 2-11/16 | 68 | A1W, B1X, C2W, D2Z | -- |

**Approved Temperature Ratings**

A - 135 °F (57 °C), 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C), and 286 °F (141 °C)
B - 135 °F (57 °C), 155 °F (68 °C), 175 °F (79 °C), and 200 °F (93 °C)
C - 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C), and 286 °F (141 °C)
D - 155 °F (68 °C), 175 °F (79 °C), and 200 °F (93 °C)
E - 155 °F (68 °C)

**Approved Finishes**

1 - Brass, Chrome, White Poly-ester[5,6], and Black Polyester[5,6]
2 - ENT[5]
3 - Chrome

**Approved Escutcheons**

W - Installed with standard surface-mounted escutcheons
X - Installed with standard surface-mounted escutcheons **or** recessed with the Viking Micromatic® Model E-1, E-2, or G-1 Recessed Escutcheon
Z - Installed with standard surface-mounted escutcheons or recessed with the Viking Micromatic Model E-1

**Footnotes**

[1] Base part number shown. For complete part number, refer to Viking's current price schedule.
[2] Metric K-factor measurement shown is when pressure is measured in Bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0.
[3] This table shows the listings and approvals available at the time of printing. Other approvals may be in process.
[4] Listed by Underwriters Laboratories Inc. for use in the U.S. and Canada.
[5] cULus Listed as corrosion-resistant.
[6] Other colors are available on request with the same Listings and Approvals as the standard colors.
[7] Approved according to China GB Standard.

## DESIGN CRITERIA - UL

(Also refer to Approval Chart 1.)

**cULus Listing Requirements:**

Quick Response Horizontal Sprinkler VK305 is cULus Listed as indicated in Approval Chart 1 for installation in accordance with the latest edition of NFPA 13 for sidewall standard spray sprinklers.

- Designed for use in Light and Ordinary Hazard occupancies.
- Locate with the deflector 4" to 12" (102 mm to 305 mm) below the ceiling.
- Protection areas and maximum spacing shall be in accordance with the tables provided in NFPA 13.
- Minimum spacing allowed is 6 ft. (1.8 m).
- Align the top of the deflector parallel with the ceiling.
- Locate no less than 4" (102 mm) from end walls.
- Maximum distance from end walls shall be no more than one-half of the allowable distance between sprinklers. The distance shall be measured perpendicular to the wall.
- The sprinkler installation and obstruction rules contained in NFPA 13 for sidewall standard spray sprinklers must be followed.

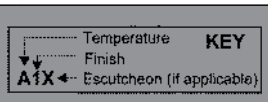
**IMPORTANT: Always refer to Bulletin Form No. F_091699 - Care and Handling of Sprinklers. Also refer to Bulletin Form No. F_080614 for general care, installation, and maintenance information. Viking sprinklers are to be installed in accordance with the latest edition of Viking technical data, the appropriate standards of NFPA, LPCB, APSAD, VdS or other similar organizations, and also with the provisions of governmental codes, ordinances, and standards, whenever applicable.**

| VIKING | TECHNICAL DATA | MICROFAST® QUICK RESPONSE HORIZONTAL SIDEWALL SPRINKLER VK305 (K5.6) |
|---|---|---|

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## Approval Chart 1 (FM)

**Microfast® Quick Response Sidewall Sprinklers**
**Maximum 175 PSI WWP**




| Sprinkler Base Part Number[1] | SIN | Thread Size | | Nominal K-Factor | | Overall Length | | FM Approvals[3,4] (Refer also to Design Criteria below.) | |
|---|---|---|---|---|---|---|---|---|---|
| | | NPT | BSPT | U.S. | metric[2] | Inches | mm | | |
| 12997 | VK305 | 1/2" | 15 mm | 5.6 | 80.6 | 2-11/16 | 68 | A1Y, B1X | |
| *NOTICE - Product Below - Limited Availability (Contact Local Viking Office)* | | | | | | | | | |
| 12121 | VK305 | 1/2" | 15 mm | 5.6 | 80.6 | 2-11/16 | 68 | A1W, B1X, C2W, D2Z | -- |

**Approved Temperature Ratings**

A - 135 °F (57 °C), 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C), and 286 °F (141 °C)
B - 135 °F (57 °C), 155 °F (68 °C), 175 °F (79 °C), and 200 °F (93 °C)

**Approved Finishes**

1 - Brass

**Approved Escutcheons**

X - Installed with standard surface-mounted escutcheons **or** recessed with the Viking Micromatic® Model E-1, E-2, E-3, or G-1 Recessed Escutcheon
Y - Installed with standard surface-mounted escutcheons

**Footnotes**

[1] Base part number shown. For complete part number, refer to Viking's current price schedule.
[2] Metric K-factor measurement shown is when pressure is measured in Bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0.
[3] This table shows the FM Approvals available at the time of printing. Other approvals may be in process.
[4] Viking vertical sidewall sprinklers may be installed pendent or upright.
[5] Approved according to China GB Standard.

## DESIGN CRITERIA - FM

(Also refer to Approval Chart 2 above.)

**FM Approval Requirements:**

Horizontal Sidewall Sprinkler VK305 is FM Approved as a quick response **Non-Storage** sidewall sprinkler as indicated in the FM Approval Guide. For specific application and installation requirements, reference the latest applicable FM Loss Prevention Data Sheets (including Data Sheet 2-0). FM Global Loss Prevention Data Sheets contain guidelines relating to, but not limited to: minimum water supply requirements, hydraulic design, ceiling slope and obstructions, minimum and maximum allowable spacing, and deflector distance below the ceiling.

**NOTE: The FM installation guidelines may differ from cULus and/or NFPA criteria.**

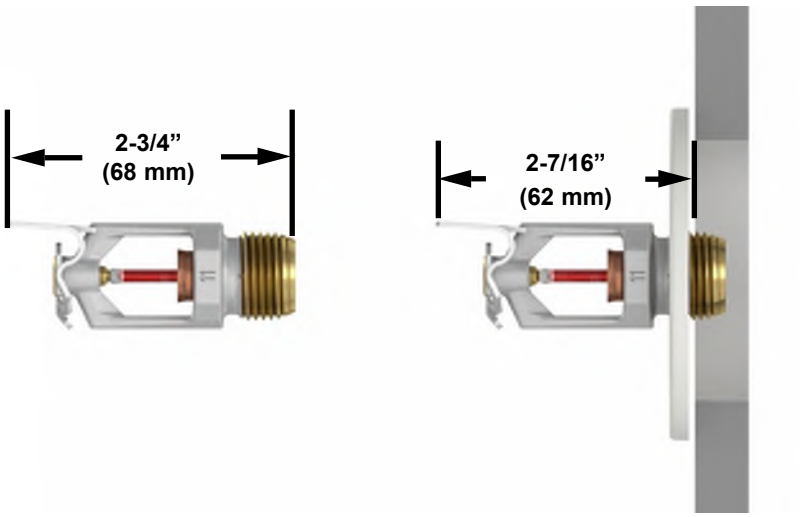
**IMPORTANT: Always refer to Bulletin Form No. F_091699 - Care and Handling of Sprinklers. Also refer to Bulletin Form No. F_080614 for general care, installation, and maintenance information. Viking sprinklers are to be installed in accordance with the latest edition of Viking technical data, the appropriate standards of NFPA, FM Global, LPCB, APSAD, VdS or other similar organizations, and also with the provisions of governmental codes, ordinances, and standards, whenever applicable.**

VIKING

TECHNICAL DATA

MICROFAST® QUICK RESPONSE HORIZONTAL SIDEWALL SPRINKLER VK305 (K5.6)

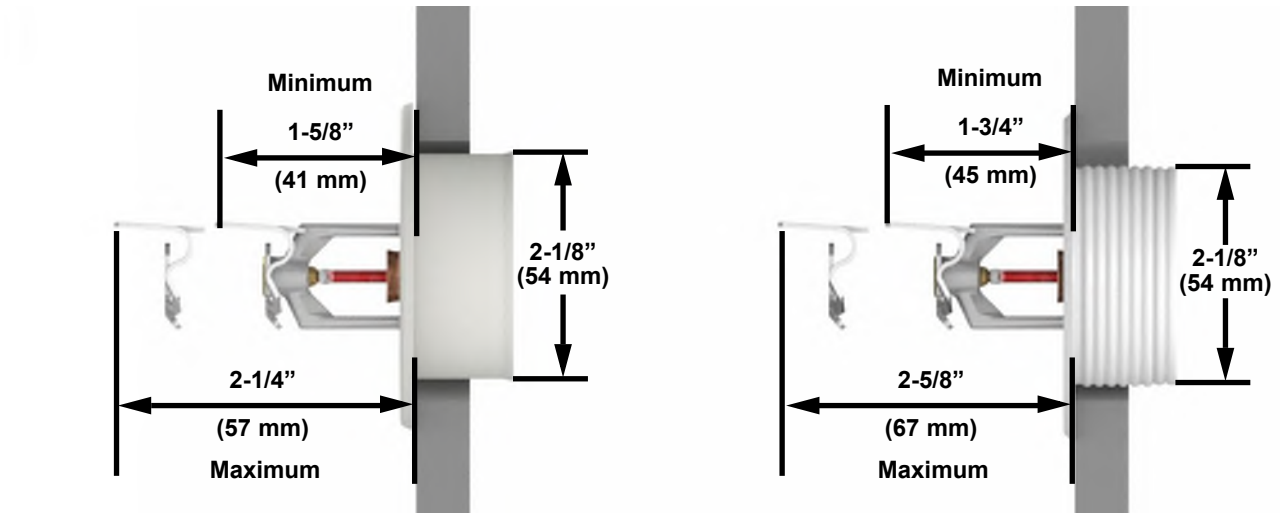
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Wall Opening Size:
2-5/16” (58.7 mm) minimum
2-1/2” (63.5 mm) maximum

Installed with a Standard 1/8” Surface-Mounted Escutcheon

Figure 3: Sidewall Sprinkler Dimensions with a Standard Escutcheon




Wall Opening Size:
2-5/16” (58.7 mm) minimum
2-1/2” (63.5 mm) maximum

Installed with the Micromatic Model E-1 Recessed Escutcheon

Installed with the Threaded Model E-2 Recessed Escutcheon

Figure 4: Sidewall Sprinkler VK305 Dimensions with the Model E-1 and E-2 Recessed Escutcheons

# TECHNICAL DATA

# VK3001 QUICK RESPONSE UPRIGHT SPRINKLER (K5.6)

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## 1. DESCRIPTION

The Viking VK3001 Quick Response Upright Sprinkler is a small thermosensitive glass bulb spray sprinkler available with various finishes and temperature ratings to meet design requirements. The special Polyester and Electroless Nickel PTFE (ENT) coatings can be used in decorative applications where colors are desired. In addition, these coatings have been investigated for installation in corrosive environments and are Listed and Approved as indicated in the Approval Chart.



## 2. LISTINGS AND APPROVALS

**UL Listed**: Category VNIV

**FM Approved**: Classes 2016, 2043
Also approved for use in FM Approved vacuum dry sprinkler systems with a maximum supervisory vacuum pressure of -3 PSI (-207 mbar).

**CE**: Standard EN12259-1, DOP_XT1A_1-3-21

Refer to the Approval Chart and Design Criteria for requirements that must be followed.

**WARNING**: Cancer and Reproductive Harm- www.P65Warnings.ca.gov

## 3. TECHNICAL DATA

Minimum Operating Pressure: 7 PSI (0.5 bar)
Rated to: UL - 250 PSI (24 bar) WWP
FM - 175 PSI (12 bar) WWP
Factory tested hydrostatically to 500 PSI (34.5 bar)
Thread size: 1/2" NPT (15 mm BSPT)
Nominal K-factor: 5.6 U.S. (80.6 metric*)
Glass-bulb fluid temperature rated to -65 °F (-55 °C)
Metric K-factor measurement shown is in bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0.

**Material Standards:**
Sprinkler Body: Brass CW602N, UNS-C84400 or QM Brass
Deflector: Stainless Steel UNS S30400
Pip Cap Shell - Stainless Steel UNS-S44400
Pip Cap Disc - Stainless Steel UNS-S30100
Belleville Spring - Nickel Alloy
Pip Cap Seal - Polytetrafluoroethylene (PTFE)
Compression Screw: Brass CW612N, CW508L, UNS-C36000 or UNS-C26000
Shipping Cap: Polyethylene
Bulb: Glass, nominal 3 mm diameter

**Ordering Information: (Refer to Table 1 and the current Viking List Price Book.)**

## 4. INSTALLATION

Refer to appropriate NFPA, FM Global, and/or any other applicable installation standards. Refer to Figure 3

**NOTICE** **Risk of permanent damage.**

**Over-tightening the sprinkler can cause permanent damage.**
**> Tighten the sprinkler to a MAXIMUM torque of 14 ft-lbs (19 N-m).**

## 5. OPERATION

During fire conditions, when the temperature around the sprinkler reaches its operating temperature, the heat-sensitive liquid in the glass bulb expands, causing the bulb to shatter, releasing the pip cap assembly. Water flowing through the sprinkler orifice strikes the sprinkler deflector, forming a uniform spray pattern to extinguish or control the fire.

## 6. INSPECTIONS, TESTS AND MAINTENANCE

Refer to NFPA 25 for Inspection, Testing and Maintenance requirements.

## 7. AVAILABILITY

Viking Sprinklers are available through a network of domestic and international distributors. See the website for the closest distributor or contact Viking.

## 8. GUARANTEE

For details of warranty, refer to Viking's current list price schedule or contact Viking directly.

# TECHNICAL DATA

# VK3001 QUICK RESPONSE UPRIGHT SPRINKLER (K5.6)

**The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058**
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## TABLE 1: ORDERING INFORMATION

**Instructions: Using the sprinkler base part number,**
**(1) add the suffix for the desired Finish**
**(2) add the suffix for the desired Temperature Rating.**

| Sprinkler Base Part Number | Size | | 1: Finishes | | 2: Temperature Ratings | | | |
|---|---|---|---|---|---|---|---|---|
| | NPT Inch | BSPT mm | Description | Suffix[1] | Nominal Rating | Bulb Color | Max. Ambient Ceiling Temperature[2] | Suffix |
| 23869 | 1/2 | -- | Brass | A | 135 °F (57 °C) | Orange | 100 °F (38 °C) | A |
| 23881 | -- | 15 | Chrome | F | 155 °F (68 °C) | Red | 100 °F (38 °C) | B |
| | | | White Polyester [3,5] | M-/W | 175 °F (79 °C) | Yellow | 150 °F (65 °C) | D |
| | | | Black Polyester [3,5] | M-/B | 200 °F (93 °C) | Green | 150 °F (65 °C) | E |
| | | | ENT [3,4,5] | JN | 286 °F (141 °C) | Blue | 225 °F (107 °C) | G |
| | | | | | OPEN | -- | -- | Z |

**Example**: 23869MB/W = VK3001 with white polyester finish and 155 °F (68 °C) nominal temperature rating. This sprinkler is to be installed into an area with a maximum ambient temperature of 100 °F (38 °C) meaning if the area will experience temperatures above the maximum ambient rating, you shall use a higher temperature-rated sprinkler.

## Accessories

**Sprinkler Wrenches (see Figure 1):**
Standard (straight) Wrench: Part number 23559MB.
**Sprinkler Cabinet:**
A. Up to 6 sprinklers: Part number 01724A
B. 6-12 sprinklers: Part number 01725A

## Footnotes

1. Where a dash (-) is shown in the Finish suffix designation, insert the desired Temperature Rating suffix. See example above.
2. Based on NFPA 13, NFPA 13R, and NFPA 13D. Other limits may apply, depending on fire loading, sprinkler location, and other requirements of the Authority Having Jurisdiction. Refer to specific installation standards.
3. UL Listed as corrosion resistant.
4. FM Approved as corrosion resistant.
5. The corrosion resistant and corrosion proofing coatings have passed the standard corrosion test required by the approving agencies indicated in the Approval Chart. These tests cannot and do not represent all possible corrosive environments. Prior to installation, verify through the end-user that the coatings are compatible with or suitable for the proposed environment. For automatic sprinklers, the ENT coating is applied to all exposed exterior surfaces, including the waterway.
6. UL Listed for 250 PSI (17.2 bar) WWP.




**Figure 1: Sprinkler Wrench**

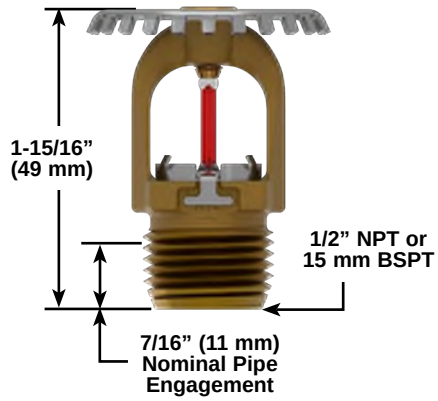



**Figure 2: Sprinkler Dimensions**

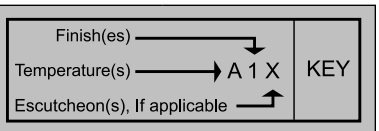
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# VK3001 QUICK RESPONSE UPRIGHT SPRINKLER (K5.6)

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## APPROVAL CHART

**Viking Quick Response Upright Sprinkler**
**VK3001 K5.6 (80.6 metric)**




| Sprinkler Base Part Number[1] | Thread Size | | Listings and Approvals[2,6] | | | | |
|---|---|---|---|---|---|---|---|
| | NPT | BSPT | cULus | | FM | | CE[6] |
| | Inch | mm | Approval Listing | Maximum WWP | Approval Listing | Maximum WWP | Approval Listing |
| 23869 | 1/2 | -- | A1 | 250 PSI (17.2 bar) | A1 | 175 PSI (12 bar) | B1 |
| 23881 | -- | 15 | A1 | 250 PSI (17.2 bar) | A1 | 175 PSI (12 bar) | B1 |

**Approved Temperature Ratings:**

**A** = 135 °F (57 °C), 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C) and 286 °F (141 °C)
**B** = 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C) and 286 °F (141 °C)

**Approved Finishes:**

**1** = Brass, Chrome, White Polyester [3,4], Black Polyester [3,4], and ENT [4,5]

**Footnotes**

1 Base Part number is shown. For complete part number, refer to Viking's current price schedule.
2 This table shows the listings and approvals available at the time of printing. Check with the manufacturer for any additional approvals.
3 Other colors are available upon request with the same Listings and Approvals as the standard colors.
4 cULus Listed as corrosion resistant.
5 FM Approved as corrosion resistant.
6 CE: Standard EN12259-1, Declaration of Performance DOP_XT1A_1-3-21.

## DESIGN CRITERIA - UL

**cULus Listing Requirements:**

The Viking VK3001 Quick Response Upright Sprinkler is cULus Listed as indicated in Approval Chart for installation in accordance with the latest edition of NFPA 13 for standard spray sprinklers.

- Designed for use in Light and Ordinary Hazard occupancies.
- The sprinkler installation rules contained in NFPA 13 for standard spray upright sprinklers shall be followed.

## DESIGN CRITERIA - FM

**FM Approval Requirements:**

The Viking VK3001 Quick Response Upright Sprinkler is FM Approved as quick response Non-Storage upright sprinkler as indicated in the FM Approval Guide. For specific application and installation requirements, reference the latest applicable FM Loss Prevention Data Sheets (including Data Sheet 2-0). FM Global Loss Prevention Data Sheets contain guidelines relating to, but not limited to: minimum water supply requirements, hydraulic design, ceiling slope and obstructions, minimum and maximum allowable spacing, and deflector distance below the ceiling.

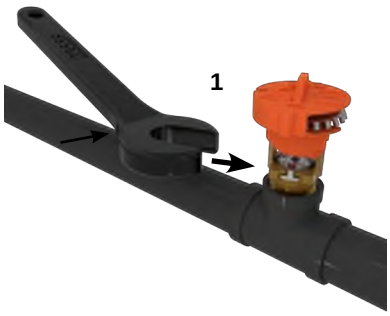
**NOTE: The FM Installation guidelines may differ from UL and/or NFPA criteria.**

**IMPORTANT: Always refer to Form Number F_091699 - Care and Handling of Sprinklers. Also refer to Form Number F_080614 for general care, installation, and maintenance information. Viking sprinklers are to be installed in accordance with the latest edition of Viking Technical Data, the appropriate standards of NFPA, FM Global, LPCB, APSAD, VdS or other similar organizations, and also with the provisions of governmental codes, ordinances, and standards, whenever applicable.**

| VIKING® | TECHNICAL DATA | VK3001 QUICK RESPONSE UPRIGHT SPRINKLER (K5.6) |
|---|---|---|

**The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058**
**Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com**
**Visit the Viking website for the latest edition of this technical data page www.vikinggroupinc.com**

**1. Carefully slide the wrench onto the wrench flats.**




**2. Install the sprinkler into the pipe fitting.**
**NOTE: The sprinkler frame arms shall be parallel to the pipe.**

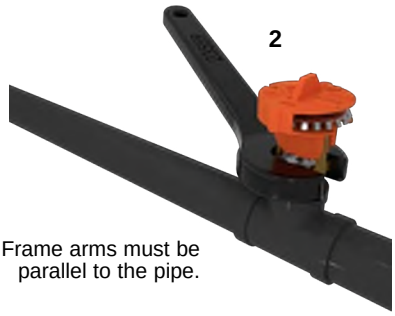



**Figure 3: Installation**

# TECHNICAL DATA

# VK3021 QUICK RESPONSE PENDENT SPRINKLER (K5.6)

**The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058**
**Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com**
**Visit the Viking website for the latest edition of this technical data page www.vikinggroupinc.com**

## 1. DESCRIPTION

The Viking VK3021 Quick Response Pendent Sprinkler is a small thermosensitive glass bulb spray sprinkler available with various finishes and temperature ratings to meet design requirements. The special Polyester and Electroless Nickel PTFE (ENT) coatings can be used in decorative applications where colors are desired. In addition, these coatings have been investigated for installation in corrosive environments and are Listed and Approved as indicated in the Approval Chart.



## 2. LISTINGS AND APPROVALS

**UL Listed**: Category VNIV

**FM Approved**: Classes 2017, 2015, 2043
Also approved for use in FM Approved vacuum dry sprinkler systems with a maximum supervisory vacuum pressure of -3 PSI (-207 mbar)

**CE**: Standard EN12259-1, DOP_XT1A_1-3-21

Refer to the Approval Chart and Design Criteria for requirements that must be followed.

## 3. TECHNICAL DATA

**Specifications:**
Minimum Operating Pressure: 7 PSI (0.5 bar)
Rated to: UL - 250 PSI (24 bar) WWP
FM - 175 PSI (12 bar) WWP
Factory tested hydrostatically to 500 PSI (34.5 bar)
Thread size: 1/2" NPT (15 mm BSPT)
Nominal K-factor: 5.6 U.S. (80.6 metric*)
Glass-bulb fluid temperature rated to -65 °F (-55 °C)

**WARNING**: Cancer and Reproductive Harm- www.P65Warnings.ca.gov

* Metric K-factor measurement shown is in bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0.

**Material Standards:**
Sprinkler Body: Brass CW602N, UNS-C84400 or QM Brass
Deflector: Stainless Steel UNS S30400
Pip Cap Shell - Stainless Steel UNS-S44400
Pip Cap Disc - Stainless Steel UNS-S30100
Belleville Spring - Nickel Alloy
Pip Cap Seal - Polytetrafluoroethylene (PTFE)
Compression Screw: Brass CW612N, CW508L, UNS-C36000 or UNS-C26000
Shipping Cap: Polyethylene
Bulb: Glass, nominal 3 mm diameter
**Ordering Information: (Refer to Table 1 and the current Viking List Price Book.)**

## 4. INSTALLATION

Refer to appropriate NFPA, FM Global, and/or any other applicable installation standards.

**NOTICE** **Risk of permanent damage.**

**Over-tightening the sprinkler can cause permanent damage.**
**> Tighten the sprinkler to a MAXIMUM torque of 14 ft-lbs (19 N-m).**

## 5. OPERATION

During fire conditions, when the temperature around the sprinkler reaches its operating temperature, the heat-sensitive liquid in the glass bulb expands, causing the bulb to shatter, releasing the pip cap assembly. Water flowing through the sprinkler orifice strikes the sprinkler deflector, forming a uniform spray pattern to extinguish or control the fire.

## 6. INSPECTIONS, TESTS AND MAINTENANCE

Refer to NFPA 25 for Inspection, Testing and Maintenance requirements.

## 7. AVAILABILITY

Viking Sprinklers are available through a network of domestic and international distributors. See the Viking website for the closest distributor or contact Viking.

## 8. GUARANTEE

For details of warranty, refer to Viking's current list price schedule or contact Viking directly.

# TECHNICAL DATA

# VK3021 QUICK RESPONSE PENDENT SPRINKLER (K5.6)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com
Visit the Viking website for the latest edition of this technical data page www.vikinggroupinc.com

## TABLE 1: ORDERING INFORMATION

**Instructions: Using the sprinkler base part number,**
**(1) add the suffix for the desired Finish**
**(2) add the suffix for the desired Temperature Rating.**

| Sprinkler Base Part Number | Size | | 1: Finishes | | 2: Temperature Ratings | | | |
|---|---|---|---|---|---|---|---|---|
| | NPT Inch | BSPT mm | Description | Suffix[1] | Nominal Rating | Bulb Color | Max. Ambient Ceiling Temperature[3] | Suffix |
| 23870[7] | 1/2 | | Brass | A | 135 °F (57 °C) | Orange | 100 °F (38 °C) | A |
| 23882[7] | | 15 | Chrome | F | 155 °F (68 °C) | Red | 100 °F (38 °C) | B |
| | | | White Polyester [4,6] | M-/W | 175 °F (79 °C) | Yellow | 150 °F (65 °C) | D |
| | | | Black Polyester [4,6] | M-/B | 200 °F (93 °C) | Green | 150 °F (65 °C) | E |
| | | | ENT [4,5,6] | JN | 286 °F (141 °C) | Blue | 225 °F (107 °C) | G |
| | | | | | OPEN | -- | -- | Z |

**Example**: 23870MB/W = VK3021 with white polyester finish and 155 °F (68 °C) nominal temperature rating. This sprinkler is to be installed into an area with a maximum ambient temperature of 100 °F (38 °C) meaning if the area will experience temperatures above the maximum ambient rating, you shall use a higher temperature-rated sprinkler.

## Accessories

**Sprinkler Wrenches (see Figure 1):**

A. Standard Wrench: Part number 23559MB
B. Recessed Socket Wrench: Part number 23560MB[2]

**Sprinkler Cabinet:**

A. Up to 6 sprinklers: Part number 01724A
B. 6-12 sprinklers: Part number 01725A

## Footnotes

1. Where a dash (-) is shown in the Finish suffix designation, insert the desired Temperature Rating suffix. See example above.
2. Requires a 1/2" ratchet which is not available from Viking.
3. Based on NFPA 13, NFPA 13R, and NFPA 13D. Other limits may apply, depending on fire loading, sprinkler location, and other requirements of the Authority Having Jurisdiction. Refer to specific installation standards.
4. UL Listed as corrosion resistant.
5. FM Approved as corrosion resistant.
6. The corrosion resistant coatings have passed the standard corrosion test required by the approving agencies indicated in the Approval Chart. These tests cannot and do not represent all possible corrosive environments. Prior to installation, verify through the end-user that the coatings are compatible with or suitable for the proposed environment. For automatic sprinklers, the ENT coating is applied to all exposed exterior surfaces, including the waterway.
7. UL Listed for 250 PSI (17 bar) WWP.

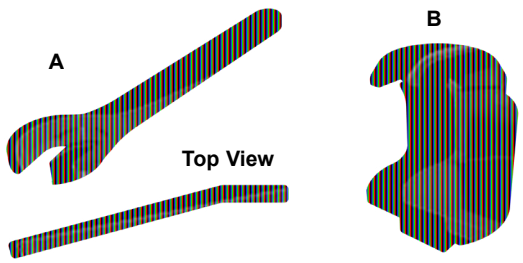



Figure 1: Sprinkler Wrenches

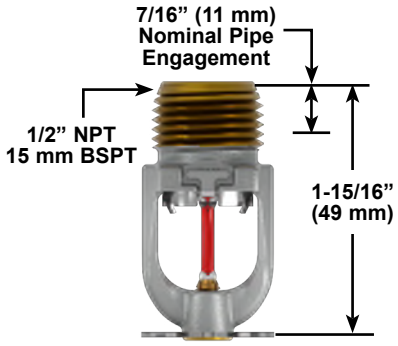



Figure 2: Sprinkler Dimensions

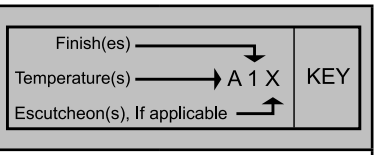
# TECHNICAL DATA

# VK3021 QUICK RESPONSE PENDENT SPRINKLER (K5.6)

**The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058**
**Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com**
**Visit the Viking website for the latest edition of this technical data page www.vikinggroupinc.com**

## APPROVAL CHART

**Viking Quick Response Pendent Sprinkler**
**VK3021 K5.6 (80.6 metric)**




| Sprinkler Base Part Number[1] | Thread Size | | Listings and Approvals[2,6] | | | | |
|---|---|---|---|---|---|---|---|
| | NPT | BSPT | cULus | | FM | | CE[6] |
| | Inch | mm | Approval Listings | Maximum WWP | Approval Listings | Maximum WWP | Approval Listings |
| 23870 | 1/2 | -- | A1, B2X, B3Y | 250 PSI (17 bar) | A1, B2X, B3Y | 175 PSI (12 bar) | C1, D2X, D3Y |
| 23882 | -- | 15 | A1, B2X, B3Y | 250 PSI (17 bar) | A1, B2X, B3Y | 175 PSI (12 bar) | C1, D2X, D3Y |

**Approved Temperature Ratings:**

**A** = 135 °F (57 °C), 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C) and 286 °F (141 °C)
**B** = 135 °F (57 °C), 155 °F (68 °C), 175 °F (79 °C), and 200 °F (93 °C)
**C** = 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C) and 286 °F (141 °C)
**D** = 155 °F (68 °C), 175 °F (79 °C), and 200 °F (93 °C)

**Approved Finishes:**

**1** = Brass, Chrome, White Polyester [3,4], Black Polyester [3,4], and ENT [4,5]
**2** = Brass, Chrome, White Polyester [3,4], and Black Polyester [3,4]
**3** = ENT [4,5]

**Approved Escutcheon Code:**

**X** = Installed with Viking Recessed Escutcheons Models E-1, E-2, E-3, NP-1, NP-2, and NP-3, or Viking Standard Surface Mounted Escutcheons
**Y** = Installed with Viking Recessed Escutcheons Models E-1 and NP-1, or Viking Standard Surface Mounted Escutcheons

**Footnotes**

1 Base Part number is shown. For complete part number, refer to Viking's current price schedule.
2 This table shows the listings and approvals available at the time of printing. Check with the manufacturer for any additional approvals.
3 Other colors are available upon request with the same Listings and Approvals as the standard colors.
4 cULus Listed as corrosion resistant.
5 FM Approved as corrosion resistant.
6 CE: Standard EN12259-1, Declaration of Performance DOP_XT1A_1-3-21.

## DESIGN CRITERIA - UL

**cULus Listing Requirements:**

The Viking VK3021 Quick Response Pendent Sprinkler is cULus Listed as indicated in Approval Chart for installation in accordance with the latest edition of NFPA 13 for standard spray sprinklers.

- Designed for use in Light and Ordinary Hazard occupancies.
- The sprinkler installation rules contained in NFPA 13 for standard spray pendent sprinklers shall be followed.

**IMPORTANT: Always refer to Form Number F_091699 - Care and Handling of Sprinklers. Also refer to Form Number F_080614 for general care, installation, and maintenance information. Viking sprinklers are to be installed in accordance with the latest edition of Viking Technical Data, the appropriate standards of NFPA, LPCB, APSAD, VdS or other similar organizations, and also with the provisions of governmental codes, ordinances, and standards, whenever applicable.**

## DESIGN CRITERIA - FM

**FM Approval Requirements:**

The Viking VK3021 Quick Response Pendent Sprinkler is FM Approved as quick response Non-Storage Pendent sprinkler as indicated in the FM Approval Guide. For specific application and installation requirements, reference the latest applicable FM Loss Prevention Data Sheets (including Data Sheet 2-0). FM Global Loss Prevention Data Sheets contain guidelines relating to, but not limited to: minimum water supply requirements, hydraulic design, ceiling slope and obstructions, minimum and maximum allowable spacing, and deflector distance below the ceiling.

**NOTE: The FM Installation guidelines may differ from UL and/or NFPA criteria.**

**IMPORTANT: Always refer to Form Number F_091699 - Care and Handling of Sprinklers. Also refer to Form Number F_080614 for general care, installation, and maintenance information. Viking sprinklers are to be installed in accordance with the latest edition of Viking Technical Data, the appropriate standards of NFPA, LPCB, APSAD, VdS or other similar organizations, and also with the provisions of governmental codes, ordinances, and standards, whenever applicable.**

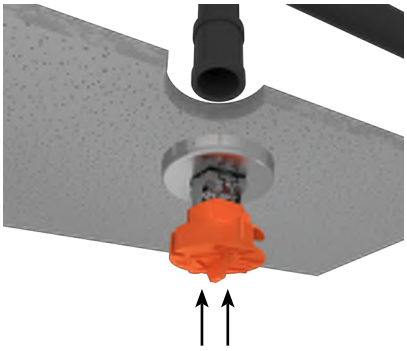
VIKING®

TECHNICAL DATA

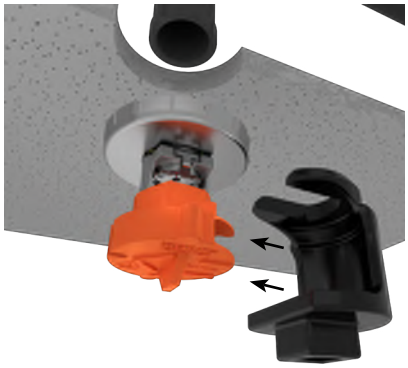
VK3021 QUICK RESPONSE PENDENT SPRINKLER (K5.6)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com
Visit the Viking website for the latest edition of this technical data page www.vikinggroupinc.com

1. Install the escutcheon inner ring onto the sprinkler threads.



2. Carefully slide the wrench** sideways around the protective cap then push upwards to engage with the sprinkler wrench flats.



3. Install the sprinkler and escutcheon assembly into the pipe fitting. Be sure the escutcheon outer ring contacts the surface of the finished ceiling.

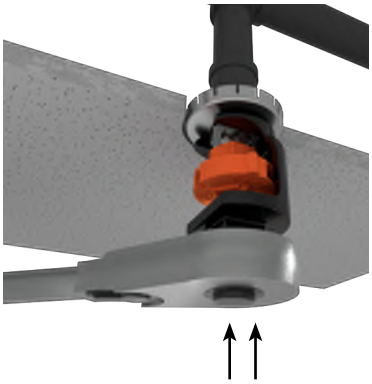
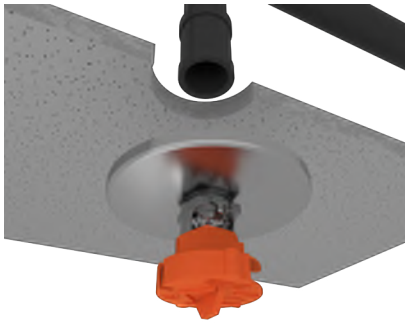


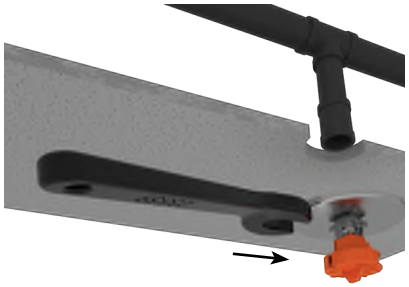
**Figure 3: Recessed Installation (with Recessed Socket Wrench)**

**A 1/2" ratchet is required (not available from Viking).

1. Install the escutcheon onto the sprinkler threads.



2. Carefully slide the wrench onto the sprinkler wrench flats.



3. Install the sprinkler and escutcheon assembly into the pipe fitting. Be sure the escutcheon contacts the surface of the finished ceiling.

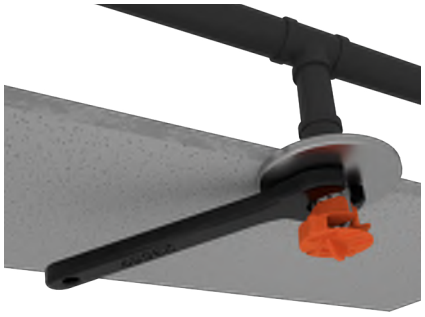


**Figure 4: Installation (with Standard Wrench)**

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TECHNICAL DATA

VK3021 QUICK RESPONSE PENDENT SPRINKLER (K5.6)

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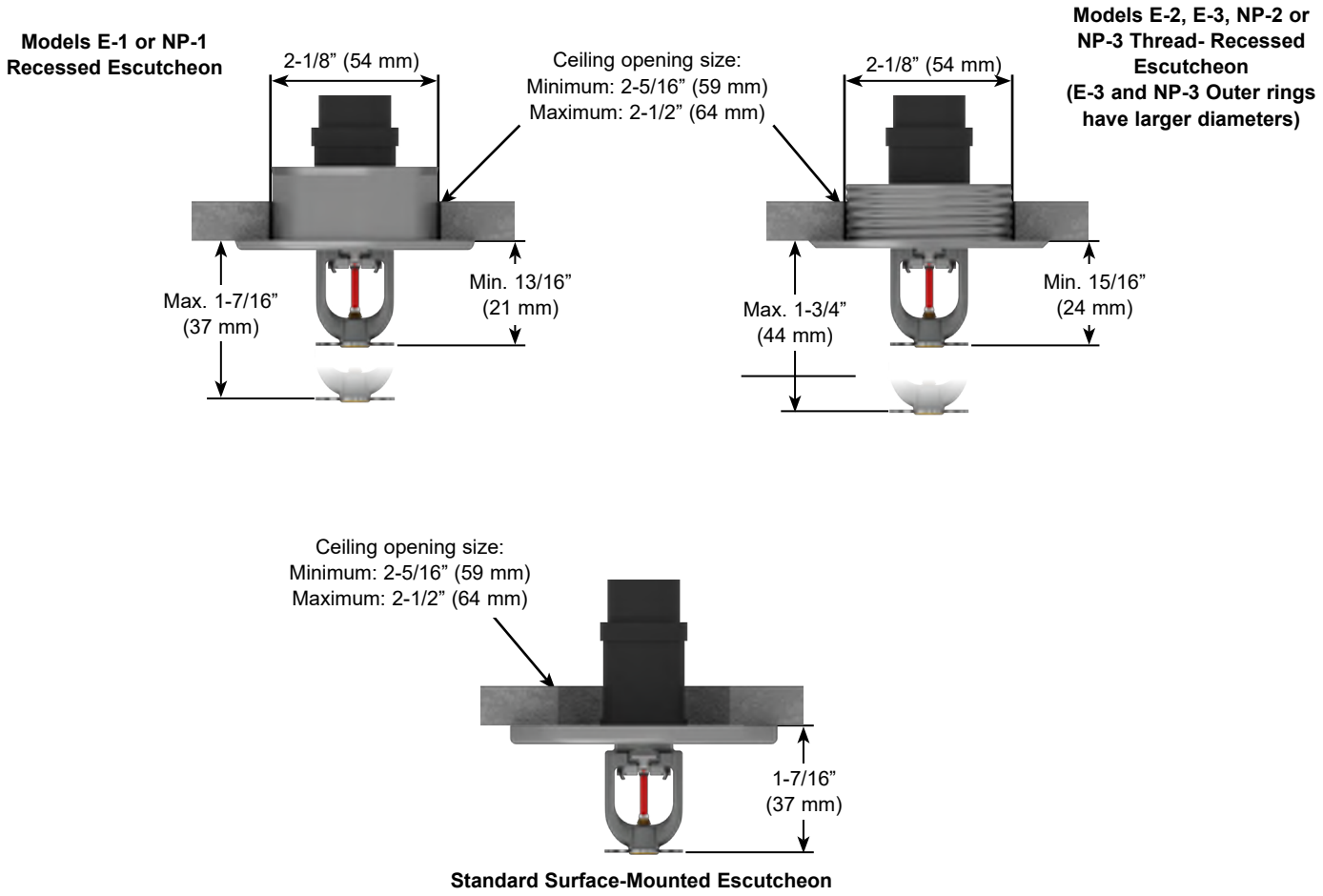



**Figure 5: Installation Dimensions with Viking Escutcheons**

VIKING

**BULLETIN**

# CARE AND HANDLING OF SPRINKLERS

**The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058**
**Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com**

## SPRINKLERS ARE FRAGILE - HANDLE WITH CARE!

### General Handling and Storage:

- Store sprinklers in a cool, dry place.
- Protect sprinklers during storage, transport, handling, and after installation.
- Use the original shipping containers. DO NOT place sprinklers loose in boxes, bins, or buckets.
- Keep sprinklers separated at all times. DO NOT allow metal parts to contact sprinkler operating elements.

### For Pre-Assembled Drops:

- Protect sprinklers during handling and after installation.
- For recessed assemblies, use the protective sprinkler cap (Viking Part Number 10364).

### Sprinklers with Protective Shields or Caps:

- DO NOT remove shields or caps until after sprinkler installation and there no longer is potential for mechanical damage to the sprinkler operating elements.
- **Sprinkler shields or caps MUST be removed BEFORE placing the system in service!**
- Remove the sprinkler shield by carefully pulling it apart where it is snapped together.
- Remove the cap by turning it slightly and pulling it off the sprinkler.

### Sprinkler Installation:

- DO NOT use the sprinkler deflector or operating element to start or thread the sprinkler into a fitting.
- **Use only the designated sprinkler head wrench!** Refer to the current sprinkler technical data page to determine the correct wrench for the model of sprinkler used.
- DO NOT install sprinklers onto piping at the floor level.
- Install sprinklers after the piping is in place to prevent mechanical damage.
- DO NOT allow impacts such as hammer blows directly to sprinklers or to fittings, pipe, or couplings in close proximity to sprinklers. Sprinklers can be damaged from direct or indirect impacts.
- DO NOT attempt to remove drywall, paint, etc., from sprinklers.
- **Take care not to over-tighten the sprinkler and/or damage its operating parts!**

  **Maximum Torque:**
  **1/2" NPT: 14 ft-lbs. (19.0 N-m)**
  **3/4" NPT: 20 ft-lbs. (27.1 N-m)**
  **1" NPT: 30 ft-lbs. (40.7 N-m)**



**CORRECT**
**(Original container used)**



**INCORRECT**
**(Placed loose in box)**



**CORRECT**
**(Protected with caps)**



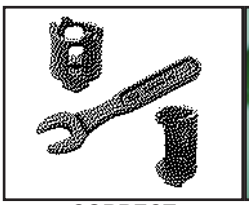
**INCORRECT**
**(Protective caps not used)**



**CORRECT**
**(Piping is in place at the ceiling)**



**INCORRECT**
**(Sprinkler at floor level)**



**CORRECT**
**(Special installation wrenches)**



**INCORRECT**
**(Designated wrench not used)**

**WARNING**: Cancer and Reproductive Harm-
www.P65Warnings.ca.gov

**⚠ WARNING**

Any sprinkler with a loss of liquid from the glass bulb or damage to the fusible element should be destroyed. Never install sprinklers that have been dropped, damaged, or exposed to temperatures exceeding the maximum ambient temperature allowed. Sprinklers that have been painted in the field must be replaced per NFPA 13. Protect sprinklers from paint and paint overspray in accordance with the installation standards. Do not clean sprinklers with soap and water, ammonia, or any other cleaning fluid. Do not use adhesives or solvents on sprinklers or their operating elements.

**Refer to the appropriate technical data page and NFPA standards for complete care, handling, installation, and maintenance instructions. For additional product and system information Viking data pages and installation instructions are available on the Viking Web site at www.vikinggroupinc.com.**

VIKING | BULLETIN | CARE AND HANDLING OF SPRINKLERS

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
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# PROTECTIVE SPRINKLER SHIELDS AND CAPS

**General Handling and Storage:**

Many Viking sprinklers are available with a plastic protective cap or shield temporarily covering the operating elements. The snap-on shields and caps are factory installed and are intended to help protect the operating elements from mechanical damage during shipping, storage, and installation. NOTE: It is still necessary to follow the care and handling instructions on the appropriate sprinkler technical data sheets* when installing sprinklers with bulb shields or caps.

**WHEN TO REMOVE THE SHIELDS AND CAPS:**

NOTE: SHIELDS AND CAPS MUST BE REMOVED FROM SPRINKLERS BEFORE PLACING THE SYSTEM IN SERVICE!

Remove the shield or cap from the sprinkler only after checking all of the following:

- The sprinkler has been installed*.
- The wall or ceiling finish work is completed where the sprinkler is installed and there no longer is a potential for mechanical damage to the sprinkler operating elements.

SHIELDS AND CAPS MUST BE REMOVED FROM SPRINKLERS BEFORE PLACING THE SYSTEM IN SERVICE!

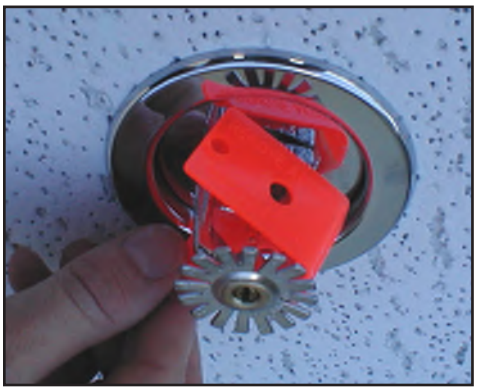


**Figure 1: Sprinkler shield being removed from a pendent sprinkler.**



**Figure 2: Sprinkler cap being removed from a pendent sprinkler.**



**Figure 3: Sprinkler cap being removed from and upright sprinkler.**

## HOW TO REMOVE SHIELDS AND CAPS:

No tools are necessary to remove the shields or caps from sprinklers. DO NOT use any sharp objects to remove them! **Take care not to cause mechanical damage to sprinklers when removing the shields or caps.** When removing caps from fusible element sprinklers, use care to prevent dislodging ejector springs or damaging fusible elements. NOTE: Squeezing the sprinkler cap excessively could damage sprinkler fusible elements.

- To remove the shield, simply pull the ends of the shield apart where it is snapped together. Refer to Figure 1.
- To remove the cap, turn it slightly and pull it off the sprinkler. Refer to Figures 2 and 3.

**NOTICE** Refer to the current sprinkler technical data page to determine the correct sprinkler wrench for the model of sprinkler used.

**WARNING** Never install sprinklers that have been dropped, damaged, or exposed to temperatures in excess of the maximum ambient temperature allowed.

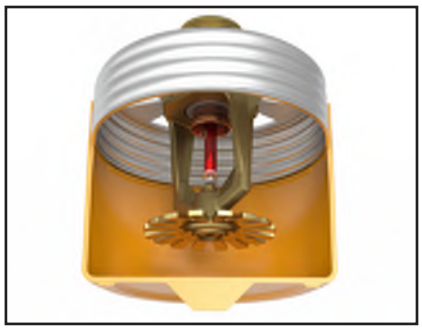
*** Refer to the appropriate current technical data pages for complete care, handling, and installation instructions. Data pages are included with each shipment from Viking or Viking distributors. They can also be found on the Web site at www.vikinggroupinc.com.**

# BULLETIN

# CARE AND HANDLING OF SPRINKLERS

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
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**CAUTION CONCEALED COVER ASSEMBLIES ARE FRAGILE!**
**TO ASSURE SATISFACTORY PERFORMANCE OF THE PRODUCT, HANDLE WITH CARE.**

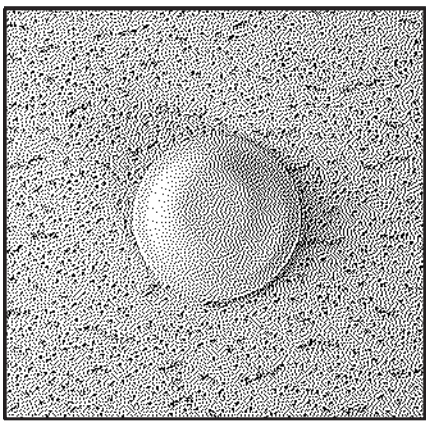


**Concealed Sprinkler and Adapter Assembly with Protective Cap**

**Concealed Sprinkler and Adapter Assembly (Protective Cap Removed)**



**Cover Plate Assembly (Pendent Cover 12381 shown)**



**GENERAL HANDLING AND STORAGE INSTRUCTIONS:**

- Do not store in temperatures exceeding 100 °F (38 °C). Avoid direct sunlight and confined areas subject to heat.
- Protect sprinklers and cover assemblies during storage, transport, handling, and after installation.
  -- Use original shipping containers.
  -- Do not place sprinklers or cover assemblies loose in boxes, bins, or buckets.
- Keep the sprinkler bodies covered with the protective sprinkler cap any time the sprinklers are shipped or handled, during testing of the system, and while ceiling finish work is being completed.
- Use only the designated Viking recessed sprinkler wrench (refer to the appropriate sprinkler data page) to install these sprinklers. **NOTE:** The protective cap is temporarily removed during installation and then placed back on the sprinkler for protection until finish work is completed.
- Do not over-tighten the sprinklers into fittings during installation.
- Do not use the sprinkler deflector to start or thread the sprinklers into fittings during installation.
- Do not attempt to remove drywall, paint, etc., from the sprinklers.
- Remove the plastic protective cap from the sprinkler before attaching the cover plate assembly. **PROTECTIVE CAPS MUST BE REMOVED FROM SPRINKLERS BEFORE PLACING THE SYSTEM IN SERVICE!**

**Refer to the appropriate current technical data pages for complete care, handling, and installation instructions. Data pages are included with each shipment from Viking or Viking distributors. They can also be found on the Web site at www.vikinggroupinc.com.**

VIKING

BULLETIN

# CARE AND HANDLING OF SPRINKLERS

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## USE THE FOLLOWING PRECAUTIONS WHEN HANDLING WAX-COATED SPRINKLERS

Many of Viking's sprinklers are available with factory-applied wax coating for corrosion resistance. These sprinklers MUST receive appropriate care and handling to avoid damaging the wax coating and to assure satisfactory performance of the product.

**General Handling and Storage of Wax-Coated Sprinklers:**

- Store the sprinklers in a cool, dry place (in temperatures below the maximum ambient temperature allowed for the sprinkler temperature rating. Refer to Table 1 below.)
- Store containers of wax-coated sprinklers separate from other sprinklers.
- Protect the sprinklers during storage, transport, handling, and after installation.
- Use original shipping containers.
- Do not place sprinklers in loose boxes, bins, or buckets.

**Installation of Wax-Coated Sprinklers:**

Use only the special sprinkler head wrench designed for installing wax-coated Viking sprinklers (any other wrench may damage the unit).

- Take care not to crack the wax coating on the units.
- For touching up the wax coating after installation, wax is available from Viking in bar form. Refer to Table 1 below. The coating MUST be repaired after sprinkler installation to protect the corrosion-resistant properties of the sprinkler.
- Use care when locating sprinklers near fixtures that can generate heat. Do not install sprinklers where they would be exposed to temperatures exceeding the maximum recommended ambient temperature for the temperature rating used.
- Inspect the coated sprinklers frequently soon after installation to verify the integrity of the corrosion resistant coating. Thereafter, inspect representative samples of the coated sprinklers in accordance with NFPA 25. Close up visual inspections are necessary to determine whether the sprinklers are being affected by corrosive conditions.

**TABLE 1**

| Sprinkler Temperature Rating (Fusing Point) | Wax Part Number | Wax Melting Point | Maximum Ambient Ceiling Temperature[1] | Wax Color |
|---|---|---|---|---|
| 155 °F (68 °C) / 165 °F (74 °C) | 02568A | 148 °F (64 °C) | 100 °F (38 °C) | Light Brown |
| 175 °F (79 °C) | 04146A | 161 °F (71 °C) | 150 °F (65 °C) | Brown |
| 200 °F (93 °C) | 04146A | 161 °F (71 °C) | 150 °F (65 °C) | Brown |
| 220 °F (104 °C) | 02569A | 170 °F (76 °C) | 150 °F (65 °C) | Dark Brown |
| 286 °F (141 °C) | 02569A | 170 °F (76 °C) | 150 °F (65 °C) | Dark Brown |

[1] Based on NFPA-13. Other limits may apply, depending on fire loading, sprinkler location, and other requirements of the Authority Having Jurisdiction. Refer to specific installation standards.

**WARNING** Never install sprinklers that have been dropped, damaged, or exposed to temperatures in excess of the maximum ambient temperature allowed.

**Refer to the appropriate current technical data pages for complete care, handling, and installation instructions. Data pages are included with each shipment from Viking or Viking distributors. They can also be found on the Web site at www.vikinggroupinc.com.**

# TECHNICAL DATA — SPRINKLER OVERVIEW

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## 1. DESCRIPTION

Viking fire sprinklers consist of a threaded frame with a specific waterway or orifice size and a deflector for distributing water in a specified pattern. A closed or sealed sprinkler refers to a complete assembly, including the thermosensitive operating element. An open sprinkler does not use an operating element and is open at all times. The distribution of water is intended to extinguish a fire or to control its spread.

Viking sprinklers are available in several models and styles. Refer to specific sprinkler technical data pages for available styles, finishes, temperature ratings, thread sizes, and nominal K-Factors for the particular model selected.

## 2. LISTINGS AND APPROVALS

Refer to the Approval Charts on the appropriate sprinkler technical data page(s) and/or approval agency listings.

**WARNING**: Cancer and Reproductive Harm- www.P65Warnings.ca.gov

## 3. TECHNICAL DATA

**Pressure Ratings:**

Maximum allowable water working pressure is 175 psig (12 Bar) unless rated and specified for high water working pressure [250 psig (17.2 bar)].

**Sprinkler Identification:**

Viking sprinklers are identified and marked with the word “Viking”, the sprinkler identification number (SIN) consisting of “VK” plus a three digit number*, the model letter, and the year of manufacture.

**Available Finishes:**

Viking sprinklers are available in several decorative finishes. Some models are available with corrosion-resistant coatings or are fabricated from non-corrosive material. Refer to the sprinkler technical data page for additional information.

**Available Temperature Ratings:**

Viking sprinklers are available in several temperature ratings that relate to a specific temperature classification. Applicable installation rules mandate the use and limitations of each temperature classification. In selecting the appropriate temperature classification, the maximum expected ceiling temperature must be known. When there is doubt as to the maximum temperature at the sprinkler location, a maximum-reading thermometer should be used to determine the temperature under conditions that would show the highest readings to be expected. In addition, recognized installation rules may require a higher temperature classification, depending upon sprinkler location, occupancy classification, commodity classification, storage height, and other hazards. In all cases, the maximum expected ceiling temperature dictates the lowest allowable temperature classification. Sprinklers located immediately adjacent to a heat source may require a higher temperature rating.

**K-Factors:**

Viking sprinklers are available in several orifice sizes with related K-Factors. The orifice is a tapered waterway and, therefore, the K-Factor given is nominal. Nominal U.S. K-Factors are provided in accordance with the 1999 edition of NFPA 13, Section 3-2.3. Refer to the specific data page for appropriate K-Factor information.

**Available Styles:**

Viking sprinklers are available for installation in several positions as indicated by a stamping on the deflector. The deflector style dictates the appropriate installation position of the sprinkler; it breaks the solid stream of water issuing from the sprinkler orifice to form a specific spray pattern. The following list indicates the various styles and identification of Viking sprinklers.

UPRIGHT SPRINKLER: A sprinkler intended to be installed with the deflector above the frame so water flows upward through the orifice, striking the deflector and forming an umbrella-shaped spray pattern downward. Marked “SSU” (Standard Sprinkler Upright) or “UPRIGHT” on the deflector.

PENDENT SPRINKLER: A sprinkler intended to be oriented with the deflector below the frame so water flows downward through the orifice, striking the deflector and forming an umbrella-shaped spray pattern downward. Marked “SSP” (Standard Sprinkler Pendent) or “PENDENT” on the deflector.

**Viking Technical Data may be found on The Viking Corporation’s Web site at http://www.vikinggroupinc.com. The Web site may include a more recent edition of this Technical Data Page.**

CONVENTIONAL SPRINKLER: An “old style” sprinkler intended to be installed with the deflector in either the upright or pendent position. The deflector provides a spherical type pattern with 40 to 60 percent of the water initially directed downward and a proportion directed upward. Must be installed in accordance with installation rules for conventional or old style sprinklers. DO NOT USE AS A REPLACEMENT FOR STANDARD SPRAY SPRINKLERS. Marked “C U/P” (Conventional Upright/Pendent) on the deflector.

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VERTICAL SIDEWALL (VSW) SPRINKLER: A sprinkler intended for installation near the wall and ceiling. The deflector provides a water spray pattern outward in a quarter-spherical pattern and can be installed in the upright or pendent position with the flow arrow in the direction of discharge. Marked “SIDEWALL” on the deflector with an arrow and the word “FLOW”. (Note: Some vertical sidewall sprinklers can only be installed in the upright or pendent position—in this case, the sprinkler will also be marked “UPRIGHT” or “PENDENT”.)

HORIZONTAL SIDEWALL (HSW) SPRINKLER: A sprinkler intended for installation near the wall and ceiling. The special deflector provides a water spray pattern outward in a quarter-spherical pattern. Most of the water is directed away from the nearby wall with a small portion directed at the wall behind the sprinkler. The top of the deflector is oriented parallel with the ceiling or roof. The flow arrows point in the direction of discharge. Marked “SIDEWALL” and “TOP” with an arrow and the word “FLOW”.

EXTENDED COVERAGE (EC) SPRINKLER: A spray sprinkler designed to discharge water over an area having the maximum dimensions indicated in the individual listings. Maximum area of coverage, minimum flow rate, orifice size, and nominal K-Factor are specified in the individual listings. EC sprinklers are intended for Light-Hazard occupancies with smooth, flat, horizontal ceilings unless otherwise specified. In addition to the above markings, the sprinkler is marked “EC”.

QUICK RESPONSE (QR) SPRINKLER: A spray sprinkler with a fast- actuating operating element. The use of quick response sprinklers may be limited due to occupancy and hazard. Refer to the Authority Having Jurisdiction (AHJ) prior to installing.

QUICK RESPONSE EXTENDED COVERAGE (QREC) SPRINKLER: A spray sprinkler designed to discharge water over an area having the maximum dimensions indicated in the individual listing. This is a sprinkler with an operating element that meets the criteria for quick response. QREC sprinklers are only intended for Light Hazard occupancies. The sprinkler is marked “QREC”.

FLUSH SPRINKLER: A decorative spray sprinkler intended for installation with a concealed piping system. The unit is mounted flush with the ceiling or wall, with the fusible link exposed. Upon actuation, the deflector extends beyond the ceiling or wall to distribute water discharge. The sprinkler is marked “SSP”, “PEND”, or “SIDEWALL” and “TOP”.

CONCEALED SPRINKLER: A decorative spray sprinkler intended for installation with a concealed piping system. The sprinkler is hidden from view by a cover plate installed flush with the ceiling or wall. During fire conditions, the cover plate detaches, and upon sprinkler actuation, the deflector extends beyond the ceiling or wall to distribute water discharge. The sprinkler is marked “SSP”, “PEND”, or “SIDEWALL” and “TOP”.

RECESSED SPRINKLER: A spray sprinkler assembly intended for installation with a concealed piping system. The assembly consists of a sprinkler installed in a decorative adjustable recessed escutcheon that minimizes the protrusion of the sprinkler beyond the ceiling or wall without adversely affecting the sprinkler distribution or sensitivity. Refer to the appropriate technical data page for allowable sprinkler models, temperature ratings, and occupancy classifications. DO NOT RECESS ANY SPRINKLER NOT LISTED FOR USE WITH THE ESCUTCHEON.

CORROSION-RESISTANT SPRINKLER: A special service sprinkler with non-corrosive protective coatings, or that is fabricated from non-corrosive material, for use in atmospheres that would normally corrode sprinklers.

DRY SPRINKLER: A special-service sprinkler intended for installation on dry pipe systems or wet pipe systems where the sprinkler is subject to freezing temperatures. The unit consists of a sprinkler permanently secured to an extension nipple with a sealed inlet end to prevent water from entering the nipple until the sprinkler operates. The unit MUST be installed in a tee fitting. Dry upright sprinklers are marked with the “B” dimension [distance from the face of the fitting (tee) to the top of the deflector]. Dry pendent and sidewall sprinklers are marked with the “A” dimension [the distance from the face of fitting (tee) to the finished surface of the ceiling or wall].

LARGE DROP SPRINKLER: A type of special application sprinkler used to provide fire control of specific high-challenge fire hazards. Large drop sprinklers are designed to produce an umbrella-shaped spray pattern downward with a higher percentage of “large” water droplets than standard spray sprinklers. The sprinkler has an extra-large orifice with a nominal K-Factor of 11.2. Marked “HIGH CHALLENGE” and “UPRIGHT”.

EARLY SUPPRESSION FAST-RESPONSE (ESFR) SPRINKLER: A sprinkler intended to provide fire suppression of specific high-challenge fire hazards through the use of a fast response fusible link, 14.0, 16.8, or 25.2 nominal K-Factor, and special deflector. ESFR sprinklers are designed to produce high-momentum water droplets in a hemispherical pattern below the deflector. This permits penetration of the fire plume and direct wetting of the burning fuel surface while cooling the atmosphere early in the development of a high-challenge fire. Marked “ESFR” and “UPRIGHT” or “PEND”.

INTERMEDIATE LEVEL/RACK STORAGE SPRINKLER: A standard spray sprinkler assembly designed to protect its operating element from the spray of sprinklers installed at higher elevations. The assembly consists of a standard or large orifice upright or pendent sprinkler with an integral upright or pendent water shield and guard assembly. Use only those sprinklers that have been tested and listed for use with the assembly. Refer to the technical data page for allowable sprinkler models.

RESIDENTIAL SPRINKLER: A sprinkler intended for use in the following occupancies: one- and two-family dwellings with the fire protection sprinkler system installed in accordance with NFPA 13D; residential occupancies up to four stories in height with the fire protection system installed in accordance with NFPA 13R; and where allowed by the Authority Having Jurisdiction in residential portions of any occupancy with the fire protection system installed in accordance with NFPA 13.

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Residential sprinklers have a unique distribution pattern and utilize a “fast response” heat sensitive operating element. They enhance survivability in the room of fire origin and are designed to provide a life safety environment for a minimum of ten minutes. For this reason, residential sprinklers must not be used to replace standard sprinklers unless tested for and approved by the Authority Having Jurisdiction. In addition to standard markings, the unit is identified as “RESIDENTIAL SPRINKLER” or “RES”.

## 4. INSTALLATION

Refer to appropriate NFPA Installation Standards.

## 5. OPERATION

Refer to the appropriate sprinkler technical data page(s).

## 6. INSPECTIONS, TESTS AND MAINTENANCE

Refer to NFPA 25 for Inspection, Testing and Maintenance requirements.

## 7. AVAILABILITY

Viking sprinklers are available through a network of domestic and international distributors. See The Viking Corporation web site for the closest distributor or contact The Viking Corporation.

## 8. GUARANTEE

For details of warranty, refer to Viking’s current list price schedule or contact Viking directly.

**IMPORTANT: Always refer to Bulletin Form No. F_091699 - Care and Handling of Sprinklers and the appropriate sprinkler general care, installation, and maintenance guide. Viking sprinklers are to be installed in accordance with the latest edition of Viking technical data, the appropriate standards of NFPA, FM Global, LPCB, APSAD, VdS or other similar organizations, and also with the provisions of governmental codes, ordinances, and standards, whenever applicable. The sprinkler technical data page may contain installation requirements specific for the sprinkler model selected. The use of certain types of sprinklers may be limited due to occupancy and hazard. Refer to the Authority Having Jurisdiction prior to installation.**

# TECHNICAL DATA

# SPRINKLER GENERAL CARE, INSTALLATION, AND MAINTENANCE GUIDE

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## 1. DESCRIPTION - STANDARD RESPONSE, QUICK RESPONSE, EXTENDED COVERAGE, AND DRY SPRINKLERS

Viking thermosensitive spray sprinklers consist of a small frame and either a glass bulb or a fusible operating element. Available styles include pendent, flush pendent, concealed pendent, upright, horizontal sidewall, vertical sidewall, or conventional, depending on the particular sprinkler model selected.

Viking sprinklers are available with various finishes, temperature ratings, responses, and K-Factors to meet design requirements†. Used in conjunction with one of the corrosion-resistant coatings (for frame style sprinklers), the units provide protection against many corrosive environments. In addition, the special Polyester or PTFE coatings can be used in decorative applications where colors are desired.

† Refer to the sprinkler technical data page for available styles, finishes, temperature ratings, responses, and nominal K-Factors for specific sprinkler models.

## 2. LISTINGS AND APPROVALS

Refer to the Approval Charts on the appropriate sprinkler technical data page(s) and/or approval agency listings.

## 3. TECHNICAL DATA

**Specifications:**

Refer to the appropriate sprinkler technical data sheet.

**Material Standards:**

Refer to the appropriate sprinkler technical data sheet.

**WARNING**: Cancer and Reproductive Harm- www.P65Warnings.ca.gov

## 4. INSTALLATION

**NOTE: Take care not to over-tighten the sprinkler and/or damage its operating parts!**

**Maximum Torque:**

**1/2" NPT: 14 ft-lbs. (19.0 N-m)**

**3/4" NPT: 20 ft-lbs. (27.1 N-m)**

**1" NPT: 30 ft-lbs. (40.7 N-m)**

**A. Care and Handling (also refer to Bulletin - Care and Handling of Sprinklers, Form No. F_091699.)**

Sprinklers must be handled with care. They must be stored in a cool, dry place in their original shipping container. Never install sprinklers that have been dropped, damaged, or exposed to temperatures exceeding the maximum ambient temperature allowed (refer to the temperature chart on the sprinkler technical data page). Never install any glass-bulb sprinkler if the bulb is cracked or if there is a loss of liquid from the bulb. A small air bubble should be present in the glass bulb. Any sprinkler with a loss of liquid from the glass bulb or damage to the fusible element should be destroyed immediately. (Note: Installing glass bulb sprinklers in direct sunlight (ultraviolet light) may affect the color of the dye used to color code the bulb. This color change does not affect the integrity of the bulb.)

Sprinklers must be protected from mechanical damage during storage, transport, handling, and after installation. Sprinklers subject to mechanical damage must be protected with an approved sprinkler guard.

Use only sprinklers listed as corrosion resistant when subject to corrosive environments. When installing corrosion-resistant sprinklers, take care not to damage the corrosion-resistant coating. Use only the special wrench designed for installing coated or recessed Viking sprinklers (any other wrench may damage the unit).

**Concealed sprinklers must be installed in neutral or negative pressure plenums only!**

Use care when locating sprinklers near fixtures that can generate heat. Do not install sprinklers where they could be exposed to temperatures exceeding the maximum recommended ambient temperature for the temperature rating used.

Wet pipe systems must be provided with adequate heat. Sprinklers supplied from dry systems in areas subject to freezing must be listed dry sprinklers, upright, or horizontal sidewall sprinklers installed so that water is not trapped. For dry systems, pendent sprinklers and sidewall sprinklers installed on return bends are permitted, where the sprinklers, return bend, and branch line piping are in an area maintained at or above 40 °F (4 °C).

**B. Installation Instructions - Standard Spray Sprinklers**

Viking sprinklers are manufactured and tested to meet the rigid requirements of approving agencies. They are designed to be installed in accordance with recognized installation standards. Deviation from the standards or any alteration to sprinklers or cover plate assemblies after they leave the factory including, but not limited to: painting, plating, coating, or modification, may render them inoperative and will automatically nullify the approvals and any guarantee made by The Viking Corporation.

VIKING | TECHNICAL DATA | SPRINKLER GENERAL CARE, INSTALLATION, AND MAINTENANCE GUIDE

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Before installation, be sure to have the appropriate sprinkler model and style, with the correct K-Factor, temperature rating, and response characteristics. Sprinklers must be installed after the piping is in place to prevent mechanical damage. Keep sprinklers with protective caps or bulb shields contained within the caps or shields during installation and testing, and any time the sprinkler is shipped or handled.

1a. For frame-style sprinklers, install escutcheon (if used), which is designed to thread onto the external threads of the sprinkler. Refer to the appropriate sprinkler data page to determine approved escutcheons for use with specific sprinkler models.

1b. For flush and concealed style sprinklers: Cut the sprinkler nipple so that the ½" or 3/4" (15 mm or 20 mm)* NPT outlet of the reducing coupling is at the desired location, and centered in the opening* in the ceiling or wall.

*Size depends on the sprinkler model used. Refer to the sprinkler technical data page.

2. Apply a small amount of pipe-joint compound or tape to the external threads of the sprinkler only, taking care not to allow a build-up of compound in the sprinkler inlet. **NOTE:** Sprinklers with protective caps or bulb shields must have the caps or shields kept on them when applying pipe-joint compound or tape. *Exception: For domed concealed sprinklers, remove the protective cap for installation, and then place it back on the sprinkler temporarily..*

3. Refer to the appropriate sprinkler technical data page to determine the correct sprinkler wrench for the model of sprinkler used. DO NOT use the deflector or fusible element to start or thread the sprinkler into a fitting.

a. Install the sprinkler onto the piping using the special sprinkler wrench only, taking care not to over-tighten or damage the sprinkler.

b. For flush and concealed style sprinklers: the internal diameter of the special sprinkler installation wrench is designed for use with the sprinkler contained in the protective cap. *Exception: For domed concealed sprinklers, remove the protective cap for installation, and then place it back on the sprinkler temporarily.* Thread the flush or concealed sprinkler into the ½" or 3/4" (15 mm or 20 mm)* NPT outlet of the coupling by turning it clockwise with the special sprinkler wrench. *Thread size depends on the particular sprinkler model used. Refer to the sprinkler technical data page.

**C. Installation Instructions - Dry Sprinklers**

**WARNING:** Viking dry sprinklers are to be installed in the 1" outlet (for dry and preaction systems), or run of malleable, ductile iron, or Nibco CPVC* threaded tee fittings (for wet systems) that meet the dimensional requirements of ANSI B16.3 (Class 150), or cast iron threaded tee fittings that meet the dimensional requirements of ANSI B16.4 (Class 125), even at branch line ends. The threaded end of the dry sprinkler is designed to allow the seal to penetrate and extend into the fitting to a predetermined depth. This prevents condensation from accumulating and freezing over the sprinkler seal. ***NOTE: When using CPVC fittings with Viking dry sprinklers, use only new Nibco Model 5012-S-BI. When selecting other CPVC fittings, contact Viking Technical Services.**

1. **DO NOT** install the dry sprinkler into a threaded elbow, coupling, or any other fitting that could interfere with thread penetration. Such installation would damage the brass seal.
2. **DO NOT** install dry sprinklers into couplings or fittings that would allow condensation to accumulate above the seal when the sprinkler is located in an area subject to freezing.
3. **NEVER** try to modify dry sprinklers. They are manufactured for specific "A" or "B" dimensions and cannot be modified.

The dry sprinkler must be installed after the piping is in place to prevent mechanical damage. Before installation, be sure to have the correct sprinkler model and style, with the appropriate "A" or "B" dimension(s), temperature rating, orifice size, and response characteristics. Keep sprinklers with protective caps or bulb shields contained within the caps or shields during installation and testing, and any time the sprinkler is shipped or handled. *Exception:* For concealed and adjustable recessed dry sprinklers, the protective caps and shields are removed for installation.

To install the dry sprinkler, refer to the instructions below and the appropriate sprinkler technical data page for illustrated instructions.

*Dry upright sprinklers must be installed above the piping, in the upright position only. When installing dry upright or plain barrel style vertical sidewall sprinklers on piping located close to the ceiling, it may be necessary to lower the sprinkler into the fitting from above the ceiling. When installing dry upright or plain barrel vertical sidewall sprinklers from below the ceiling, verify that the opening in the ceiling is a minimum 1-1/2" (38.1 mm) in diameter.*

*For dry upright or plain barrel vertical sidewall sprinklers in the upright position: First, install the escutcheon (if used) over the threaded end of the sprinkler barrel. Slide the escutcheon past the external threads. NOTE: When installing the dry upright or plain barrel vertical sidewall sprinkler from above the ceiling, it will be necessary to install the escutcheon after lowering the threaded end of the sprinkler through the ceiling penetration.*

A. **For all dry sprinklers:** Apply a small amount of pipe-joint compound or tape to the external threads of the sprinkler barrel only, taking care not to allow a build-up of compound or tape over the brass inlet and seal. **NOTE:** Sprinklers with protective caps or bulb shields must be contained within the caps or shields before applying pipe-joint compound or tape.

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B. Refer to the appropriate sprinkler technical data page to determine the correct sprinkler wrench for the model of sprinkler used.
C. Install the dry sprinkler on the piping using the special dry sprinkler wrench only, while taking care not to damage the sprinkler. **NOTE:** Thread the sprinkler into the fitting hand tight, plus 1/2 turn with the dry sprinkler wrench.
D. *For adjustable standard and adjustable recessed dry pendent and sidewall sprinklers: Escutcheons can be installed after the sprinklers have been installed onto the piping. Refer to the appropriate sprinkler technical data page for escutcheon installation instructions and illustrations.*

**D. Installation Instructions - Testing**

4. After installation, the entire sprinkler system must be tested. The test must be conducted to comply with the installation standards. Viking *high pressure* sprinklers may be hydrostatically tested at a maximum of 300 psi (20.7 bar) for limited periods of time (two hours), for the purpose of acceptance by the Authority Having Jurisdiction.
   a. Make sure the sprinkler is properly tightened. If a thread leak occurs, normally the sprinkler must be removed, new pipe-joint compound or tape applied, and then reinstalled. This is due to the fact that when the joint seal is damaged, the sealing compound or tape is washed out of the joint. Air testing [do not exceed 40 psi (2.76 bar)] the sprinkler piping prior to testing with water may be considered in areas where leakage during testing must be prevented. Refer to the Installation Standards and the Authority Having Jurisdiction.
   b. **Remove plastic protective sprinkler caps or bulb shields AFTER the wall or ceiling finish work is completed where the sprinkler is installed and there no longer is a potential for mechanical damage to the sprinkler operating elements.** To remove the bulb shields, simply pull the ends of the shields apart where they are snapped together. To remove caps from frame style sprinklers, turn the caps slightly and pull them off the sprinklers. **SPRINKLER CAPS OR BULB SHIELDS MUST BE REMOVED FROM SPRINKLERS BEFORE PLACING THE SYSTEM IN SERVICE!** Retain a protective cap or shield in the spare sprinkler cabinet.
5. For flush style sprinklers: the ceiling ring can now be installed onto the sprinkler body. Align the ceiling ring with the sprinkler body and thread or push it on (depends on sprinkler model) until the outer flange touches the surface of the ceiling. Note the maximum adjustment is 1/4" (6.35 mm). DO NOT MODIFY THE UNIT. If necessary, re-cut the sprinkler drop nipple as required.
6. For concealed sprinklers: the cover assembly can now be attached.
   a. Remove the cover from the protective box, taking care not to damage the cover plate assembly.
   b. Gently place the base of the cover plate assembly over the sprinkler protruding through the opening in the ceiling.
   c. Push the cover plate assembly onto the sprinkler until the unfinished brass flange of the cover plate base (or the cover adapter, if used) touches the surface of the ceiling.
   d. Refer to the applicable technical data sheet to determin the maximum adjustment available for concealed sprinklers. DO NOT MODIFY THE UNIT. If necessary, re-cut the sprinkler drop nipple.

**NOTE:** If it is necessary to remove the entire sprinkler unit, the system must be taken out of service. See section 6. INSPECTIONS, TESTS AND MAINTENANCE and follow all warnings and instructions.

## 5. OPERATION

Refer to the appropriate sprinkler technical data page(s). During fire conditions, the operating element fuses or shatters (depending on the type of sprinkler), releasing the pip cap and sealing assembly. Water flowing through the sprinkler orifice strikes the sprinkler deflector, forming a uniform spray pattern to extinguish or control the fire.

**IMPORTANT: Always refer to Bulletin Form No. F_091699 - Care and Handling of Sprinklers. Viking sprinklers are to be installed in accordance with the latest edition of Viking technical data, the appropriate standards of NFPA, FM Global, LPCB, APSAD, VdS or other similar organizations, and also with the provisions of governmental codes, ordinances, and standards, whenever applicable. The sprinkler technical data page may contain installation requirements specific for the sprinkler model selected. The use of certain types of sprinklers may be limited due to occupancy and hazard. Refer to the Authority Having Jurisdiction prior to installation.**

**The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058**
**Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com**
**Visit the Viking website for the latest edition of this technical data page.**

## 6. INSPECTIONS, TESTS AND MAINTENANCE

**NOTICE:** Refer to NFPA 25 for Inspection, Testing and Maintenance requirements. **NOTICE:** The owner is responsible for having the fire-protection system and devices inspected, tested, and maintained in proper operating condition in accordance with this guide, and applicable NFPA standards. In addition, the Authority Having Jurisdiction may have additional maintenance, testing, and inspection requirements that must be followed.

A. Sprinklers must be inspected on a regular basis for corrosion, mechanical damage, obstructions, paint, etc. Frequency of inspections may vary due to corrosive atmospheres, water supplies, and activity around the sprinkler unit.

B. Sprinklers or cover plate assemblies that have been field painted, caulked, or mechanically damaged must be replaced immediately. Sprinklers showing signs of corrosion shall be tested and/or replaced immediately as required. Installation standards require sprinklers to be tested and, if necessary, replaced after a specified term of service. Refer to NFPA 25 and the Authority Having Jurisdiction for the specified period of time after which testing and/or replacement is required. Never attempt to repair or reassemble a sprinkler. Sprinklers and cover assemblies that have operated cannot be reassembled or re-used, but must be replaced. When replacement is necessary, use only new sprinklers and cover assemblies with identical performance characteristics.

C. The sprinkler discharge pattern is critical for proper fire protection. Therefore, nothing should be hung from, attached to, or otherwise obstruct the discharge pattern. All obstructions must be immediately removed or, if necessary, additional sprinklers installed.

D. When replacing existing sprinklers, the system must be removed from service. Refer to the appropriate system description and/or valve instructions. Prior to removing the system from service, notify all Authorities Having Jurisdiction. Consideration should be given to employment of a fire patrol in the affected area.

1. Remove the system from service, drain all water, and relieve all pressure on the piping.

2a. For frame-style sprinklers, use the special sprinkler wrench to remove the old sprinkler by turning it counterclockwise to unthread it from the piping.

2b. For flush and concealed style sprinklers: Remove the ceiling ring or cover plate assembly before unthreading the sprinkler body from the piping. Ceiling rings and cover plates can be removed either by gently unthreading them or pulling them off the sprinkler body (depends on the sprinkler model used). After the ceiling ring or cover plate assembly has been removed from the sprinkler body, place the plastic protective cap (from the spare sprinkler cabinet) over the sprinkler to be removed and then fit the sprinkler wrench over the cap. Then use the wrench to unthread the sprinkler from the piping. *Exception: Domed concealed sprinklers are removed without the plastic cap.*

3. Install the new sprinkler unit by following the instructions in section 4. INSTALLATION. Care must be taken to ensure that the replacement sprinkler is the proper model and style, with the correct K-Factor, temperature rating, and response characteristics. A fully stocked spare sprinkler cabinet should be provided for this purpose. For flush or concealed sprinklers: stock of spare ceiling rings or cover plates should also be available in the spare sprinkler cabinet.

E. Place the system back in service and secure all valves. Check for and repair all leaks. Sprinkler systems that have been subjected to a fire must be returned to service as soon as possible. The entire system must be inspected for damage, and repaired or replaced as necessary. Sprinklers that have been exposed to corrosive products of combustion or high ambient temperatures, but have not operated, should be replaced. Refer to the Authority Having Jurisdiction for minimum replacement requirements.

## 7. AVAILABILITY

Viking sprinklers are available through a network of domestic and international distributors. See The Viking Corporation web site for the closest distributor or contact The Viking Corporation.

## 8. GUARANTEE

For details of warranty, refer to Viking's current list price schedule or contact Viking directly.

VIKING®

**BULLETIN**

# REGULATORY AND HEALTH WARNINGS

**The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058**
**Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com**
**Visit the Viking website for the latest edition of this technical data page www.vikinggroupinc.com**

## 1. DESCRIPTION

Regulatory and Health Warnings applying to materials used in the manufacture and construction of fire protection products are provided herin as they relate to legally mandated jurisdictional regions.

**⚠ WARNING**

**STATE OF CALIFORNIA, USA**

Installing or servicing fire protection products such as sprinklers, valves, piping etc. can expose you to chemicals including, but not limited to, lead, nickel, butadiene, titaninum dioxide, chromium, carbon black, and acrylonitrile which are known to the State of California to cause cancer or birth defects or other reproductive harm.

For more information, go to **www.P65Warnings.ca.gov**

## 2. WARRANTY TERMS AND CONDITIONS

For details of warranty, refer to Viking's current list price schedule at **www.vikinggroupinc.com** or contact Viking directly.

# Victaulic® VicFlex™ Sprinkler Fittings
# Series AH2 and AH2-CC Braided Flexible Hoses





Series AH2



Series AH2-CC

## 1.0 PRODUCT DESCRIPTION

**Available Sizes by Component**

**Series AH2 1"/DN25 ID Braided Hose:** 31, 36, 48, 60, 72"/790, 915, 1220, 1525, 1830 mm. Note: length includes adapter nipple and 5.75"/140 mm straight reducer.

**Series AH2-CC 1"/DN25 ID Braided Hose**: 31, 36, 48, 60, 72"/790, 915, 1220, 1525, 1830 mm.
Note: length includes captured coupling and 5.75"/140 mm straight reducer.

**Connections**

- **From Branchline**
  - ¾"/20mm BSPT female thread (VdS only)
  - 1 ¼"/32mm BSPT female thread (LPCB only)
  - 1"/25mm NPT or BSPT female Thread
  - 1"/25mm Grooved IGS (refer to Submittal 10.54 for additional IGS connections)
    - No. 116 CPVC Adapter (1"/25mm Female CPVC Socket x 1"/25mm Grooved IGS)
    - No. 142 Welded Outlet
    - Style 922 Outlet-T
    - Style 920N Mechanical-T Outlet
    - No. 65 Grooved End of Run Fitting
- **Hose Inlet**
  - 1"/25mm Grooved IGS
  - 1"/25mm NPT or BSPT male thread
  - ¾"/20mm BSPT male thread (VdS only)
  - 1 ¼"/32mm BSPT male thread (LPCB only)

**ALWAYS REFER TO ANY NOTIFICATIONS AT THE END OF THIS DOCUMENT REGARDING PRODUCT INSTALLATION, MAINTENANCE OR SUPPORT.**


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## 1.0 PRODUCT DESCRIPTION (CONTINUED)

- **Sprinkler Reducer**
  - Sprinkler Connection: ½" and ¾"/15mm and 20mm NPT or BSPT female thread
  - Straight Lengths: 5.75", 9", 13"/140mm, 230mm, 330mm
  - 90˚ Elbows
    - Standard Short
    - Low Profile Short
    - Standard Long
    - Low Profile Long

  (Short elbows typically used with concealed sprinklers. Long elbows typically used with recessed pendent sprinklers)

**Brackets**

- Style AB2 for suspended and hard-lid ceilings and sidewalls, allows for vertical sprinkler adjustment, and installation before most ceiling tiles in place
- Style AB3 for surface mount applications, wood, metal and block walls, or ceilings
- Style AB4 for hard-lid ceilings with hat furring channel grid systems, allows for vertical sprinkler adjustment
- Style AB5 for hard-lid ceilings and sidewalls, allows for vertical sprinkler adjustment
- Style AB7 for suspended and hard-lid ceilings
- Style AB7 Adjustable for suspended and hard-lid ceilings
- Style AB10 for Armstrong® TechZone™ ceilings
- Style AB11 for lay-in panel suspended t-grid ceilings or drywall suspended t-grid ceilings, allows for low profile installations (use only with 90° low profile elbows)
- Style AB12 for suspended and hard-lid ceilings, allows for vertical sprinkler adjustment, and allows for low profile installation down to 4"/100mm.
- Style ABBA bracket for suspended, exposed, and hard-lid ceilings
- Style ABMM bracket for surface mount and stand off-mount applications, wood, metal and block walls, or ceilings and hard-lid ceilings
- Strut channel and pipe clamp, not supplied by Victaulic

**Maximum Working Temperature**

- 225°F/107°C
- 150°F/65°C (No. 116 CPVC Adapter)

**Maximum Working Pressure**

- 200 psi/1375 kPa (FM Approval)
- 175 psi/1206 kPa (cULus Listed)
- 1600 kPa/232 psi (VdS/LPCB Approved)
- 1.4 MPa (CCCf Approved)
- 175 psi/1206 kPa (No. 116 CPVC Adapter)

**Minimum Bend Radius**

- 7"/178 mm (FM/CCCf Approval)
- 2"/51 mm (cULus Listed)
- 3"/76.2 mm (VdS/LPCB Approved)

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## 1.0 PRODUCT DESCRIPTION (CONTINUED)

**Maximum Allowable Sprinkler K-Factors**

- FM (½"/15 mm reducer) K5.6/8,1 (S.I.), (¾"/20 mm reducer) K14.0/20,2 (S.I.)
- cULus (½"/15 mm reducer) K8.0/11,5 (S.I.), (¾"/20 mm reducer) K14.0/20,2 (S.I.)
- VdS/LPCB (½"/15 mm reducer) K5.6/8,1 (S.I.), (¾"/20 mm reducer) K8.0/11,5 (S.I.)

## 2.0 CERTIFICATION/LISTINGS

LPS 1261: Issue 1.2
Cert/LPCB Ref. 1044/01
1044/04

**NOTE**

- The *VicFlex* Series AH2 Hose has been tested and evaluated by Spears® for acceptable use with Spears® CPVC Products and is therefore covered under the Spears® FlameGuard® Installer Protection Plan.

## 3.0 SPECIFICATIONS – MATERIAL

**Series AH2:**

**Flexible Hose:** 300-series Stainless Steel
**Collar/Weld Fitting:** 300-series Stainless Steel
**Gasket Seal:** Victaulic EPDM
**Isolation Ring:** Nylon
**Nut and Nipple:** Carbon Steel, Zinc-Plated
**Reducer (½"/15 mm or ¾"/20 mm):** Carbon Steel, Zinc-Plated
**Low Profile Elbows:** Ductile Iron, Zinc-Plated

**Brackets:** Carbon Steel, Zinc-Plated

**Series AH2-CC:**

**Flexible Hose:** 300-series Stainless Steel
**Collar/Weld Fitting:** 300-series Stainless Steel
**Gasket Seal:** Victaulic EPDM
**Isolation Ring:** Nylon
**Coupling Retainer Ring:** Polyethelene
**Nut:** Carbon Steel, Zinc-Plated
**Reducer (½"/15 mm or ¾"/20 mm):** Carbon Steel, Zinc-Plated
**Low Profile Elbows:** Ductile Iron, Zinc-Plated
**Housing:** Ductile iron conforming to ASTM A 536, Grade 65-45-12. Ductile iron conforming to ASTM A 395, Grade 65-45-15, is available upon special request.

**Coupling Housing Coating:**

- Orange enamel (North America, Asia Pacific).
- Red enamel (Europe).
- Hot dipped galvanized.

**Gasket:**[1]

**Grade "E" EPDM (Type A)**
FireLock EZ products have been Listed by Underwriters Laboratories Inc., Underwriters Laboratories of Canada Limited, and Approved by Factory Mutual Research for wet and dry (oil free air) sprinkler services within the rated working pressure.

[1] Services listed are General Service Guidelines only. It should be noted that there are services for which these gaskets are not compatible. Reference should always be made to the latest Victaulic Gasket Selection Guide for specific gasket service guidelines and for a listing of services which are not compatible.

**Bolts/Nut:** Zinc electroplated carbon steel, trackhead meeting the physical and chemical requirements of ASTM A 449 and physical requirements of ASTM A 183.

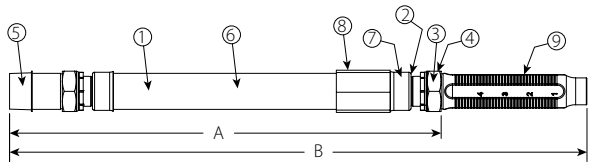
**Linkage:** CrMo Alloy Steel zinc electroplated per ASTM B633 Zn/Fe 5, Type III Finish

**No. 116 Adapter Fitting:** CPVC and Brass
**Seal:** Victaulic EPDM

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## 4.0 DIMENSIONS

### Product Details - Series AH2 Braided Hose

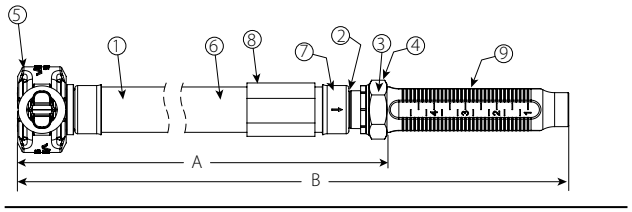



| Item | Description |
|---|---|
| 1 | Flexible Hose |
| 2 | Isolation Ring |
| 3 | Gasket |
| 4 | Nut |
| 5 | Adapter Nipple |
| 6 | Braid |
| 7 | Collar/Weld Fitting |
| 8 | Sleeve |
| 9 | Reducer |

### Hose Length Dimensions

| Hose Length<br>inches<br>mm | A<br>inches<br>mm | B<br>inches<br>mm |
|---|---|---|
| 31<br>790 | 25.3<br>641 | 31<br>790 |
| 36<br>915 | 31.3<br>794 | 36<br>915 |
| 48<br>1219 | 42.3<br>1073 | 48<br>1220 |
| 60<br>1525 | 54.3<br>1378 | 60<br>1525 |
| 72<br>1830 | 66.3<br>1683 | 72<br>1830 |

### Series AH2-CC Braided Hose



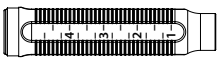

| Item | Description |
|---|---|
| 1 | Flexible Hose |
| 2 | Isolation Ring |
| 3 | Gasket |
| 4 | Nut |
| 5 | Captured Coupling |
| 6 | Braid |
| 7 | Collar/Weld Fitting |
| 8 | Sleeve |
| 9 | Reducer |

| Hose Length<br>inches<br>mm | A<br>inches<br>mm | B<br>inches<br>mm |
|---|---|---|
| 31<br>790 | 24.5<br>622 | 29.8<br>757 |
| 36<br>915 | 29.5<br>749 | 34.8<br>884 |
| 48<br>1219 | 41.5<br>1054 | 46.8<br>1189 |
| 60<br>1525 | 53.5<br>1359 | 58.8<br>1494 |
| 72<br>1830 | 65.5<br>1664 | 70.8<br>1798 |

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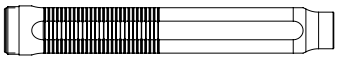
## 4.0 DIMENSIONS (CONTINUED)

### Standard Reducer

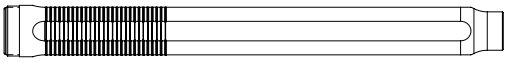


5.75"/140 mm straight reducer

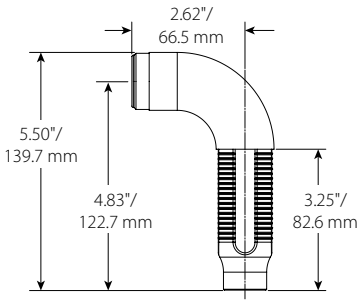
### Optional Reducers



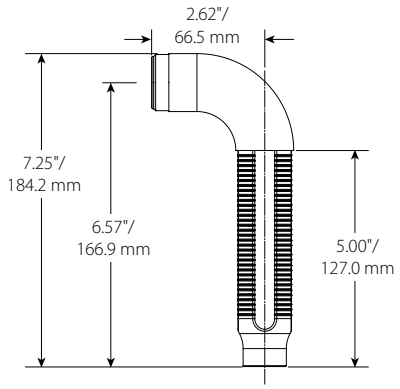
9.0"/229 mm straight reducer



13.0"/330 mm straight reducer




Short 90° elbow reducer

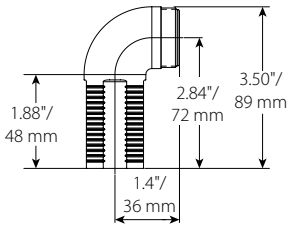



Long 90° elbow reducer

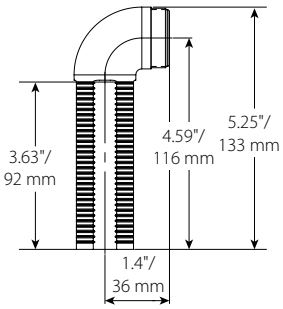
**NOTE**

- The Short 90° elbow reducer is typically used with concealed sprinklers while the longer 90° elbow is typically used in the installation of recessed pendent sprinklers.
- FM/VdS Approved only.

### Low Profile




Short 90° elbow reducer

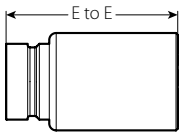



Long 90° elbow reducer

**NOTE**

- Style AB11: When low profiles elbows are with the Style AB11 bracket, the Low Profile Short Elbow is typically used with concealed sprinklers while the Low Profile Long Elbow is typically used in the installation of recessed pendent sprinklers.

### No. 116 CPVC Adapter




**NOTES**

- E to E is 3.0"/76.0 mm
- The No. 116 CPVC Adapter has 2 ft. (0.6 m) EQL of 1" Schedule 40 pipe.

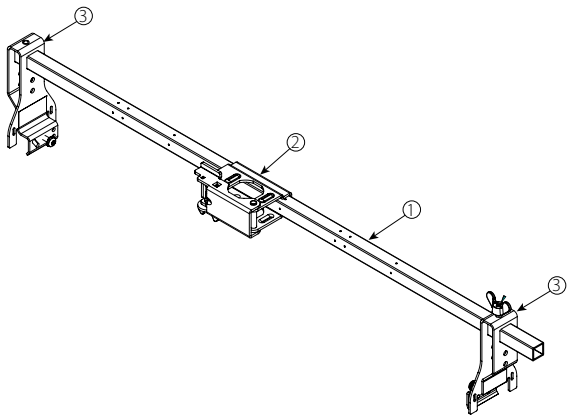
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## 4.1 DIMENSIONS

### *VicFlex* Brackets

### Style AB2

- Suspended Ceilings
- Hard-Lid Ceilings



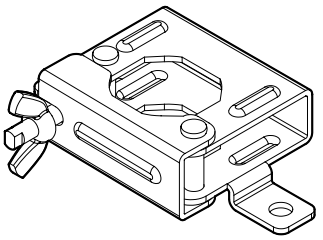

| Item | Description |
|---|---|
| 1 | 24"/610 mm or 48"/1219 mm Square Bar |
| 2 | Patented Vertically Adjustable Center Bracket |
| 3 | End Bracket |

**NOTE**

- Both sizes FM/VdS/LPCB Approved, cULus listed

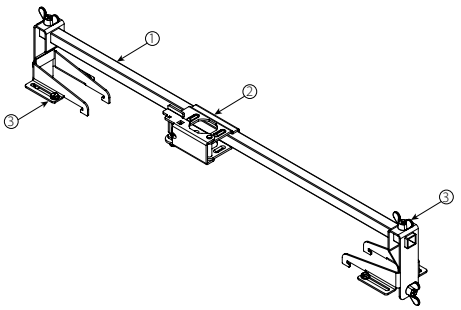
### Style AB3

- Surface Mount Applications
- FM/LPCB Approved



### Style AB4

- Hard-Lid Ceilings with Hat furring channel grid system




| Item | Description |
|---|---|
| 1 | 24"/610 mm or 48"/1219 mm Square Bar |
| 2 | Patented Vertically Adjustable Center Bracket |
| 3 | End Bracket for Hat Furring Channel |

**NOTE**

- Both sizes FM/VdS/LPCB Approved, cULus listed.

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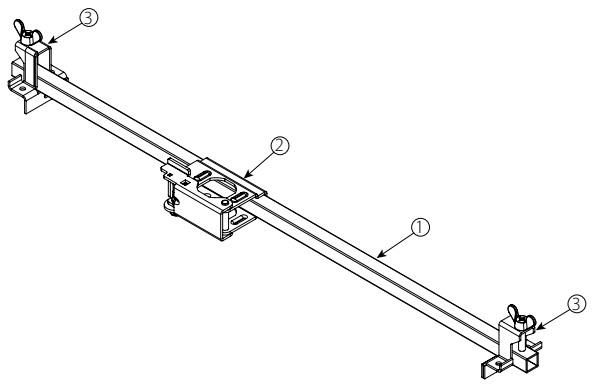
## 4.2 DIMENSIONS

### *VicFlex* Brackets

### Style AB5

- Hard-Lid Ceilings

| Item | Description |
|---|---|
| 1 | 24"/610 mm or 48"/1219 mm Square Bar |
| 2 | Patented Vertically Adjustable Center Bracket |
| 3 | End Bracket |



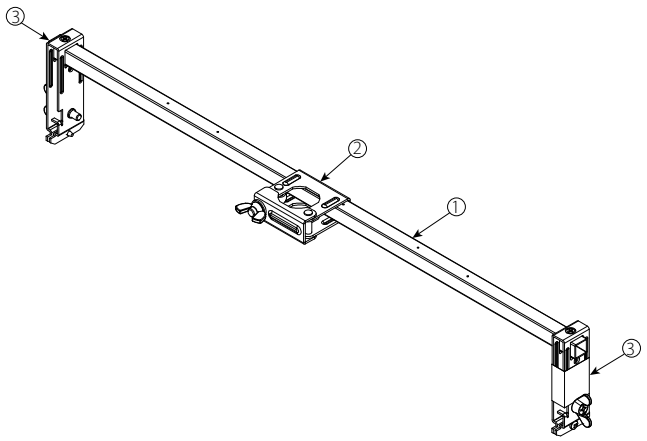

**NOTE**

- Both sizes FM/VdS/LPCB Approved, cULus listed.

### Style AB7

- Suspended Ceilings
- Hard-Lid Ceilings

| Item | Description |
|---|---|
| 1 | 24"/610 mm or 48"/1219 mm Square Bar |
| 2 | Patented 1-Bee2® Center Bracket |
| 3 | End Bracket |



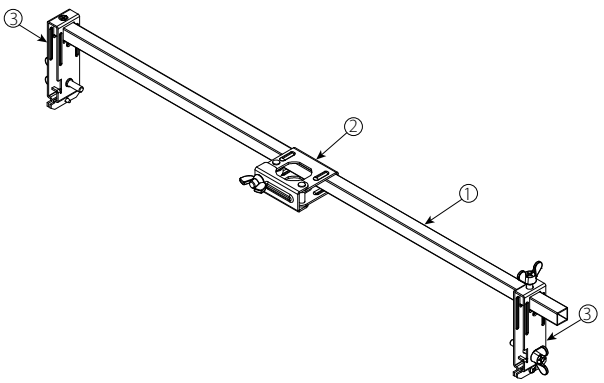

**NOTE**

- Both sizes FM/VdS/LPCB Approved.

### Style AB7 Adjustable

- Suspended Ceilings
- Hard-Lid Ceilings

| Item | Description |
|---|---|
| 1 | 700 mm or 1400 mm Square Bar |
| 2 | Patented 1-Bee2® Center Bracket |
| 3 | End Bracket (adjustable) |




**NOTE**

- Both sizes FM/VdS/LPCB Approved.

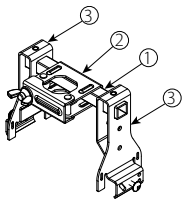
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## 4.3 DIMENSIONS

### *VicFlex* Brackets

### Style AB10

- Suspended ceilings
- Armstrong® TechZone™



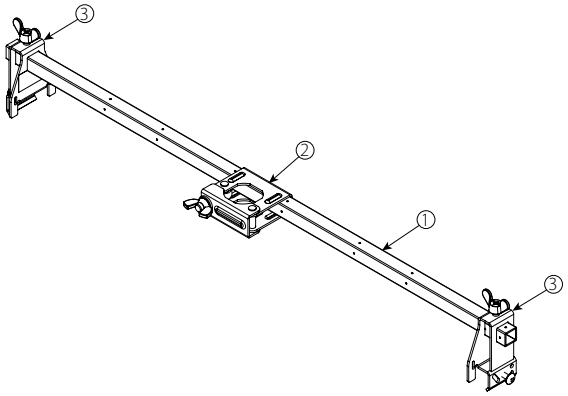

| Item | Description |
|---|---|
| 1 | 6"/152 mm Square Bar |
| 2 | Patented 1-Bee2® Center Bracket |
| 3 | End Bracket |

**NOTE**

- FM/VdS/LPCB Approved, cULus listed.

### Style AB11

- Suspended ceilings
- Hard-Lid ceilings



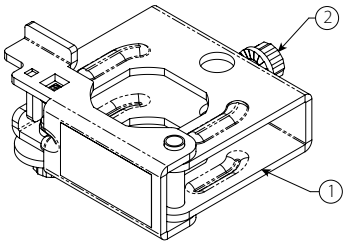

| Item | Description |
|---|---|
| 1 | 24"/610 mm or 48"/1219 mm Square Bar |
| 2 | Patented 1-Bee2® Center Bracket |
| 3 | End Bracket |

**NOTE**

- FM/VdS Approved, cULus listed.

### Style AB12

- Suspended ceilings
- Hard-Lid ceilings




| Item | Description |
|---|---|
| 1 | Style AB12 Bracket Body |
| 2 | #2 Square Drive Set Screw |

**NOTE**

- FM/VdS Approved.

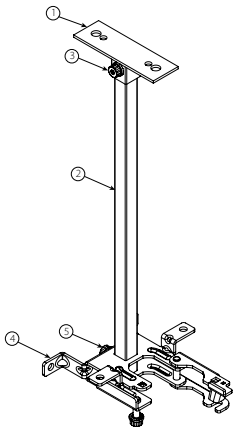
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## 4.3 DIMENSIONS (CONTINUED)

### *VicFlex* Brackets

#### Style ABBA

- Floor-above mount
- Cantilever mount
- Temporary mount in exposed ceilings



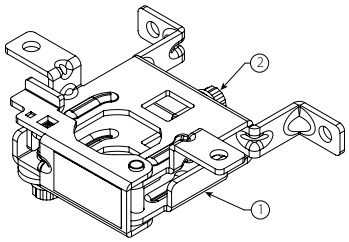

| Item | Description |
|---|---|
| 1 | Style ABBA Mounting Plate |
| 2 | Style ABBA Square Bar |
| 3 | Cap Screw, Serated Flange, M6 x 1 x 20, T25 Torx Drive Recessed |
| 4 | Style ABMM Bracket Body |
| 5 | Cap Screw, Serated Flange, M6 x 1 x 15.24, T25 Torx Drive Recessed |

**NOTE**

- FM Approved.

#### Style ABMM

- Surface mount
- Stand-off mount




| Item | Description |
|---|---|
| 1 | Style ABMM Bracket Body |
| 2 | Cap Screw, Serated Flange, M6 x 1 x 15.24, T25 Torx Drive Recessed |

**NOTE**

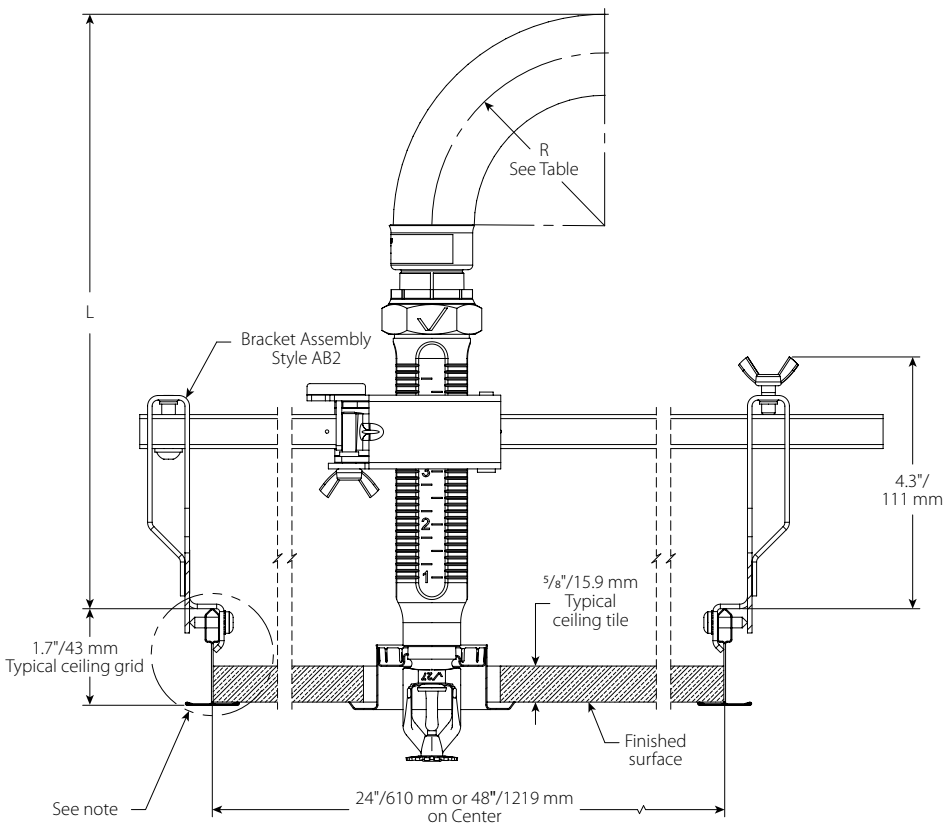
- FM Approved.

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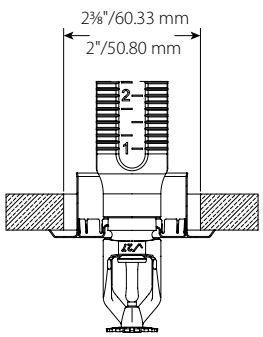
## 4.4 DIMENSIONS

### Clearances

Series AH2 Braided Hose and Style AB2 Bracket




V2707 ¾"/19 MM MAX. RECESS




V2707 MAX. EXTENSION

| Hose Clearance Chart | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Straight Reducer | | | | | | Long Elbow | Short Elbow |
| | V2707 ¾" Max Recess inches mm | V3802 ½" Max Recess inches mm | V2707 ¾" Max Recess inches mm | V3802 ½" Max Recess inches mm | V2707 ¾" Max Recess inches mm | V3802 ½" Max Recess inches mm | V2707 ¾" Max Recess inches mm | V3802 ½" Max Recess inches mm |
| "R" Minimum Bend Radius | 2.0<br>50 | | 3.0<br>80 | | 7.0<br>175 | | – | |
| "A" Minimum Required Installation Space | 8.6<br>218 | 10.1<br>269 | 9.6<br>244 | 11.1<br>281 | 13.6<br>345 | 15.1<br>383 | 5.8<br>147 | 5.8<br>147 |

**NOTE**

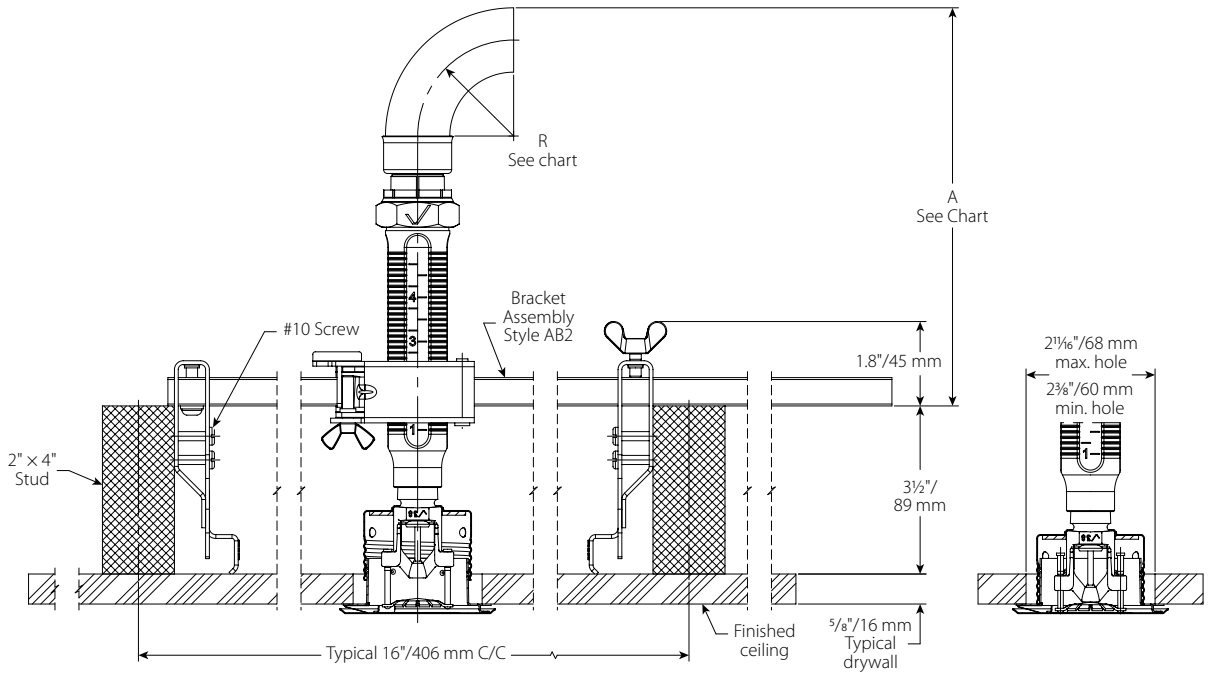
- Variations of ceiling grids, sprinkler heads, brackets, and hoses are permitted but may result in clearance differences from the figures above.

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## 4.5 DIMENSIONS

### Clearances

Series AH2 Braided Hose and Style AB2 Bracket




**V38 ½"/13 mm MAX. RECESS** **V38 MAX. EXTENSION**

| Hose Clearance Chart | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Straight Reducer | | | | | | | | |
| | **V2707 ¾" \| 20 mm Max Recess"** inches mm | **V3802 ½" \| 13 mm Max Recess** inches mm | **V2709 ¾" \| 20 mm Sidewall** inches mm | **V2707 ¾" \| 20 mm Max Recess** inches mm | **V3802 ½" \| 13 mm Max Recess** inches mm | **V2709 ¾" \| 20 mm Sidewall** inches mm | **V2707 ¾" \| 20 mm Max Recess** inches mm | **V3802 ½" \| 13 mm Max Recess** inches mm | **V2709 ¾" \| 20 mm Sidewall** inches mm |
| "R" Minimum Bend Radius | 2.0<br>50 | | | 3.0<br>80 | | | 7.0<br>175 | | |
| "A" Minimum Required Installation Space | 6.2<br>158 | 7.6<br>193 | 6.1<br>155 | 7.2<br>183 | 8.6<br>218 | 7.1<br>180 | 11.2<br>285 | 12.6<br>320 | 11.1<br>282 |

| Hose Clearance Chart | | | |
|---|---|---|---|
| | Long Elbow | | Short Elbow |
| | **V2707 ¾" \| 20 mm Max Recess** inches mm | **V2709 ¾" \| 20 mm Sidewall** inches mm | **V3802 ½" \| 13 mm Max Recess** inches mm |
| "R" Minimum Bend Radius | – | | |
| "A" Minimum Required Installation Space | 3.3<br>84 | 3.6<br>91 | 3.3<br>84 |

**NOTE**

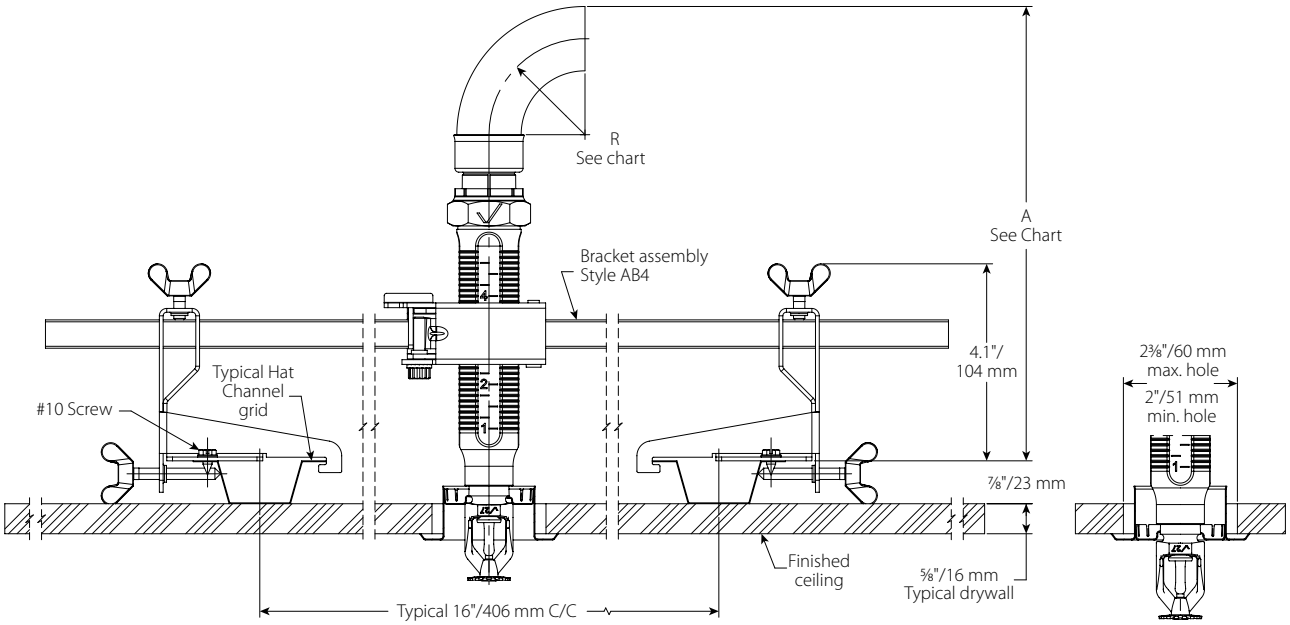
- Variations of ceiling grids, sprinkler heads, brackets, and hoses are permitted but may result in clearance differences from the figures above.

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## 4.6 DIMENSIONS

### Clearances

Series AH2 Braided Hose and Style AB4 Bracket




**V27 ¾"/19 mm MAX. RECESS**

**V27 MAX. EXTENSION**

| Hose Clearance Chart | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Straight Reducer | | | | | | Long Elbow | Short Elbow |
| | **V2707 ¾" Max Recess** inches mm | **V3802 ½" Max Recess** inches mm | **V2707 ¾" Max Recess** inches mm | **V3802 ½" Max Recess** inches mm | **V2707 ¾" Max Recess** inches mm | **V3802 ½" Max Recess** inches mm | **V2707 ¾" Max Recess** inches mm | **V3802 ½" Max Recess** inches mm |
| "R" Minimum Bend Radius | 2.0<br>50 | 2.0<br>50 | 3.0<br>80 | 3.0<br>80 | 7.0<br>175 | 7.0<br>175 | – | |
| "A" Minimum Required Installation Space | 8.8<br>224 | 10.2<br>259 | 9.8<br>249 | 11.2<br>285 | 13.8<br>351 | 15.2<br>386 | 8.0<br>203 | 5.9<br>150 |

**NOTE**

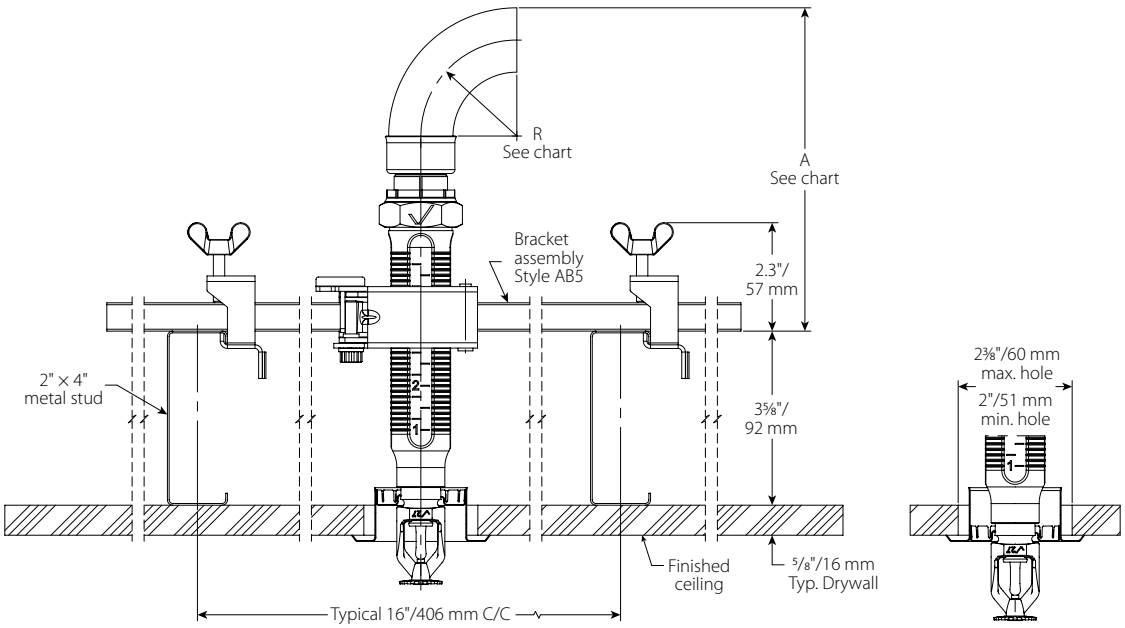
Variations of ceiling grids, sprinkler heads, brackets, and hoses are permitted but may result in clearance differences from the figures above.

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## 4.7 DIMENSIONS

### Clearances

Series AH2 Braided Hose and Style AB5 Bracket




**V27 ¾"/19 mm MAX. RECESS** **V27 MAX. EXTENSION**

| Hose Clearance Chart | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Straight Reducer | | | | | | | | |
| | "V2707 ¾" I 20 mm Max Recess" inches mm | V3802 ½" I 13 mm Max Recess inches mm | V2709 ¾" I 20 mm Sidewall inches mm | V2707 ¾" I 20 mm Max Recess inches mm | V3802 ½" I 13 mm Max Recess inches mm | V2709 ¾" I 20 mm Sidewall inches mm | V2707 ¾" I 20 mm Max Recess inches mm | V3802 ½" I 13 mm Max Recess inches mm | V2709 ¾" I 20 mm Sidewall inches mm |
| "R" Minimum Bend Radius | 2.0 50 | | | 3.0 80 | | | 7.0 175 | | |
| "A" Minimum Required Installation Space | 6.0 158 | 7.7 196 | 6.1 155 | 7.0 178 | 8.7 221 | 7.1 180 | 11.0 279 | 12.7 323 | 11.1 282 |

| Hose Clearance Chart | | | | | |
|---|---|---|---|---|---|
| | Long Elbow | | | Low-Profile Long Elbow | Short Elbow |
| | V2707 ¾" I 20 mm Max Recess inches mm | V3802 ½" I 13 mm Max Recess inches mm | V2709 ¾" I 20 mm Sidewall inches mm | V3802 ½" I 13 mm Max Recess inches mm | V3802 ½" I 13 mm Max Recess inches mm |
| "R" Minimum Bend Radius | – | | | | |
| "A" Minimum Required Installation Space | 3.5 89 | 4.9 124 | 3.6 91 | 2.9 74 | 3.3 84 |

**NOTE**

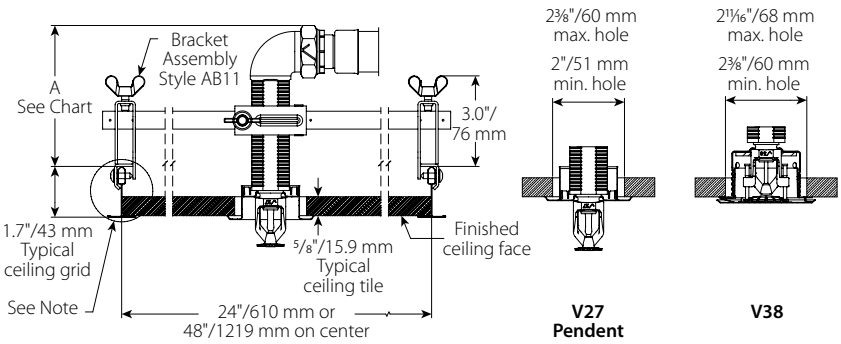
- Variations of ceiling grids, sprinkler heads, brackets, and hoses are permitted but may result in clearance differences from the figures above.

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## 4.8 DIMENSIONS

### Clearances

Series AH2 Braided Hose and Style AB11 Bracket (LOW PROFILE SOLUTION)




| Hose Clearance Chart | | |
|---|---|---|
| | **Low-Profile Long Elbow** | **Low-Profile Short Elbow** |
| | **V2707 ¾" I 20 mm Max Recess"** inches mm | **V3802 ½" I 13 mm Max Recess** inches mm |
| "A" Minimum Required Installation Space | 4.0 102 | 3.9 99 |

**NOTE**

- Variations of ceiling grids, sprinkler heads, brackets, and hoses are permitted but may result in clearance differences from the figures above.

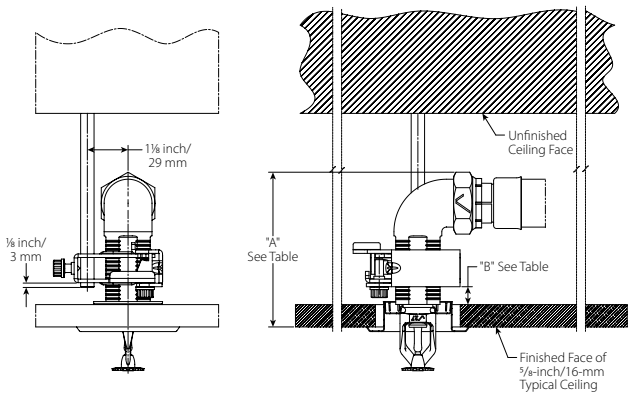
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## 4.9 DIMENSIONS

### Clearances

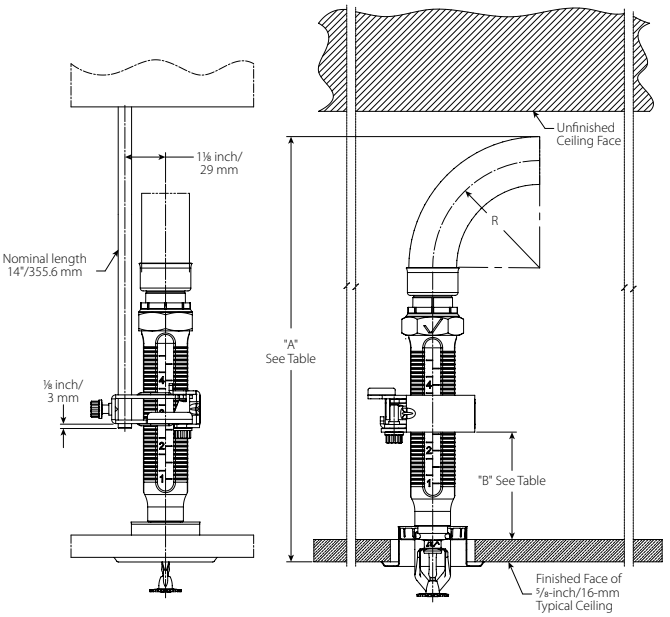
### Style AB12 and ABBA Bracket

Suspended Ceiling Grid with Recessed Sprinkler with Low Profile Short Elbow




V2707 ½"/12.7 mm MAX. RECESS

Suspended Ceiling Grid with Recessed Sprinkler and Straight 5.75"/140 mm Reducer



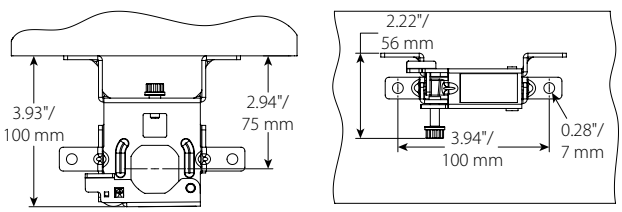

V2707 ¾"/19 mm MAX. RECESS

| Dimension | | Low Profile Short Elbow | | Low Profile Long Elbow | | Standard Short Elbow | | Standard Long Elbow | | Standard Straight Reducer | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ¾"/19 mm Recessed* inches mm | Concealed inches mm | ¾"/19 mm Recessed inches mm | Concealed inches mm | ¾"/19 mm Recessed inches mm | Concealed inches mm | ¾"/19 mm Recessed inches mm | Concealed inches mm | ¾"/19 mm Recessed inches mm | Concealed inches mm |
| A | Minimum Required Installation Space | 4.0<br>101.6 | 5.5<br>139.7 | 5.6<br>142.2 | 7.2<br>182.9 | 5.9<br>149.9 | 7.5<br>190.5 | 7.7<br>195.6 | 9.3<br>236.2 | 15.0<br>381.0 | 16.6<br>421.6 |
| B | Distance from Top of Typical Ceiling Tile to Bottom of Gate | 0.5<br>12.7 | 2.0<br>50.8 | 1.5<br>38.1 | 1.5<br>38.1 | 1.5<br>38.1 | 1.5<br>38.1 | 3.0<br>76.2 | 3.0<br>76.2 | 3.0<br>76.2 | 3.0<br>76.2 |

* Adjustability will be limited

### Style ABMM Bracket

### Stand-off Dimensions



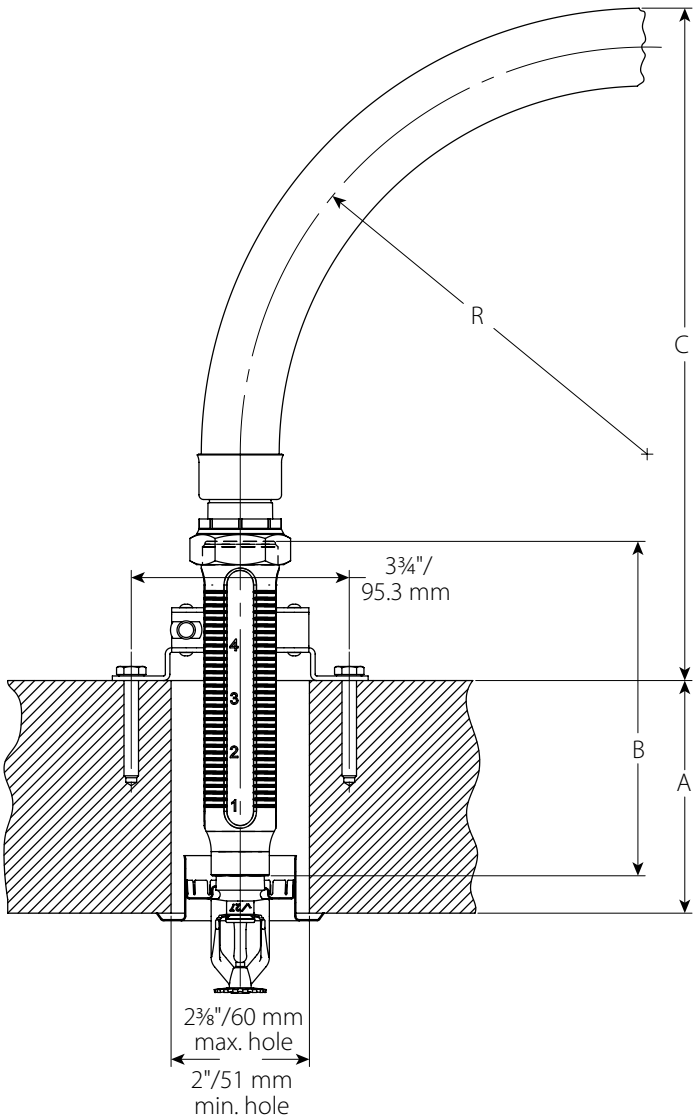

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## 4.10 DIMENSIONS

### Clearances

### Style AB3 and ABMM Bracket

Surface Mount Application with Recessed Sprinkler




| Hose Clearances | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dimension** | inches<br>mm | | | inches<br>mm | | | inches<br>mm | | inches<br>mm | inches<br>mm | inches<br>mm | | | | inches<br>mm | | | inches<br>mm | | | inches<br>mm | inches<br>mm |
| Wall Thickness<br>"A" | 2<br>50 | | | 4<br>100 | | | 6<br>150 | | 8<br>200 | 10<br>250 | 2<br>50 | | | | 4<br>100 | | | 6<br>150 | | | 8<br>200 | 10<br>250 |
| Outlet Length<br>"B" | 5.75<br>146.1 | 9<br>228.6 | 13<br>330.2 | 5.75<br>146.1 | 9<br>228.6 | 13<br>330.2 | 9<br>228.6 | 13<br>330.2 | 13<br>330.2 | 13<br>330.2 | 5.75<br>146.1 | 9<br>228.6 | 13<br>330.2 | 5.75<br>146.1 | 9<br>228.6 | 13<br>330.2 | 9<br>228.6 | 13<br>330.2 | 13<br>330.2 | 13<br>330.2 |
| Hose Clearance<br>"C" | 11.6<br>294 | 14.8<br>376 | 18.8<br>478 | 9.6<br>243 | 12.8<br>325 | 16.8<br>427 | 10.8<br>275 | 14.8<br>376 | 12.8<br>325 | 10.8<br>275 | 12.6<br>319 | 15.8<br>402 | 19.8<br>503 | 10.6<br>268 | 13.8<br>351 | 17.8<br>452 | 11.8<br>300 | 15.8<br>402 | 13.8<br>351 | 11.8<br>300 |
| Bend Radius<br>"R" | 7<br>175 | | | | | | | | | | 8<br>200 | | | | | | | | | |

**NOTE**

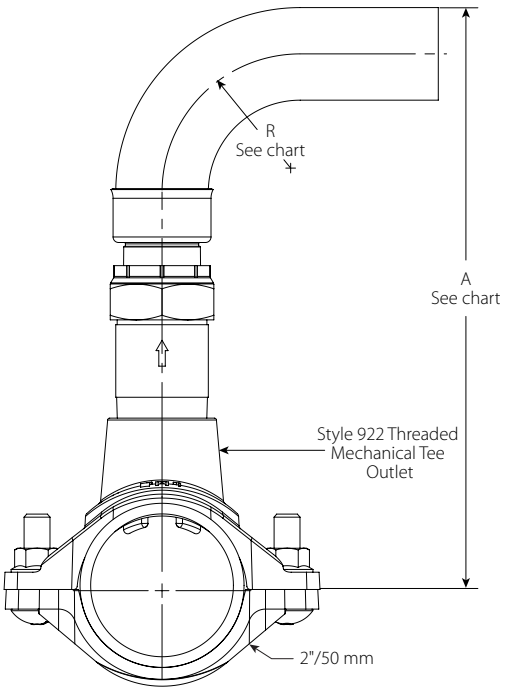
- Variations of ceiling grids, sprinkler heads, brackets, and hoses are permitted but may result in clearance differences from the figures above.

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## 4.11 DIMENSIONS

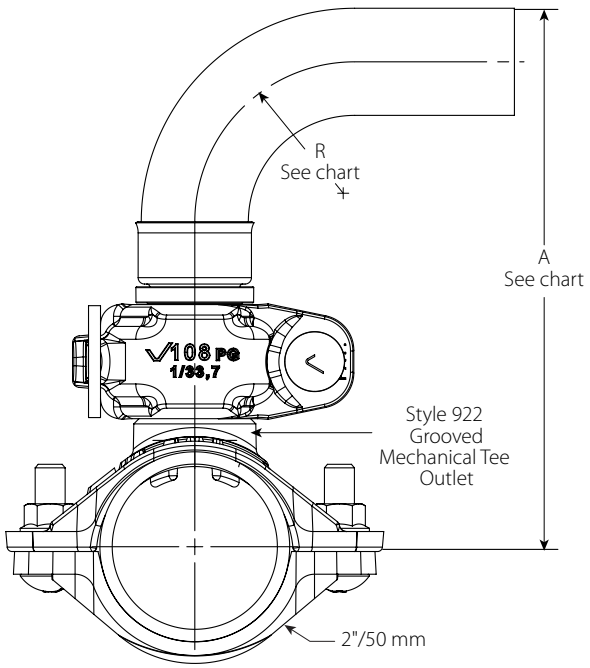
### BRANCHLINE CLEARANCES

Series AH2 Braided Hose with Style 922 threaded outlet




| Hose Clearance Chart | | | | | | |
|---|---|---|---|---|---|---|
| Dimension | | inches<br>mm | inches<br>mm | inches<br>mm | inches<br>mm | inches<br>mm |
| R | Minimum<br>Bend Radius | 3<br>80 | 4<br>100 | 5<br>125 | 6<br>150 | 7<br>175 |
| A | Min. | 9.4<br>238 | 10.4<br>263 | 11.4<br>289 | 12.4<br>314 | 13.4<br>339 |

Series AH2-CC Braided Hose with Style 922 grooved outlet



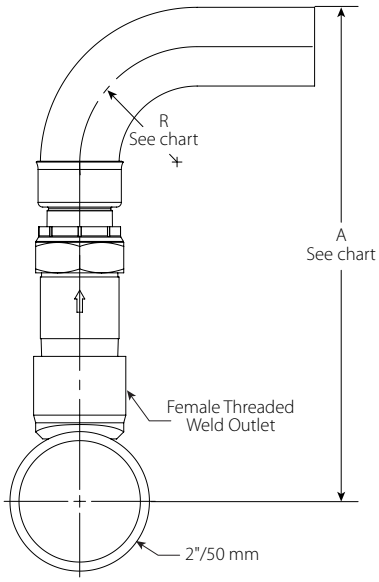

| Hose Clearance Chart | | | | | | |
|---|---|---|---|---|---|---|
| Dimension | | inches<br>mm | inches<br>mm | inches<br>mm | inches<br>mm | inches<br>mm |
| R | Minimum<br>Bend Radius | 3<br>80 | 4<br>100 | 5<br>125 | 6<br>150 | 7<br>175 |
| A | Min. | 7.7<br>197 | 8.7<br>222 | 9.7<br>247 | 10.7<br>273 | 11.7<br>298 |

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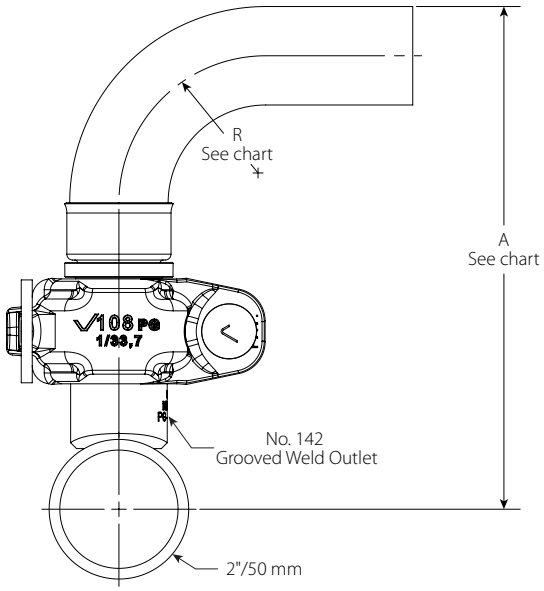
## 4.12 DIMENSIONS

### BRANCHLINE CLEARANCES

Series AH2 Braided Hose with female threaded outlet




Series AH2-CC Braided Hose with grooved outlet




| Hose Clearance Chart | | | | | | |
|---|---|---|---|---|---|---|
| Dimension | | inches<br>mm | inches<br>mm | inches<br>mm | inches<br>mm | inches<br>mm |
| R | Minimum<br>Bend Radius | 3<br>80 | 4<br>100 | 5<br>125 | 6<br>150 | 7<br>175 |
| A | Min. | 9.4<br>239 | 10.4<br>264 | 11.4<br>290 | 12.4<br>315 | 13.41<br>341 |

| Hose Clearance Chart | | | | | | |
|---|---|---|---|---|---|---|
| Dimension | | inches<br>mm | inches<br>mm | inches<br>mm | inches<br>mm | inches<br>mm |
| R | Minimum<br>Bend Radius | 3<br>80 | 4<br>100 | 5<br>125 | 6<br>150 | 7<br>175 |
| A | Min. | 8.1<br>205 | 9.1<br>231 | 10.1<br>256 | 11.1<br>281 | 12.1<br>307 |

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## 5.0 PERFORMANCE – FRICTION LOSS DATA

**Series AH2 and AH2-CC Braided Hoses with Straight 5.75"/140 mm Reducers**
**Style AB2, AB4, AB5 and AB10 Brackets**

| Hose | Reducer | | UL | |
|---|---|---|---|---|
| **Length**<br>inches<br>mm | **Type** | **Nominal Outlet Size**<br>inches<br>DN | **Equivalent Length of 1"/33.7mm Sch. 40 pipe**<br>feet<br>meters | **Max Bends** |
| 31<br>790 | Straight | ½<br>DN15 | 15.0<br>4.6 | 3 |
| 31<br>790 | Straight | ½<br>DN15 | 16.0<br>4.9 | 4 |
| 31<br>790 | Straight | ¾<br>DN20 | 19.0<br>5.8 | 3 |
| 31<br>790 | Straight | ¾<br>DN20 | 20.0<br>6.1 | 4 |
| 36<br>915 | Straight | ½<br>DN15 | 18.0<br>5.5 | 3 |
| 36<br>915 | Straight | ½<br>DN15 | 21.0<br>6.4 | 5 |
| 36<br>915 | Straight | ¾<br>DN20 | 21.0<br>6.4 | 3 |
| 36<br>915 | Straight | ¾<br>DN20 | 23.0<br>7.0 | 5 |
| 48<br>1220 | Straight | ½<br>DN15 | 21.0<br>6.4 | 3 |
| 48<br>1220 | Straight | ½<br>DN15 | 32.0<br>9.8 | 8 |
| 48<br>1220 | Straight | ¾<br>DN20 | 26.0<br>7.9 | 3 |
| 48<br>1220 | Straight | ¾<br>DN20 | 37.0<br>11.3 | 8 |
| 60<br>1525 | Straight | ½<br>DN15 | 27.0<br>8.2 | 3 |
| 60<br>1525 | Straight | ½<br>DN15 | 46.0<br>14.0 | 10 |
| 60<br>1525 | Straight | ¾<br>DN20 | 27.0<br>8.2 | 3 |
| 60<br>1525 | Straight | ¾<br>DN20 | 46.0<br>14.0 | 10 |
| 72<br>1830 | Straight | ½<br>DN15 | 31.0<br>9.4 | 3 |
| 72<br>1830 | Straight | ½<br>DN15 | 55.0<br>16.8 | 12 |
| 72<br>1830 | Straight | ¾<br>DN20 | 30.0<br>9.1 | 3 |
| 72<br>1830 | Straight | ¾<br>DN20 | 60.0<br>18.3 | 12 |

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## 5.0 PERFORMANCE – FRICTION LOSS DATA (CONTINUED)

### Series AH2 and AH2-CC Braided Hose with 90° Low Profile Elbows
### Style AB11 *VicFlex* Bracket

| Hose | Reducer | | UL | |
|---|---|---|---|---|
| **Length**<br>inches<br>mm | **Type** | **Nominal Outlet Size**<br>inches<br>DN | **Equivalent Length of 1"/33.7mm Sch. 40 pipe**<br>feet<br>meters | **Max Bends** |
| 31<br>790 | LP Elbow | ½<br>DN15 | 18.0<br>5.5 | 3 |
| 31<br>790 | LP Elbow | ½<br>DN15 | 24.0<br>7.3 | 4 |
| 31<br>790 | LP Elbow | ¾<br>DN20 | 21.0<br>6.4 | 3 |
| 31<br>790 | LP Elbow | ¾<br>DN20 | 24.0<br>7.3 | 4 |
| 36<br>915 | LP Elbow | ½<br>DN15 | 19.0<br>5.8 | 3 |
| 36<br>915 | LP Elbow | ½<br>DN15 | 26.0<br>7.9 | 5 |
| 36<br>915 | LP Elbow | ¾<br>DN20 | 23.0<br>7.0 | 3 |
| 36<br>915 | LP Elbow | ¾<br>DN20 | 28.0<br>8.5 | 5 |
| 48<br>1220 | LP Elbow | ½<br>DN15 | 23.0<br>7.0 | 3 |
| 48<br>1220 | LP Elbow | ½<br>DN15 | 43.0<br>13.1 | 8 |
| 48<br>1220 | LP Elbow | ¾<br>DN20 | 30.0<br>9.1 | 3 |
| 48<br>1220 | LP Elbow | ¾<br>DN20 | 42.0<br>12.8 | 8 |
| 60<br>1525 | LP Elbow | ½<br>DN15 | 28.0<br>8.5 | 3 |
| 60<br>1525 | LP Elbow | ½<br>DN15 | 49.0<br>14.9 | 10 |
| 60<br>1525 | LP Elbow | ¾<br>DN20 | 31.0<br>9.4 | 3 |
| 60<br>1525 | LP Elbow | ¾<br>DN20 | 50.0<br>15.2 | 10 |
| 72<br>1830 | LP Elbow | ½<br>DN15 | 31.0<br>9.4 | 3 |
| 72<br>1830 | LP Elbow | ½<br>DN15 | 65.0<br>19.8 | 12 |
| 72<br>1830 | LP Elbow | ¾<br>DN20 | 36.0<br>11.0 | 3 |
| 72<br>1830 | LP Elbow | ¾<br>DN20 | 63.0<br>19.2 | 12 |

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## 5.0 PERFORMANCE – FRICTION LOSS DATA (CONTINUED)

### Series AH2 and AH2-CC Braided Hoses Equivalent Length Design Guide

Equivalent length values at various numbers of 90 degree bends at 2"/51 mm center line bend radius

| **Length**<br>inches<br>mm | **Nominal Outlet Size**<br>inches<br>DN | **1 Bend**<br>feet<br>meters | **2 Bends**<br>feet<br>meters | **3 Bends**<br>feet<br>meters | **4 Bends**<br>feet<br>meters | **5 Bends**<br>feet<br>meters | **6 Bends**<br>feet<br>meters | **7 Bends**<br>feet<br>meters | **8 Bends**<br>feet<br>meters | **9 Bends**<br>feet<br>meters | **10 Bends**<br>feet<br>meters | **11 Bends**<br>feet<br>meters | **12 Bends**<br>feet<br>meters |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 31<br>790 | ½<br>DN15 | 11.0<br>3.4 | 13.0<br>4.0 | 15.0<br>4.6 | 16.0<br>4.9 | – | – | – | – | – | – | – | – |
| 31<br>790 | ¾<br>DN20 | 12.0<br>3.7 | 14.0<br>4.3 | 19.0<br>5.8 | 20.0<br>6.1 | – | – | – | – | – | – | – | – |
| 36<br>915 | ½<br>DN15 | 14.0<br>4.3 | 16.0<br>4.9 | 18.0<br>5.5 | 19.0<br>5.8 | 21.0<br>6.4 | – | – | – | – | – | – | – |
| 36<br>915 | ¾<br>DN20 | 17.0<br>5.2 | 19.0<br>5.8 | 21.0<br>6.4 | 22.0<br>6.7 | 23.0<br>7.0 | – | – | – | – | – | – | – |
| 48<br>1220 | ½<br>DN15 | 18.0<br>5.5 | 19.0<br>5.8 | 21.0<br>6.4 | 23.0<br>7.0 | 25.0<br>7.6 | 27.0<br>8.2 | 30.0<br>9.1 | 32.0<br>9.8 | – | – | – | – |
| 48<br>1220 | ¾<br>DN20 | 21.0<br>6.4 | 24.0<br>7.3 | 26.0<br>7.9 | 28.0<br>8.5 | 31.0<br>9.4 | 33.0<br>10.1 | 35.0<br>10.7 | 37.0<br>11.3 | – | – | – | – |
| 60<br>1525 | ½<br>DN15 | 21.0<br>6.4 | 24.0<br>7.3 | 27.0<br>8.2 | 30.0<br>9.1 | 32.0<br>9.8 | 35.0<br>10.7 | 37.0<br>11.3 | 40.0<br>12.2 | 43.0<br>13.1 | 46.0<br>14.0 | – | – |
| 60<br>1525 | ¾<br>DN20 | 23.0<br>7.0 | 25.0<br>7.6 | 27.0<br>8.2 | 29.0<br>8.8 | 32.0<br>9.8 | 34.0<br>10.4 | 37.0<br>11.3 | 40.0<br>12.2 | 43.0<br>13.1 | 46.0<br>14.0 | – | – |
| 72<br>1830 | ½<br>DN15 | 27.0<br>8.2 | 29.0<br>8.8 | 31.0<br>9.4 | 34.0<br>10.4 | 37.0<br>11.3 | 40.0<br>12.2 | 43.0<br>13.1 | 46.0<br>14.0 | 48.0<br>14.6 | 50.0<br>15.2 | 52.0<br>15.8 | 55.0<br>16.8 |
| 72<br>1830 | ¾<br>DN20 | 26.0<br>7.9 | 28.0<br>8.5 | 30.0<br>9.1 | 33.0<br>10.1 | 37.0<br>11.3 | 40.0<br>12.2 | 44.0<br>13.4 | 48.0<br>14.6 | 51.0<br>15.5 | 54.0<br>16.5 | 57.0<br>17.4 | 60.0<br>18.3 |

**NOTES**

- Values for use with 5.75"/140 mm straight reducers.
- The values in this table are provided by the manufacturer for reference only. For friction loss data in accordance with the UL Certification, please refer to pages 19 and 20 of this publication.

How to use this Design Guide:

- For some systems, it may be advantageous for the designer to calculate the system hydraulics using shorter equivalent lengths associated with fewer than the maximum allowable number of bends. In this case, the designer may select a design number of bends for the job and use the associated equivalent length from the design guide to determine the system hydraulics.
- It is possible that the actual installed condition of some of the flexible drops may have more bends than the designer selected. When this happens, the design guide may be used to find equivalent lengths based on the actual installed number of bends for particular sprinkler installations. The system hydraulics can be recalculated using actual equivalent lengths to verify the performance of the system.

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## 5.1 PERFORMANCE – FRICTION LOSS DATA

FM

**Series AH2 and AH2-CC Braided Hoses**
**Style AB2, AB3, AB4, AB5, AB7, AB7 Adj., AB8, AB10, AB12, ABBA and ABMM *VicFlex* Brackets**

| Length of Stainless Steel Flexible Hose<br>inches<br>mm | K-Factor<br>Imperial<br>S.I. | Outlet Size<br>inches<br>mm<br>type | Equivalent Length of 1"/33.7 mm Sch. 40 Pipe<br>feet<br>meters | Maximum Number of 90° Bends at 7"/178 mm Bend Radius |
|---|---|---|---|---|
| 31<br>790 | 5.6<br>8.1 | ½<br>15<br>Straight | 13.8<br>4.2 | 2 |
| | | ½<br>15<br>90° Elbow | 23.5<br>7.1 | |
| 36<br>915 | 5.6<br>8.1 | ½<br>15<br>Straight | 16.6<br>5.1 | 2 |
| | | ½<br>15<br>90° Elbow | 25.6<br>7.8 | |
| 48<br>1220 | 5.6<br>8.1 | ½<br>15<br>Straight | 23.4<br>7.1 | 3 |
| | | ½<br>15<br>90° Elbow | 30.7<br>9.3 | |
| 60<br>1525 | 5.6<br>8.1 | ½<br>15<br>Straight | 30.2<br>9.2 | 4 |
| | | ½<br>15<br>90° Elbow | 35.9<br>10.9 | |
| 72<br>1830 | 5.6<br>8.1 | ½<br>15<br>Straight | 37.0<br>11.3 | 4 |
| | | ½<br>15<br>90° Elbow | 41.1<br>12.5 | |
| 31<br>790 | 8.0<br>11.5 | ¾<br>20<br>Straight | 16.8<br>5.1 | 2 |
| | | ¾<br>20<br>90° Elbow | 16.8<br>5.1 | |
| 36<br>915 | 8.0<br>11.5 | ¾<br>20<br>Straight | 20<br>6.0 | 2 |
| | | ¾<br>20<br>90° Elbow | 19.7<br>6.0 | |
| 48<br>1220 | 8.0<br>11.5 | ¾<br>20<br>Straight | 27.8<br>8.4 | 3 |
| | | ¾<br>20<br>90° Elbow | 26.6<br>8.1 | |

**FM NOTES**

- The Series AH2 hose has been tested and Approved by FM Global for use in wet, dry and preaction systems per NFPA 13, 13R, and 13D and FM data sheets 2-0, 2-5, and 2-8. FM 1637 standard for safety include, but are not limited to, pressure cycling, corrosion resistance, flow characterisitics, vibration resistance, leakage, mechanical and hydrostatic strength.
- EXAMPLE: A 48-inch hose installed with two 30° bends and two 90° bends is permitted and considered equivalent to the data in the table shown above. In this example, the total number of degrees is 240°, which is less than the allowable 270°.

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## 5.1 PERFORMANCE – FRICTION LOSS DATA (CONTINUED)

FM

**Series AH2 and AH2-CC Braided Hoses**
**Style AB2, AB3, AB4, AB5, AB7, AB7 Adj., AB8, AB10, AB12, ABBA and ABMM *VicFlex* Brackets**

| Length of Stainless Steel Flexible Hose<br>inches<br>mm | K-Factor<br>Imperial<br>S.I. | Outlet Size<br>inches<br>mm<br>type | Equivalent Length of 1"/33.7 mm Sch. 40 Pipe<br>feet<br>meters | Maximum Number of 90° Bends at 7"/178 mm Bend Radius |
|---|---|---|---|---|
| 60<br>1525 | 8.0<br>11.5 | ¾<br>20<br>Straight | 35.7<br>10.9 | 4 |
| | | ¾<br>20<br>90° Elbow | 33.6<br>10.2 | |
| 72<br>1830 | 8.0<br>11.5 | ¾<br>20<br>Straight | 43.5<br>13.2 | 4 |
| | | ¾<br>20<br>90° Elbow | 40.6<br>12.2 | |
| 31<br>790 | 11.2<br>16.1 | ¾<br>20<br>Straight | 16.5<br>5.0 | 2 |
| | | ¾<br>20<br>90° Elbow | 17.8<br>5.4 | |
| 36<br>915 | 11.2<br>16.1 | ¾<br>20<br>Straight | 19.5<br>5.9 | 2 |
| | | ¾<br>20<br>90° Elbow | 20.7<br>6.3 | |
| 48<br>1220 | 11.2<br>16.1 | ¾<br>20<br>Straight | 26.7<br>8.1 | 3 |
| | | ¾<br>20<br>90° Elbow | 27.9<br>8.5 | |
| 60<br>1525 | 11.2<br>16.1 | ¾<br>20<br>Straight | 33.9<br>10.3 | 4 |
| | | ¾<br>20<br>90° Elbow | 35<br>10.7 | |
| 72<br>1830 | 11.2<br>16.1 | ¾<br>20<br>Straight | 41.3<br>12.5 | 4 |
| | | ¾<br>20<br>90° Elbow | 42.2<br>12.8 | |
| 31<br>790 | 14.0<br>20.2 | ¾<br>20<br>Straight | 14.9<br>4.5 | 2 |
| | | ¾<br>20<br>90° Elbow | 15.5<br>4.72 | |

**FM NOTES**

- The Series AH2 hose has been tested and Approved by FM Global for use in wet, dry and preaction systems per NFPA 13, 13R, and 13D and FM data sheets 2-0, 2-5, and 2-8. FM 1637 standard for safety include, but are not limited to, pressure cycling, corrosion resistance, flow characterisitics, vibration resistance, leakage, mechanical and hydrostatic strength.
- EXAMPLE: A 48-inch hose installed with two 30° bends and two 90° bends is permitted and considered equivalent to the data in the table shown above. In this example, the total number of degrees is 240°, which is less than the allowable 270°.

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## 5.1 PERFORMANCE – FRICTION LOSS DATA (CONTINUED)

FM

### Series AH2 and AH2-CC Braided Hoses
### Style AB2, AB3, AB4, AB5, AB7, AB7 Adj., AB8, AB10, AB12, ABBA and ABMM *VicFlex* Brackets

| Length of Stainless Steel Flexible Hose<br>inches<br>mm | K-Factor<br>Imperial<br>S.I. | Outlet Size<br>inches<br>mm<br>type | Equivalent Length of 1"/33.7 mm Sch. 40 Pipe<br>feet<br>meters | Maximum Number of 90° Bends at 7"/178 mm Bend Radius |
|---|---|---|---|---|
| 36<br>915 | 14.0<br>20.2 | ¾<br>20<br>Straight | 19.4<br>5.9 | 2 |
| | | ¾<br>20<br>90˚ Elbow | 19.6<br>5.9 | |
| 48<br>1220 | 14.0<br>20.2 | ¾<br>20<br>Straight | 30.3<br>9.2 | 3 |
| | | ¾<br>20<br>90˚ Elbow | 29.5<br>8.9 | |
| 60<br>1525 | 14.0<br>20.2 | ¾<br>20<br>Straight | 33.9<br>10.3 | 4 |
| | | ¾<br>20<br>90˚ Elbow | 34.1<br>10.4 | |
| 72<br>1830 | 14.0<br>20.2 | ¾<br>20<br>Straight | 37.5<br>11.4 | 4 |
| | | ¾<br>20<br>90˚ Elbow | 38.6<br>11.7 | |

**FM NOTES**

- The Series AH2 hose has been tested and Approved by FM Global for use in wet, dry and preaction systems per NFPA 13, 13R, and 13D and FM data sheets 2-0, 2-5, and 2-8. FM 1637 standard for safety include, but are not limited to, pressure cycling, corrosion resistance, flow characterisitics, vibration resistance, leakage, mechanical and hydrostatic strength.
- EXAMPLE: A 48-inch hose installed with two 30° bends and two 90° bends is permitted and considered equivalent to the data in the table shown above. In this example, the total number of degrees is 240°, which is less than the allowable 270°.

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## 5.2 PERFORMANCE – FRICTION LOSS DATA

FM

**Series AH2 Braided Hose with 90° Low Profile Elbows**
**Style AB5, AB11, AB12, ABBA and ABMM *VicFlex* Bracket**

| Length of Stainless Steel Flexible Hose<br>inches<br>mm | K-Factor<br>Imperial<br>S.I. | Outlet Size<br>inches<br>mm | Equivalent Length of 1"/33.7mm Sch. 40 Pipe<br>feet<br>meters | Maximum Number of 90° Bends at 7"/178mm Bend Radius |
|---|---|---|---|---|
| 31<br>790 | 5.6<br>8.1 | ½<br>15 | 13.7<br>4.2 | 2 |
| 36<br>915 | 5.6<br>8.1 | ½<br>15 | 17.0<br>5.2 | 2 |
| 48<br>1220 | 5.6<br>8.1 | ½<br>15 | 25.0<br>7.6 | 3 |
| 60<br>1525 | 5.6<br>8.1 | ½<br>15 | 33.0<br>10.1 | 4 |
| 72<br>1830 | 5.6<br>8.1 | ½<br>15 | 41.1<br>12.5 | 4 |
| 31<br>790 | 8.0<br>11.5 | ¾<br>20 | 13.6<br>4.14 | 2 |
| 36<br>915 | 8.0<br>11.5 | ¾<br>20 | 16.9<br>5.2 | 2 |
| 48<br>1220 | 8.0<br>11.5 | ¾<br>20 | 27.8<br>8.5 | 3 |
| 60<br>1525 | 8.0<br>11.5 | ¾<br>20 | 32.6<br>9.9 | 4 |
| 72<br>1830 | 8.0<br>11.5 | ¾<br>20 | 40.6<br>12.4 | 4 |
| 31<br>790 | 11.2<br>16.1 | ¾<br>20 | 13.7<br>4.2 | 2 |
| 36<br>915 | 11.2<br>16.1 | ¾<br>20 | 17.0<br>5.2 | 2 |
| 48<br>1220 | 11.2<br>16.1 | ¾<br>20 | 24.9<br>7.6 | 3 |
| 60<br>1525 | 11.2<br>16.1 | ¾<br>20 | 32.9<br>10.0 | 4 |
| 72<br>1830 | 11.2<br>16.1 | ¾<br>20 | 40.9<br>12.5 | 4 |
| 31<br>790 | 14.0<br>20.2 | ¾<br>20 | 13.5<br>4.1 | 2 |
| 36<br>915 | 14.0<br>20.2 | ¾<br>20 | 16.8<br>5.1 | 2 |
| 48<br>1220 | 14.0<br>20.2 | ¾<br>20 | 24.7<br>7.5 | 3 |
| 60<br>1525 | 14.0<br>20.2 | ¾<br>20 | 32.7<br>9.9 | 4 |
| 72<br>1830 | 14.0<br>20.2 | ¾<br>20 | 40.7<br>12.4 | 4 |

**FM NOTES**

- The Series AH2 hose has been tested and Approved by FM Global for use in wet, dry and preaction systems per NFPA 13, 13R, and 13D and FM data sheets 2-0, 2-5, and 2-8. FM 1637 standard for safety include, but are not limited to, pressure cycling, corrosion resistance, flow characterisitics, vibration resistance, leakage, mechanical and hydrostatic strength.
- EXAMPLE: A 48-inch hose installed with two 30° bends and two 90° bends is permitted and considered equivalent to the data in the table shown above. In this example, the total number of degrees is 240°, which is less than the allowable 270°.

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## 5.3 PERFORMANCE – FRICTION LOSS DATA

VdS

**Series AH2 and AH2-CC Braided Hose**
**Style AB2, AB4, AB5, AB7, AB7 Adj., AB8, AB10, AB11 and AB12 Brackets**

| Length of Stainless Steel Flexible Hose<br>mm<br>inches | Outlet Size<br>DN<br>inches | Equivalent Length of steel pipe according to EN 10255 DN 25 (33,7 x 3,25)<br>meters<br>feet | Maximum Number of 90° Bends at 3"/76.2 mm Bend Radius |
|---|---|---|---|
| 790<br>31 | DN15<br>½<br>DN20<br>¾ | 5.5<br>18.0 | 3 |
| 915<br>36 | DN15<br>½<br>DN20<br>¾ | 6.4<br>21.0 | 3 |
| 1220<br>48 | DN15<br>½<br>DN20<br>¾ | 8.5<br>27.9 | 3 |
| 1525<br>60 | DN15<br>½<br>DN20<br>¾ | 10.7<br>35.1 | 4 |
| 1830<br>72 | DN15<br>½<br>DN20<br>¾ | 12.8<br>42.0 | 4 |

### VdS Ceiling Manufacturers List

**AB2, AB7, AB10 ,AB11**

1. AMF
2. Armstrong
3. Chicago Metallic
4. Dipling
5. Durlum
6. Geipel
7. Gema-Armstrong
8. Hilti
9. Knauf
10. Lafarge
11. Linder
12. Odenwald
13. Richter
14. Rigips
15. Rockfon Pagos
16. Suckow & Fischer
17. USG Donn

**AB4**

No specific approval

**AB5, AB8**

1. Hilti
2. Knauf
3. Lafarge
4. Lindner
5. Rigips

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## 5.3 PERFORMANCE – FRICTION LOSS DATA

LPS 1261: Issue 1.2
Cert/LPCB Ref. 104I/01
104I/04

### Series AH2 and AH2-CC Braided Hose Style AB2, AB3, AB4, AB5, AB7, AB8, and AB10 Brackets

| Length of Stainless Steel Flexible Hose<br>mm<br>inches | Outlet Size<br>mm<br>inches<br>type | Equivalent Length of steel pipe according to EN 10255 DN 25 (33,7 x 3,25)<br>meters<br>feet | Maximum Number of 90° Bends at 3"/76.2 mm Bend Radius |
|---|---|---|---|
| 790<br>31 | 15 mm<br>½<br>Straight | 1.8<br>6.0 | 2 |
| | 20 mm<br>¾<br>Straight | | |
| 915<br>36 | 15 mm<br>½<br>Straight | 3.6<br>11.9 | 3 |
| | 20 mm<br>¾<br>Straight | | |
| 1220<br>48 | 15 mm<br>½<br>Straight | 4.3<br>14.0 | 3 |
| | 20 mm<br>¾<br>Straight | | |
| 1525<br>60 | 15 mm<br>½<br>Straight | 4.1<br>13.6 | 3 |
| | 20 mm<br>¾<br>Straight | | |
| 1830<br>72 | 15 mm<br>½<br>Straight | 5.5<br>18.1 | 3 |
| | 20 mm<br>¾<br>Straight | | |

### Series AH2 Braided Hose Style AB2, AB3, AB4, AB5, AB7, AB8, AB10 and AB12 Brackets

| Length of Flexible Hose<br>mm<br>inches | Equivalent Length of 1"/33.7 mm Sch. 40 Pipe | |
|---|---|---|
| | Straight Configuration<br>meters<br>feet | Bend Configuration<br>meters<br>feet |
| 790<br>31 | 0.87<br>2.9 | 2.70<br>8.9 |
| 915<br>36 | 1.00<br>3.3 | 2.80<br>9.2 |
| 1220<br>48 | 2.23<br>7.3 | 4.66<br>15.3 |
| 1525<br>60 | 2.90<br>9.5 | 6.5<br>21.3 |
| 1830<br>72 | 3.31<br>10.9 | 7.16<br>23.5 |

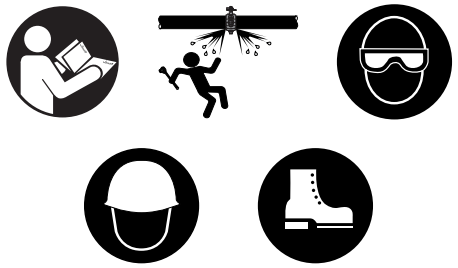
**CCCF NOTE**

- Friction loss data is in accordance with GB5135.16 tested at a flow rate of 114 liters per minute (30 gallons per minute).

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## 6.0 NOTIFICATIONS

**⚠ WARNING**



- **Read and understand all instructions before attempting to install any Victaulic products.**
- **Always verify that the piping system has been completely depressurized and drained immediately prior to installation, removal, adjustment, or maintenance of any Victaulic products.**
- **Wear safety glasses, hardhat, and foot protection.**

- **These products shall be used only in fire protection systems that are designed and installed in accordance with current, applicable National Fire Protection Association (NFPA 13, 13D, 13R, etc.) standards, or equivalent standards, and in accordance with applicable building and fire codes. These standards and codes contain important information regarding protection of systems from freezing temperatures, corrosion, mechanical damage, etc.**
- **The installer shall understand the use of this product and why it was specified for the particular application.**
- **The installer shall understand common industry safety standards and potential consequences of improper product installation.**

**⚠ WARNING**

- **It is the responsibility of the system designer to verify suitability of 300-series stainless steel flexible hose for use with the intended fluid media within the piping system and external environments.**
- **The effect of chemical composition, pH level, operating temperature, chloride level, oxygen level, and flow rate on 300-series stainless steel flexible hose must be evaluated by the material specifier to confirm system life will be acceptable for the intended service.**
- **It is the responsibility of the owner of a building or their authorized agent to provide the sprinkler system installer with any knowledge that the water supply might be contaminated with or conducive to the development of microbiologically influenced corrosion (MIC), including as required by NFPA 13. Failure to identify adverse water quality issues may affect the VicFlex product and void the manufacturer's warranty.**

**Failure to follow these instructions could cause product failure, resulting in serious personal injury and/or property damage.**

Victaulic VicFlex Series AH2 and AH2-CC Flexible Sprinkler Fittings may be painted provided the paint is compatible with stainless steel and zinc-plated carbon steel or ductile iron. Care should be taken to ensure the sprinkler and associated escutcheon or coverplate are not painted.

Victaulic VicFlex Series AH2 and AH2-CC penetrating through non-fire rated gypsum wall (drywall) will function as designed, provided the components are installed in accordance with the respective installation instructions referenced in this document.

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## 7.0 REFERENCE MATERIALS – CHARACTERISTICS

### *VicFlex* Maximum Load Values

### Series AH2 Hose with 24" Bracket

| Model Size | Actual Length ft m | Total Load lb | Total Load N | Max. Uniform Load lb/linear ft | Max. Uniform Load N/linear m |
|---|---|---|---|---|---|
| 31/790 | 2.6 0.8 | 5.2 | 23 | 2.6 | 38 |
| 36/915 | 3 0.9 | 5.5 | 25 | 2.8 | 40 |
| 48/1220 | 4 1.2 | 6.3 | 28 | 3.1 | 46 |
| 60/1525 | 5 1.5 | 7.0 | 31 | 3.5 | 51 |
| 72/1830 | 6 1.8 | 7.7 | 34 | 3.9 | 57 |

### Series AH2 Hose with 48" Bracket

| Model Size | Actual Length ft m | Total Load lb | Total Load N | Max. Uniform Load lb/linear ft | Max. Uniform Load N/linear m |
|---|---|---|---|---|---|
| 31/790 | 2.6 0.8 | 6.1 | 27 | 1.5 | 22 |
| 36/915 | 3 0.9 | 6.4 | 29 | 1.6 | 23 |
| 48/1220 | 4 1.2 | 7.2 | 32 | 1.8 | 26 |
| 60/1525 | 5 1.5 | 7.9 | 35 | 2.0 | 29 |
| 72/1830 | 6 1.8 | 8.7 | 39 | 2.2 | 32 |

Total Load is defined as the sum of the weights of the following:

- water-filled flexible sprinkler hose with threaded end fittings, including a typical fire sprinkler
- bracket assembly (any applicable Victaulic bracket model of the relevant associated size)

### ASTM C 635: Suspension System Load-Carrying Capabilities (excerpted)

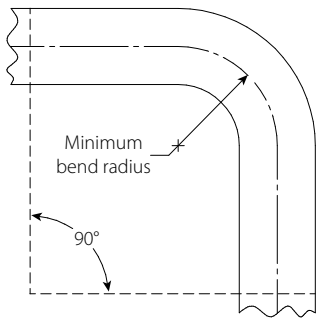
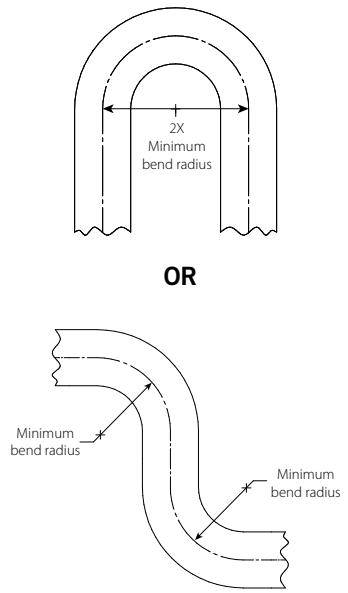
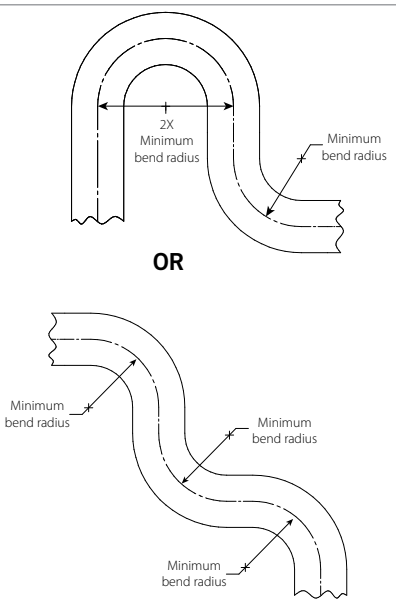
| Suspension System | Actual Length ft/m | Min. Allowable Uniform Load lb/linear ft | Min. Allowable Uniform Load N/linear m |
|---|---|---|---|
| Direct Hung | Light | 5.0 | 75.7 |
| | Intermediate | 12.0 | 181.0 |
| | Heavy | 16.0 | 241.7 |

SUMMARY: All direct-hung suspension system duty classifications per ASTM C 635 are able to withstand the maximum water-filled weight of the *VicFlex* sprinkler hose and bracket.

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## 7.0 REFERENCE MATERIALS – CHARACTERISTICS (CONTINUED)

### Flexible Hose In-Plane Bend Characteristics

| One Bend | Two Bends | Three Bends |
|---|---|---|
|  |  |  |



**NOTE**

For out-of-plane (three-dimensional) bends, care must be taken to avoid imparting torque on the hose.

I-VicFlex-AB1-AB2
I-VicFlex-AB3
I-VicFlex-AB4
I-VicFlex-AB5
I-VicFlex-AB7
I-VicFlex-AB12
I-VicFlex-ABBA
I-VicFlex-ABMM
I-RES

**User Responsibility for Product Selection and Suitability**
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**Note**
This product shall be manufactured by Victaulic or to Victaulic specifications. All products to be installed in accordance with current Victaulic installation/assembly instructions. Victaulic reserves the right to change product specifications, designs and standard equipment without notice and without incurring obligations.

**Installation**
Reference should always be made to I-VICFLEX-AB1-AB2-AB10, I-VICFLEX-AB4, I-VICFLEX-AB7, or I-VICFLEX-AB8 for the product you are installing. Handbooks are included with each shipment of Victaulic products for complete installation and assembly data, and are available in PDF format on our website at www.victaulic.com.

**Warranty**
Refer to the Warranty section of the current Price List or contact Victaulic for details.

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# SUPERVISORY

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# VSR
## VANE TYPE WATERFLOW ALARM SWITCH WITH RETARD



**UL, CUL and CSFM Listed, FM Approved, LPCB Approved, For CE Marked (EN12259-5) / VdS Approved model use VSR-EU**

**Service Pressure:** 450 PSI (31 BAR) - UL

**Flow Sensitivity Range for Signal:**
4-10 GPM (15-38 LPM) - UL

**Maximum Surge:** 18 FPS (5.5 m/s)

**Contact Ratings:** Two sets of SPDT (Form C)
10.0 Amps at 125/250VAC
2.0 Amps at 30VDC Resistive
10 mAmps min. at 24VDC

**Conduit Entrances:** Two knockouts provided for 1/2" conduit. Individual switch compartments suitable for dissimilar voltages.

**Environmental Specifications:**

- NEMA 4/IP54 Rated Enclosure suitable for indoor or outdoor use with factory installed gasket and die-cast housing when used with appropriate conduit fitting.
- Temperature Range: 40°F - 120°F, (4.5°C - 49°C) - UL
- Non-corrosive sleeve factory installed in saddle.

**Service Use:**

| | |
|---|---|
| Automatic Sprinkler | NFPA-13 |
| One or two family dwelling | NFPA-13D |
| Residential occupancy up to four stories | NFPA-13R |
| National Fire Alarm Code | NFPA-72 |

Specifications subject to change without notice.

| Ordering Information | | | |
|---|---|---|---|
| Nominal Pipe Size | | Model | Part Number |
| 2" | DN50 | VSR-2 | 1144402 |
| 2 1/2" | DN65 | VSR-2 1/2 | 1144425 |
| 3" | DN80 | VSR-3 | 1144403 |
| 3 1/2" | - | VSR-3 1/2 | 1144435 |
| 4" | DN100 | VSR-4 | 1144404 |
| 5" | - | VSR-5 | 1144405 |
| 6" | DN150 | VSR-6 | 1144406 |
| 8" | DN200 | VSR-8 | 1144408 |

**Optional**: Cover Tamper Switch Kit, stock no. 0090148
**Replaceable Components:** Retard/Switch Assembly, stock no. 1029030

**⚠ WARNING**

- Installation must be performed by qualified personnel and in accordance with all national and local codes and ordinances.
- Shock hazard. Disconnect power source before servicing. Serious injury or death could result.
- Risk of explosion. Not for use in hazardous locations. Serious injury or death could result.

**CAUTION**

Waterflow switches that are monitoring wet pipe sprinkler systems shall not be used as the sole initiating device to discharge AFFF, deluge, or chemical suppression systems. Waterflow switches used for this application may result in unintended discharges caused by surges, trapped air, or short retard times.

**Important:** This document contains important information on the installation and operation of the VSR waterflow switches. Please read all instructions carefully before beginning installation. A copy of this document is required by NFPA 72 to be maintained on site.

### General Information

The Model VSR is a vane type waterflow switch for use on wet sprinkler systems. It is UL Listed for use on a steel pipe; schedules 5 through 40, sizes 2" - 6" and is UL Listed and FM Approved for use on steel pipe; schedules 10 through 40, sizes 2" thru 8" (50 mm thru 200 mm). LPC approved sizes are 2" thru 8" (50 mm thru 200 mm). See Ordering Information chart.

The VSR may also be used as a sectional waterflow detector on large systems. The VSR contains two single pole, double throw, snap action switches and an adjustable, instantly recycling pneumatic retard. The switches are actuated when a flow of 10 GPM (38 LPM) or more occurs downstream of the device. The flow condition must exist for a period of time necessary to overcome the selected retard period.

### Enclosure

The VSR switches and retard device are enclosed in a general purpose, die-cast housing. The cover is held in place with two tamper resistant screws which require a special key for removal. A field installable cover tamper switch is available as an option which may be used to indicate unauthorized removal of the cover. See bulletin number 5401103 for installation instructions of this switch.

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# VSR
## VANE TYPE WATERFLOW ALARM SWITCH WITH RETARD

**Installation** (see Fig. 1)

These devices may be mounted on horizontal or vertical pipe. On horizontal pipe they shall be installed on the top side of the pipe where they will be accessible. The device should not be installed within 6" (15 cm) of a fitting which changes the direction of the waterflow or within 24" (60 cm) of a valve or drain.

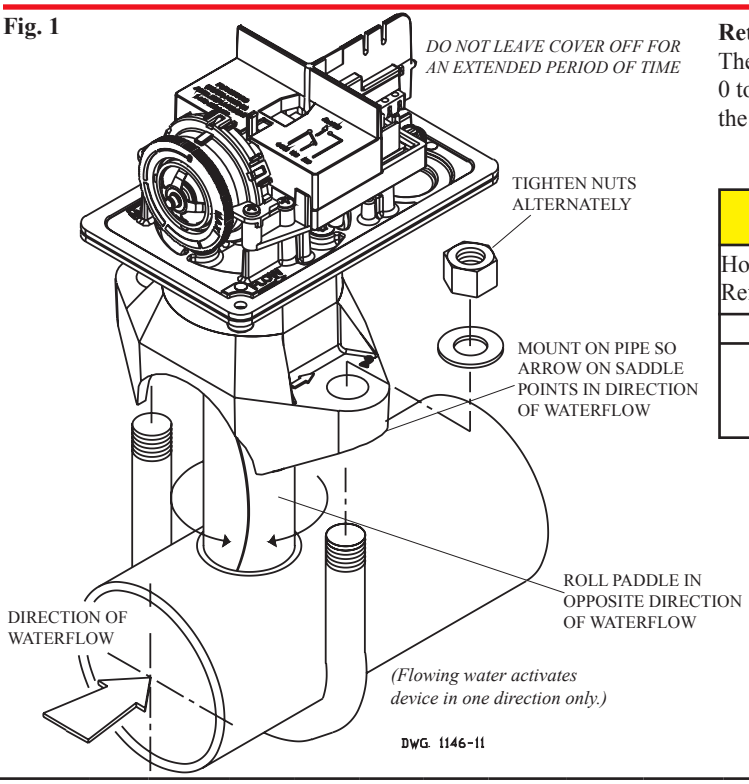
**NOTE:** Do not leave cover off for an extended period of time.

Drain the system and drill a hole in the pipe using a hole saw in a slow speed drill (see Fig. 1). Clean the inside pipe of all growth or other material for a distance equal to the pipe diameter on either side of the hole. Roll the vane so that it may be inserted into the hole; do not bend or crease it. Insert the vane so that the arrow on the saddle points in the direction of the waterflow. Take care not to damage the non-corrosive bushing in the saddle. The bushing should fit inside the hole in the pipe. Install the saddle strap and tighten nuts alternately to required torque (see the chart in Fig. 1). The vane must not rub the inside of the pipe or bind in any way.

**⚠ CAUTION**

Do not trim the paddle. Failure to follow these instructions may prevent the device from operating and will void the warranty. Do not obstruct or otherwise prevent the trip stem of the flow switch from moving when water flows as this could damage the flow switch and prevent an alarm. If an alarm is not desired, a qualified technician should disable the alarm system.

**Fig. 1**

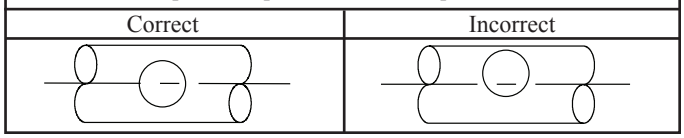


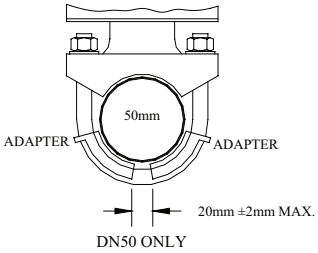

**Retard Adjustment**

The delay can be adjusted by rotating the retard adjustment knob from 0 to the max setting (60-90 seconds). The time delay should be set at the minimum required to prevent false alarms

**CAUTION**

Hole must be drilled perpendicular to the pipe and vertically centered. Refer to the Compatible Pipe/Installation Requirements chart for size.




USE (2) 5180162 ADAPTERS AS SHOWN ABOVE

DWG# 1146-1F

Compatible Pipe/ Installation Requirements

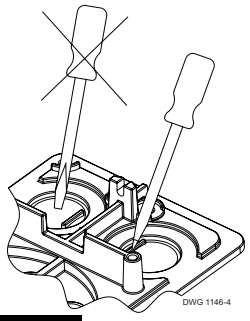
| Model | Nominal Pipe Size | | Nominal Pipe O.D. | | Pipe Wall Thickness | | | | | | | | | | Hole Size | | U-Bolt Nuts Torque | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Lightwall | | Schedule 10 (UL) | | Schedule 40 (UL) | | BS-1387 (LPC) | | DN (VDS) | | | | | |
| | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | ft-lb | n-m |
| VSR-2 | 2 | DN50 | 2.375 | 60.3 | .065 | 1.651 | 0.109 | 2.77 | 0.154 | 3.91 | 0.142 | 3.6 | 0.091 | 2.3 | 1.25 + .125/- .062 | 33.0 ± 2.0 | 20 | 27 |
| VSR-2 1/2 | 2.5 | - | 2.875 | 73.0 | .084 | 2.134 | 0.120 | 3.05 | 0.203 | 5.16 | - | - | - | - | | | | |
| VSR-2 1/2 | - | DN65 | 3.000 | 76.1 | - | - | - | - | - | - | 0.142 | 3.6 | 0.102 | 2.6 | | | | |
| VSR-3 | 3 | DN80 | 3.500 | 88.9 | .083 | 2.108 | 0.120 | 3.05 | 0.216 | 5.49 | 0.157 | 4.0 | 0.114 | 2.9 | 2.00 ± .125 | 50.8 ± 2.0 | | |
| VSR-3 1/2 | 3.5 | - | 4.000 | 101.6 | - | - | 0.120 | 3.05 | 0.226 | 5.74 | - | - | - | - | | | | |
| VSR-4 | 4 | DN100 | 4.500 | 114.3 | .084 | 2.134 | 0.120 | 3.05 | 0.237 | 6.02 | 0.177 | 4.5 | 0.126 | 3.2 | | | | |
| VSR-5 | 5 | - | 5.563 | 141.3 | - | - | 0.134 | 3.40 | 0.258 | 6.55 | - | - | - | - | | | | |
| VSR-6 | 6 | DN150 | 6.625 | 168.3 | .115 | 2.921 | 0.134 | 3.40 | 0.280 | 7.11 | 0.197 | 5.0 | 0.157 | 4.0 | | | | |
| VSR-8 | 8 | DN200 | 8.625 | 219.1 | - | - | 0.148 | 3.76 | 0.322 | 8.18 | 0.248 | 6.3 | 0.177 | 4.5 | | | | |

**NOTE**: For copper or plastic pipe use Model VSR-CF.

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# VSR
## VANE TYPE WATERFLOW ALARM SWITCH WITH RETARD

**Fig. 2**
To remove knockouts: Place screwdriver at inside edge of knockouts, not in the center.




**NOTICE**
Do not drill into the base as this creates metal shavings which can create electrical hazards and damage the device. Drilling voids the warranty.

**Fig. 3**
Break out thin section of cover when wiring both switches from one conduit entrance.

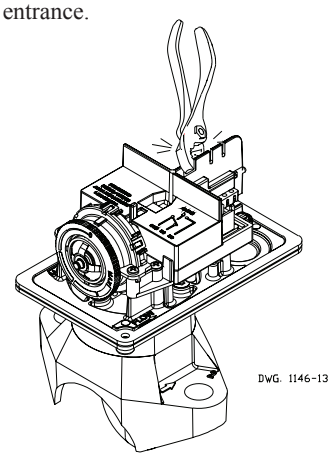
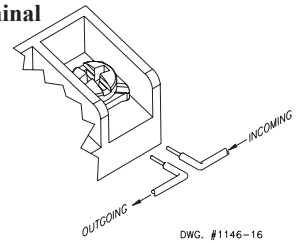


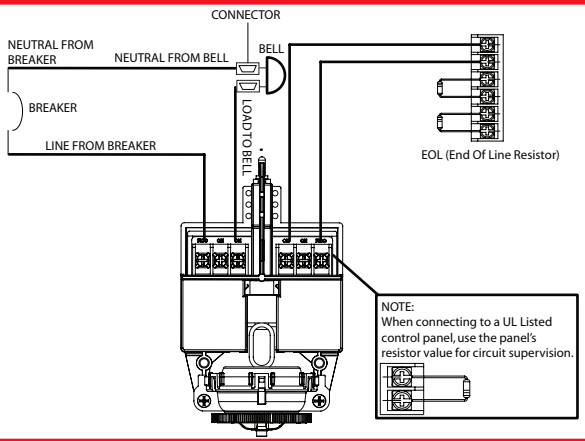

**Fig. 4 Switch Terminal Connections Clamping Plate Terminal**




**⚠ WARNING**
An uninsulated section of a single conductor should not be looped around the terminal and serve as two separate connections. The wire must be severed, thereby providing supervision of the connection in the event that the wire become dislodged from under the terminal. Failure to sever the wire may render the device inoperable risking severe property damage and loss of life.

Do not strip wire beyond 3/8" of length or expose an uninsulated conductor beyond the edge of the terminal block. When using stranded wire, capture all strands under the clamping plate.

**Fig. 5 Typical Electrical Connections**




**Notes:**
1. The Model VSR has two switches, one can be used to operate a central station, proprietary or remote signaling unit, while the other contact is used to operate a local audible or visual annunciator.
2. For supervised circuits, see "Switch Terminal Connections" drawing and warning note (Fig. 4).

**Testing**
The frequency of inspection and testing for the Model VSR and its associated protective monitoring system shall be in accordance with applicable NFPA Codes and Standards and/or the authority having jurisdiction (manufacturer recommends quarterly or more frequently).

If provided, the inspector's test valve shall always be used for test purposes. If there are no provisions for testing the operation of the flow detection device on the system, application of the VSR is not recommended or advisable.
A minimum flow of 10 GPM (38 LPM) is required to activate this device.

**NOTICE** Advise the person responsible for testing of the fire protection system that this system must be tested in accordance with the testing instructions.

**Fig. 6 Mounting Dimensions**

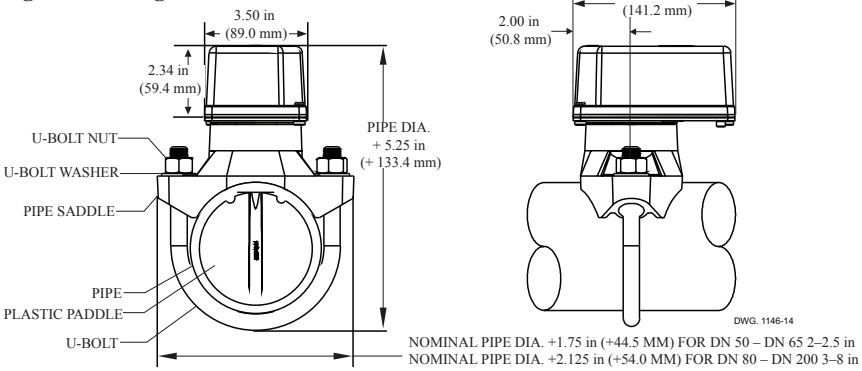
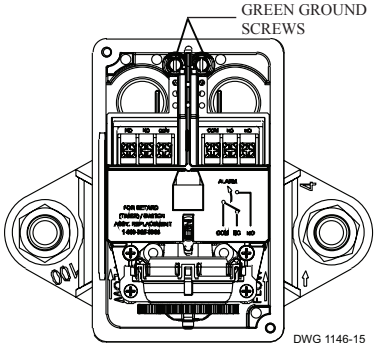



**Fig. 7**



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# VSR
## VANE TYPE WATERFLOW ALARM SWITCH WITH RETARD

**Maintenance**

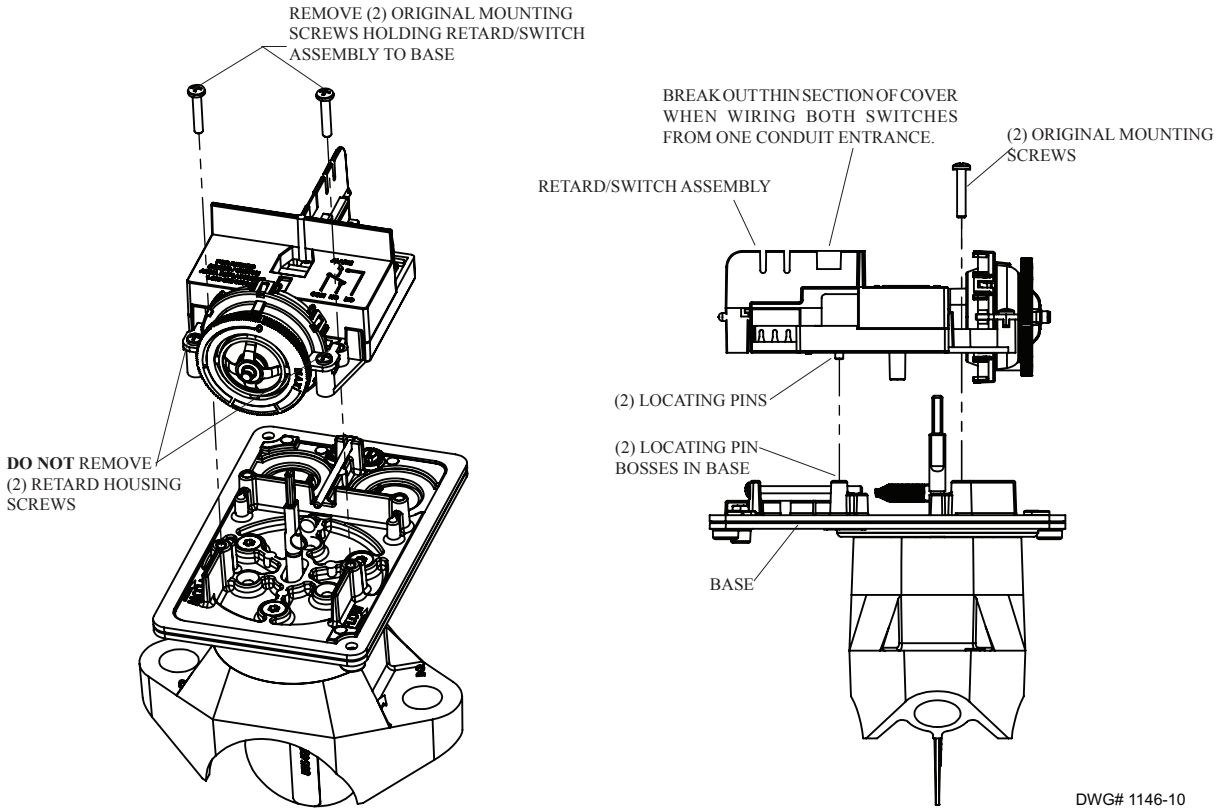
Inspect detectors monthly. If leaks are found, replace the detector. The VSR waterflow switch should provide years of trouble-free service. The retard and switch assembly are easily field replaceable. In the unlikely event that either component does not perform properly, please order replacement retard switch assembly stock #1029030 (see Fig. 8). There is no maintenance required, only periodic testing and inspection.

**Retard/Switch Assembly Replacement** (See Fig. 8)

**NOTICE** The Retard/Switch Assembly is field-replaceable without draining the system or removing the waterflow switch from the pipe

1. Make sure the fire alarm zone or circuit connected to the waterflow switch is bypassed or otherwise taken out of service.
2. Disconnect the power source for local bell (if applicable).
3. Identify and remove all wires from the waterflow switch.
4. Remove the (2) mounting screws holding retard/switch assembly to the base. **Do not** remove the (2) retard housing screws.
5. Remove the retard assembly by lifting it straight up over the tripstem.
6. Install the new retard assembly. Make sure the locating pins on the retard/switch assembly fit into the locating pin bosses on the base.
7. Re-install the (2) original mounting screws.
8. Reconnect all wires. Perform a flow test and place the system back in service.

**Fig. 8**




**Removal of Waterflow Switch**

- To prevent accidental water damage, all control valves should be shut tight and the system completely drained before waterflow detectors are removed or replaced.
- Turn off electrical power to the detector, then disconnect wiring.
- Loosen nuts and remove U-bolts.
- Gently lift the saddle far enough to get your fingers under it. With your fingers, roll the vane so it will fit through the hole while continuing to lift the waterflow detector saddle.
- Lift detector clear of pipe.

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# OSYSU Series

*Outside Screw and Yoke Valve Supervisory Switch*

## Features

- NEMA 4X* (IP 65) and 6P (IP 67)

  **Enclosure is 4X. For additional corrosion protection of mounting hardware, use model OSYSU-2 CRH*
- -40º to 140º (-40ºC to 60ºC) operating temperature range
- Visual switch indicators
- Two conduit entrances
- Adjustable length trip rod
- Accomodates up to 12AWG wire
- Three position switch detects tampering and valve closure
- Knurled mounting bracket prevents slipping
- Fine adjustment feature for fast, easy installation
- RoHS compliant
- One or two SPDT contact models (-1,-2)




**NOTICE**

Before any work is done on the fire sprinkler or fire alarm system, the building owner or their authorized representative shall be notified. Before opening any closed valve, ensure that opening the valve will not cause any damage from water flow due to open or missing sprinklers, piping, etc.

**Important:** This document contains important information on the installation and operation of OS&Y valve supervisory switches. Please read all instructions carefully before beginning installation. A copy of this document is required by NFPA 72 to be maintained on site.

## Description

The OSYSU is used to monitor the open position of an OS&Y (outside screw and yoke) type gate valve. This device is available in two models; the OSYSU-1, containing one set of SPDT (Form C) contacts and the OSYSU-2, containing two sets of SPDT (Form C) contacts. These switches mount conveniently to most OS&Y valves ranging in size from 2" to 12" (50mm to 300mm). They will mount on some valves as small as ½" (12,5mm).
The cover is held in place by two tamper resistant screws that require a special tool to remove. The tool is furnished with each device.

## Testing

The operation of the OSYSU and its associated protective monitoring system shall be inspected, tested, and maintained in accordance with all applicable local and national codes and standards and/or the Authority Having Jurisdiction (manufacturer recommends quarterly or more frequently). A minimum test shall consist of turning the valve wheel towards the closed position. The OSYSU shall operate within the first two revolutions of the wheel. Fully close the valve and ensure that the OSYSU does not restore. Fully open the valve and ensure that the OSYSU restores to normal only when the valve is fully opened.

**⚠ CAUTION**

Close the valve fully to determine that the stem threads do not activate the switch. The switch being activated by the stem threads could result in a ***false valve open*** indication.

## Technical Specifications

| | |
|---|---|
| Dimensions | See Fig 8 |
| Weight | 1.6 lbs (0,73 kg) |
| Enclosure | Cover: Die Cast Finish: Red Powder Coat<br>Base: Die Cast Finish: Black Powder Coat<br>All parts have corrosion resistant finishes |
| Cover Tamper | Tamper Resistant Screws<br>Optional Cover Tamper Switch Available |
| Contact Ratings | OSYSU-1: One Set of SPDT (Form C)<br>OSYSU-2: Two Sets of SPDT (Form C)<br>10.0 Amps at 125/250 VAC<br>2.0 Amps at 30VDC Resistive<br>10 mAmps minimum at 24 VDC |
| Environmental Limitations | -40º F to 140ºF (-40ºC to 60ºC)<br>NEMA 4X (IP 65) and NEMA 6P (IP 67) Enclosure (Use suitably rated conduit and connector)<br>Indoor or Outdoor Use (See OSYSU-EX Bulletin 5400705 for Hazardous locations) |
| Conduit Entrances | Two Knockouts for 1/2" conduit provided<br>(See Notice on Page 6 and Fig. 9 on Page 5) |
| Service Use | NFPA 13, 13D, 13R, 72 |

Specifications subject to change without notice

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# OSYSU Series

*Outside Screw and Yoke Valve Supervisory Switch*

## Theory of Operation

The OSYSU is a 3 position switch. The center position is the normal installation position. Normal is when the switch is installed on the OS&Y valve, the valve is fully open and the trip rod of the OSYSU is in the groove of the valve stem. Closing the valve causes the trip rod to ride up out of the groove and activates the switches. Removing the OSYSU from the valve causes the spring to pull the trip rod in the other direction and activates the switches.

## Visual Switch Status Indication

There are 3 visual indicators to determine the status of the switches.

Fig 1; the actuator button of the micro switches are on the raised section of the switch actuator.

Fig 2; the trip rod is perpendicular to the base and lined up with the alignment mark on the mounting bracket.

Fig 3; the white visual indicator is visible through the window on the back of the switch actuator.

A final test is to meter the contacts marked COM and N.O. to ensure they are an open circuit when the valve is open and that they close and have continuity within 2 revolutions of turning the valve handwheel towards the closed position and the contacts remain closed as the valve is completely closed and until the valve is completely opened when the trip rod drops back into the groove in the valve stem.

*Fig 1*

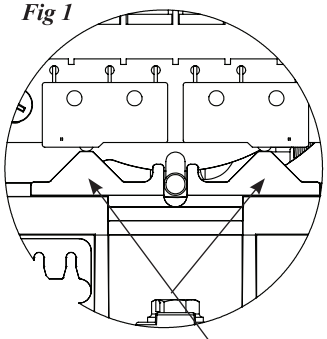


*Fig 2*

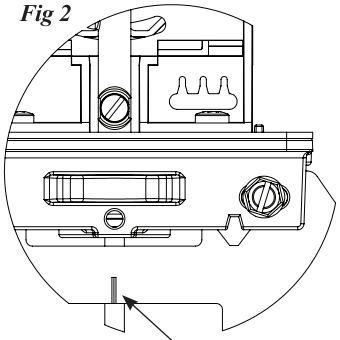


*Fig 3*

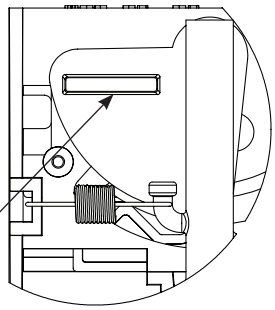


*Fig 4*

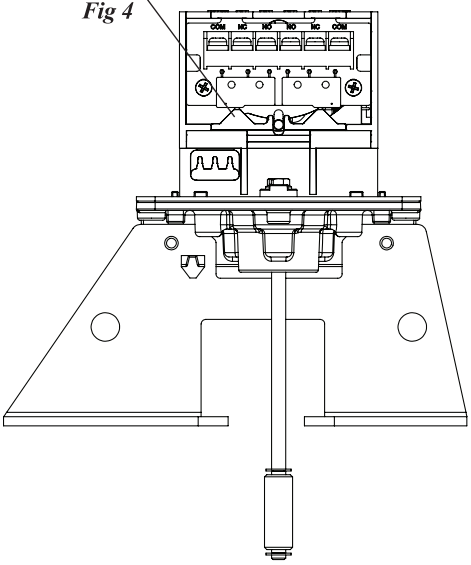



*Fig 5*

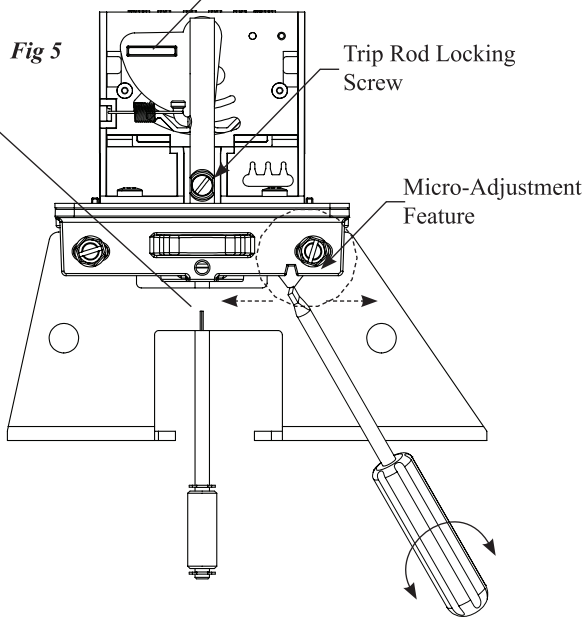
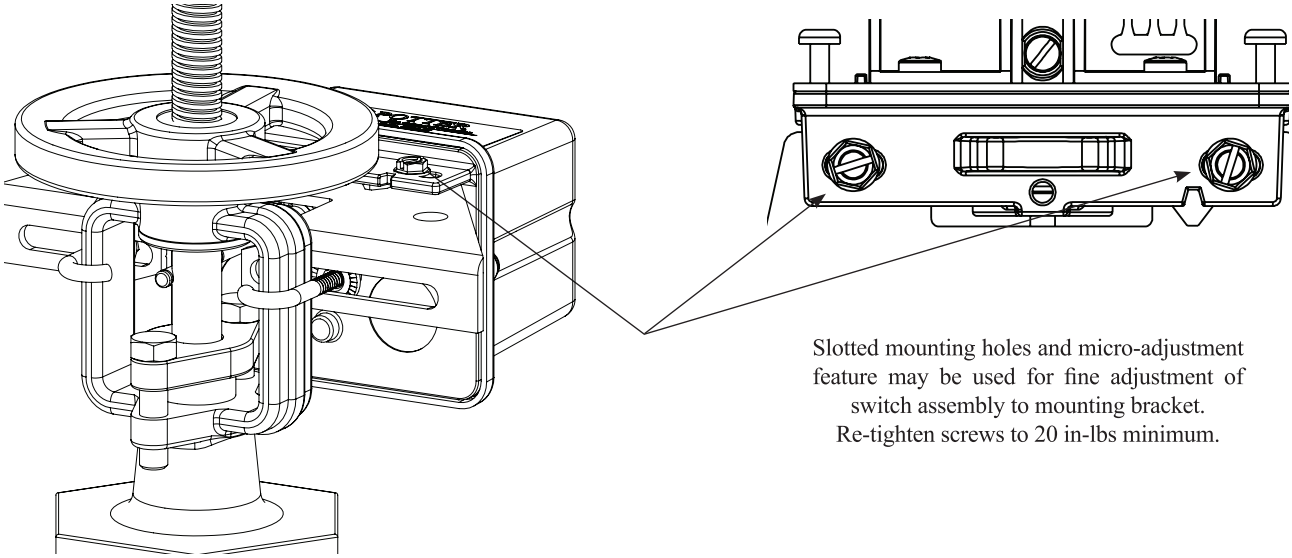


*Fig 6*

## Small Valve Installation - 1/2” Through 2 1/2” Sizes



Slotted mounting holes and micro-adjustment feature may be used for fine adjustment of switch assembly to mounting bracket. Re-tighten screws to 20 in-lbs minimum.

## Small Valve Installation

***NOTE:*** If the valve stem is pre-grooved at 1/8” minimum depth; proceed to step 7.

1. Remove and discard "E" ring and roller from the trip rod.
2. With the valve in the FULL OPEN position, locate the OSYSU across the valve yoke as far as possible from the valve gland so that the spring loaded trip rod of the OSYSU is pulled against the non threaded portion of the valve stem. Position the OSYSU with the bracket near the handwheel as shown in Fig. 6 if possible to avoid creating a pinch point between the wheel and the OSYSU.
3. Loosen the locking screw that holds the trip rod in place and adjust the rod length (see Fig. 5). When adjusted properly, the rod should extend past the valve screw, but not so far that it contacts the clamp bar. Tighten the locking screw to 5 in-lbs minimum to hold the trip rod in place and properly seal the enclosure.

   ***NOTE:*** If trip rod length is excessive, loosen the locking screw and remove the trip rod from the trip lever. Using pliers, break off the one (1) inch long notched section (see Fig. 10). Reinstall trip rod and repeat Step 3 procedure.
4. Mount the OSYSU loosely with the carriage bolts and clamp bar supplied. On valves with limited clearance use J-hooks supplied instead of the carriage bolts and clamp bar to mount the OSYSU.
5. Mark the valve stem at the center of the trip rod.
6. Remove the OSYSU. Utilizing a 3/16” or 1/4” diameter straight file, file a 1/8” minimum depth groove centered on the mark on the valve stem. Deburr and smooth the edges of the groove to prevent damage to the valve packing and to allow the trip rod to move easily in and out of the groove as the valve is operated.

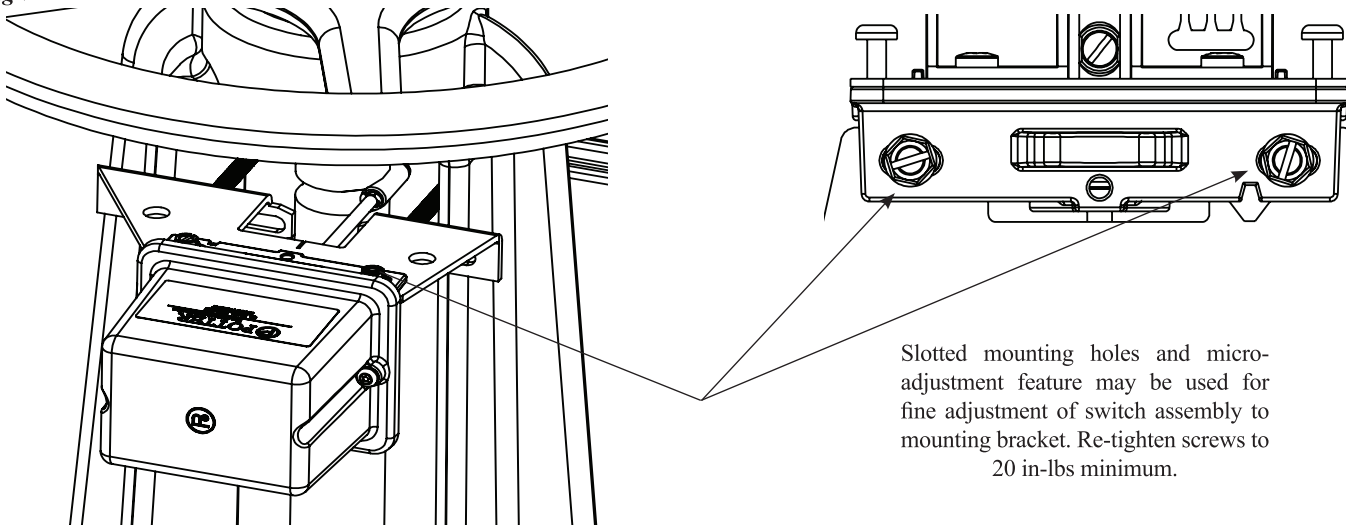
   ***NOTE:*** A groove depth of up to approximately 3/16” can make it easier to install the OSYSU so that it does not restore as it rolls over by the threads of the valve stem.
7. Mount the OSYSU on the valve yoke with the spring loaded trip rod of the OSYSU pulled against the valve stem and centered in the groove of the stem. If possible, position the OSYSU with the flat side of the bracket toward the hand wheel, as shown in Fig. 6, to help avoid creating a pinch point between the wheel and OSYSU. When in this preferred mounting position, it is usually best to use the white indicator visible through the window, as illustrated in Fig. 3, to aid in initially locating the OSYSU in the correct position on the yoke. If the unit must be installed inverted with the white indicator no longer easily visible, use the visual indicators of the actuator buttons on the micro-switches, as illustrated in Fig. 1, or the trip rod alignment mark on the bracket, as illustrated in Fig. 2 , to aid in initially locating the OSYSU.
8. Final adjustment can be made by slightly loosening the two screws on the bracket and using the fine adjustment feature (see Fig. 5). The adjustment is correct when the plungers on the switches are depressed by the actuator and there is no continuity between the COM and NO terminals on the switches.
9. Tighten the adjustment screws and all mounting hardware securely (20 in-lbs minimum). Check to insure that the rod moves out of the groove easily and that the switches activate within two turns when the valve is operated from the FULL OPEN towards the CLOSED position.
10. Reinstall the cover and tighten the cover screws to 15 in-lbs minimum to properly seal the enclosure.

**⚠ CAUTION**

Close the valve fully to determine that the stem threads do not activate the switch. The switch being activated by the stem threads could result in a ***false valve open*** indication.

## Large Valve Installation - 3” Through 12” Sizes

*Fig 7*




## Large Valve Installation

***NOTE:*** If the valve stem is pre-grooved at 1/8” minimum depth; proceed to step 6.

1. With the valve in the FULL OPEN position, locate the OSYSU across the valve yoke as far from the valve gland as possible so that the spring loaded trip rod of the OSYSU is pulled against the non threaded portion of the valve stem. Position the OSYSU with the bracket near the handwheel as shown in Fig. 7 if possible to avoid creating a pinch point between the wheel and the OSYSU.
2. Mount the OSYSU loosely with the carriage bolts and clamp bar supplied.
3. Loosen the locking screw that holds the trip rod in place and adjust the rod length (see Fig. 5). When adjusted properly, the rod should extend past the valve screw, but not so far that it contacts the clamp bar. Tighten the locking screw to 5 in-lbs minimum to hold the trip rod in place and properly seal the enclosure.

   ***NOTE:*** If trip rod length is excessive, loosen the locking screw and remove the trip rod from the trip lever. Using pliers, break off the one (1) inch long notched section (see Fig. 10). Reinstall trip rod and repeat Step 3 procedure.
4. Mark the valve stem at the center of the trip rod.
5. Remove the OSYSU. Utilizing a 3/8” or ½” diameter straight file, file a 1/8” minimum depth groove centered on the mark on the valve stem. Deburr and smooth the edges of the groove to prevent damage to the valve packing and to allow the trip rod to move easily in and out of the groove as the valve is operated.

   ***NOTE:*** A groove depth of up to approximately 3/16” can make it easier to install the OSYSU so that it does not restore as it rolls over by the threads of the valve stem.
6. Mount the OSYSU on the valve yoke with the spring loaded trip rod of the OSYSU pulled against the valve stem and centered in the groove of the stem. If possible, position the OSYSU with the flat side of the bracket toward the hand wheel, as shown in Fig. 7, to help avoid creating a pinch point between the wheel and OSYSU. When in this preferred mounting position, it is usually best to use the white indicator visible through the window, as illustrated in Fig. 3, to aid in initially locating the OSYSU in the correct position on the yoke. If the unit must be installed inverted with the white indicator no longer easily visible, use the visual indicators of the actuator buttons on the micro-switches, as illustrated in Fig. 1, or the trip rod alignment mark on the bracket, as illustrated in Fig. 2 , to aid in initially locating the OSYSU.
7. Final adjustment can be made by slightly loosening the two screws on the bracket and using the fine adjustment feature (see Fig. 5). The adjustment is correct when the plungers on the switches are depressed by the actuator and there is no continuity between the COM and NO terminals on the switches.
8. Tighten the adjustment screws and mounting hardware securely (minimum 20 in-lbs). Check to insure that the rod moves out of the groove easily and that the switches activate within two turns when the valve is operated from the FULL OPEN towards the CLOSED position.
9. Reinstall the cover and tighten the cover screws to 15 in-lbs minimum to properly seal the enclosure.

**⚠ CAUTION**

Close the valve fully to determine that the stem threads do not activate the switch. The switch being activated by the stem threads could result in a ***false valve open*** indication.

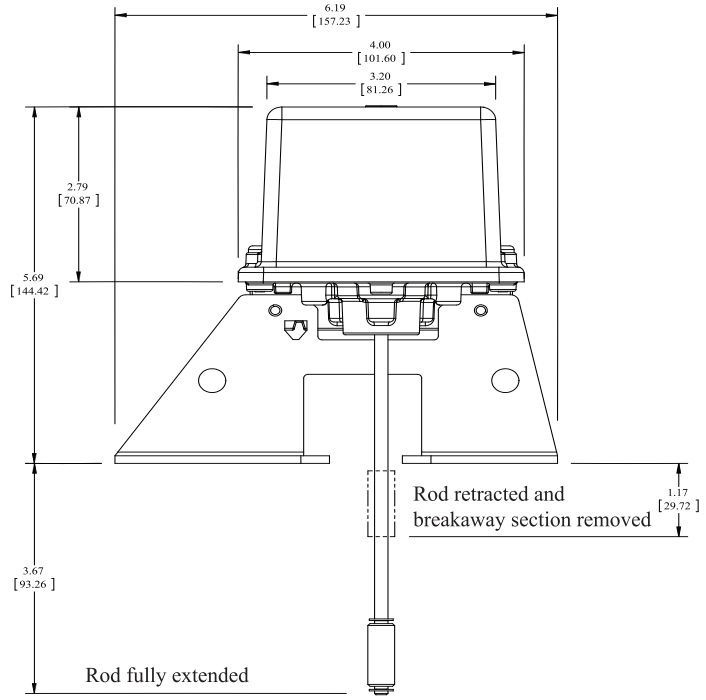
POTTER
The Symbol of Protection

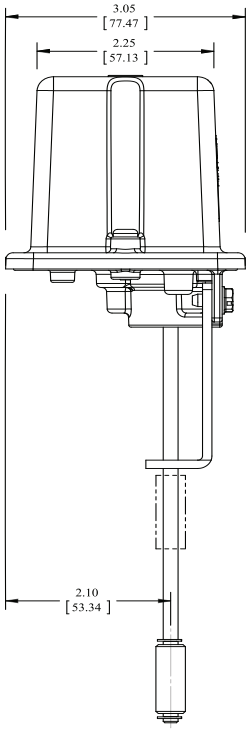
# OSYSU Series

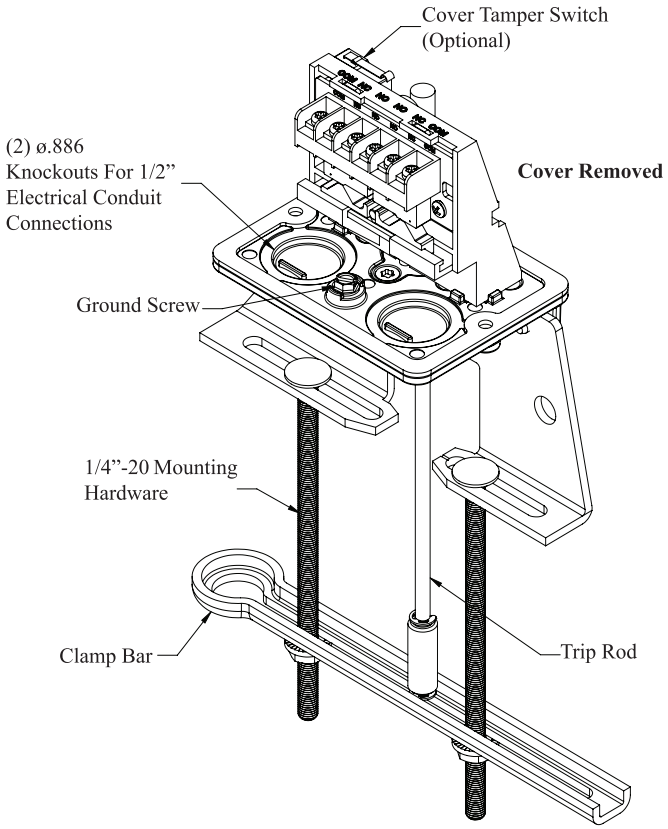
*Outside Screw and Yoke Valve Supervisory Switch*

## Dimensions

***Fig 8***



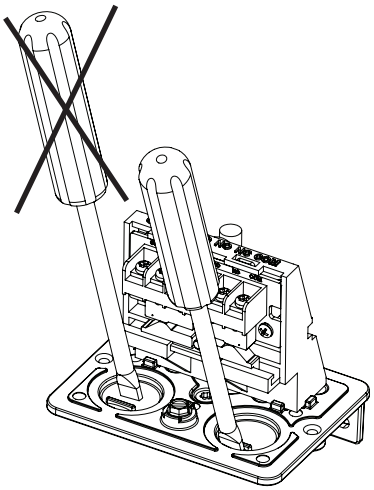




## Knockout Removal

***Fig 9***

To remove knockouts: Place screwdriver at inside edge of knockouts, not in the center.



***NOTE:*** Do not drill into the base as this creates metal shavings which can create electrical hazards and damage the device. Drilling voids the warranty.

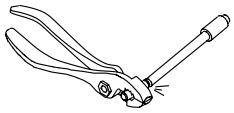
POTTER
The Symbol of Protection

# OSYSU Series

*Outside Screw and Yoke Valve Supervisory Switch*

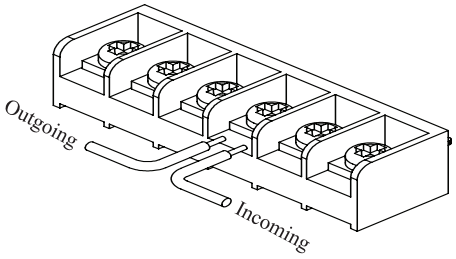
## Breaking Excessive Rod Length

*Fig 10*



## Switch Terminal Connections Clamping Plate Terminal

*Fig 11*




**⚠ WARNING**

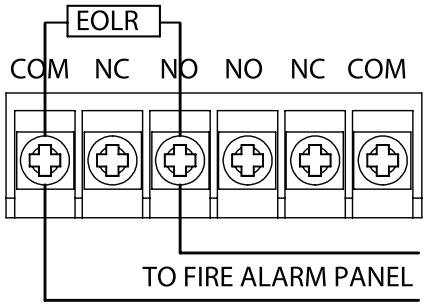
An uninsulated section of a single conductor should not be looped around the terminal and serve as two separate connections. The wire must be severed, thereby providing supervision of the connection in the event that the wire become dislodged from under the terminal. Failure to sever the wire may render the device inoperable risking severe property damage and loss of life. Do not strip wire beyond 3/8" of length or expose an uninsulated conductor beyond the edge of the terminal block. When using stranded wire, capture all strands under the clamping plate.

**NOTICE**

All conduit and connectors selected for the installation of this product shall be suitable for the environment for which it is to be used and shall be installed to the manufacturer's installation instructions. For NEMA 4, 4X, 6, 6P installations, the cover screws are recommended to be tightened to 15 in-lbs minimum and the trip rod locking screw tightened to 5 in-lbs minimum to properly seal the enclosure.

## Typical Electrical Connections

*Fig 12*




## Ordering Information

| Model | Description | Stock No. |
|---|---|---|
| OSYSU-1 | Outside Screw & Yoke Supervisory Switch (Single switch) | 1010102 |
| OSYSU-2 | Outside Screw & Yoke Supervisory Switch (Double switch) | 1010202 |
| OSYSU-2 CRH | Outside Screw & Yoke Supervisory Switch (Double Switch). Corrosion resistant hardware of 316 stainless steel | 1010210 |
| | Cover Screw | 5490424 |
| | Hex Key for Cover Screws and Installation Adjustments | 5250062 |
| | Optional Cover Tamper Switch Kit | 0090200 |

## Engineering Specifications: OS&Y Valves

UL, CUL Listed / FM Approved and CE Marked valve supervisory switches shall be furnished and installed on all OS&Y type valves that can be used to shut off the flow of water to any portion of the fire sprinkler system, where indicated on the drawings and plans and as required by applicable local and national codes and standards. The supervisory switch shall be NEMA 4X and 6P rated and capable of being mounted in any position indoors or out and be completely submerged without allowing water to enter the enclosure.. The enclosure shall be held captive by tamper resistant screws. The device shall contain two ½" conduit entrances and one or two Single Pole Double Throw (SPDT) switches. There shall be a visual indicator to display the status of the switches. To aid in installation, it shall be possible to make fine adjustments to the position of the switch on the valve without loosening the mounting bracket from the valve. The device shall contain an adjustable length trip rod and roller, the trip rod shall be held captive by a set screw accessible upon removal of the cover. The switch contacts shall be rated at 10A, 125/250VAC and 2A, 30VDC. OS&Y Valve supervisory switch shall be model OSYSU-1 for the single switch model and OSYSU-2 for the two switch model manufactured by Potter Electric Signal Company LLC

**NOTICE**

Supervisory switches have a normal service life of 10-15 years. However, the service life may be significantly reduced by local environmental conditions.

# HANGERS

# 115 STANDARD DUTY LOOP HANGER



The 115 Standard Duty Loop Hanger is ideal for suspending stationary, non-insulated pipe lines, including CPVC pipes, in fire sprinkler systems. A knurled insert nut helps simplify vertical adjustments and flared edges on the base (1/2” to 4” sizes) help protect pipes from coming into contact with any sharp edges of the hanger.

## CERTIFICATIONS

## FEATURES

- Flared edges help prevent any sharp surfaces from coming into contact with the pipe (1/2" to 4" sizes)
- Retained insert nut helps ensure the loop hanger and insert nut stay together
- Recommended for the suspension of stationary non-insulated pipe lines
- Manufactured to use the minimum rod size permitted by NFPA® for fire sprinkler piping
- Conforms with Federal Specification WW-H-171 (Type 10), Manufacturers Standardization Society (MSS) SP-58 (Type 10)

## SPECIFICATIONS

**Finish** Pregalvanized

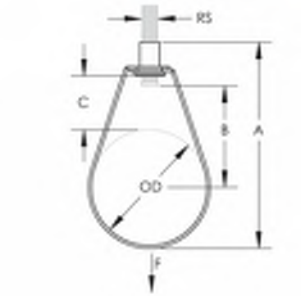
**Material** Steel

| Catalog Number | Pipe Size | Outer Diameter(OD) | Rod Size(RS) | A | B | C | Static Load(F) |
|---|---|---|---|---|---|---|---|
| 1150050EG | 1/2" | 0.840" | 3/8" | 2 13/16" | 1 1/8" | 1" | 300 lb |
| 1150075EG | 3/4" | 1.050" | 3/8" | 3" | 1 3/16" | 15/16" | 300 lb |
| 1150100EG | 1" | 1.315" | 3/8" | 3 1/4" | 1 3/8" | 15/16" | 300 lb |
| 1150125EG | 1 1/4" | 1.660" | 3/8" | 3 9/16" | 1 1/2" | 15/16" | 300 lb |
| 1150150EG | 1 1/2" | 1.900" | 3/8" | 3 13/16" | 1 5/8" | 15/16" | 300 lb |

PERMIT #2026 2513934 - CM 04 | RSN:1975523

| Catalog Number | Pipe Size | Outer Diameter(OD) | Rod Size(RS) | A | B | C | Static Load(F) |
|---|---|---|---|---|---|---|---|
| 1150200EG | 2" | 2 3/8" | 3/8" | 4 1/4" | 1 7/8" | 15/16" | 300 lb |
| 1150250EG | 2 1/2" | 2 7/8" | 3/8" | 5 15/16" | 3 7/16" | 2" | 525 lb |
| 1150300EG | 3" | 3 1/2" | 3/8" | 6 9/16" | 3 1/2" | 1 15/16" | 525 lb |
| 1150350EG | 3 1/2" | 4" | 3/8" | 7 1/16" | 3 3/4" | 1 15/16" | 585 lb |
| 1150400EG | 4" | 4 1/2" | 3/8" | 7 9/16" | 4" | 1 15/16" | 650 lb |
| 1150500EG | 5" | 5 9/16" | 1/2" | 9 13/16" | 4 3/4" | 2 1/4" | 1,000 lb |
| 1150600EG | 6" | 6 5/8" | 1/2" | 11 5/16" | 6 5/16" | 3 5/16" | 1,000 lb |
| 1150800EG | 8" | 8 5/8" | 1/2" | 12 7/8" | 6 7/8" | 2 7/8" | 1,000 lb |

## DIAGRAMS




## WARNING

nVent products shall be installed and used only as indicated in nVent's product instruction sheets and training materials. Instruction sheets are available at www.nvent.com and from your nVent customer service representative. Improper installation, misuse, misapplication or other failure to completely follow nVent's instructions and warnings may cause product malfunction, property damage, serious bodily injury and death and/or void your warranty.

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Sydney:
+61 2 9751 8500

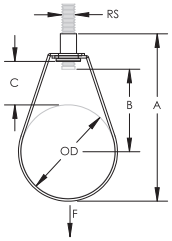


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nVent.com CADDY ERICO HOFFMAN RAYCHEM SCHROFF TRACER

# 100 Heavy Duty Loop Hanger



- Recommended for the suspension of stationary non-insulated pipe lines
- Conforms with Federal Specification WW-H-171 (Type 10), Manufacturers Standardization Society (MSS) SP-58 (Type 10)




Material: Steel
Finish: Pregalvanized

| Part Number | Pipe Size | Outer Diameter OD | Rod Size RS | A | B | C | Static Load F |
|---|---|---|---|---|---|---|---|
| 1000250EG | 2 1/2" | 2 7/8" | 1/2" | 5 5/8" | 2 9/16" | 1 1/2" | 1,000 lb |
| 1000300EG | 3" | 3 1/2" | 1/2" | 6 9/16" | 3 3/16" | 1 13/16" | 1,000 lb |
| 1000350EG | 3 1/2" | 4" | 1/2" | 7" | 3 3/8" | 1 3/4" | 1,000 lb |
| 1000400EG | 4" | 4 1/2" | 5/8" | 7 3/4" | 3 11/16" | 1 7/8" | 1,100 lb |
| 1000500EG | 5" | 5 9/16" | 5/8" | 9 1/8" | 4 9/16" | 2 3/16" | 1,100 lb |
| 1000600EG | 6" | 6 5/8" | 3/4" | 10 5/8" | 5 3/16" | 2 3/8" | 1,250 lb |
| 1000800EG | 8" | 8 5/8" | 7/8" | 13 1/8" | 6 9/16" | 2 7/8" | 1,250 lb |

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WARNING
nVent products shall be installed and used only as indicated in nVent's product instruction sheets and training materials. Instruction sheets are available at www.erico.com and from your nVent customer service representative. Improper installation, misuse, misapplication or other failure to completely follow nVent 's instructions and warnings may cause product malfunction, property damage, serious bodily injury and death and/or void your warranty.

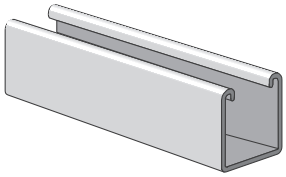
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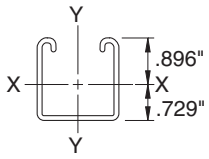
# CHANNEL

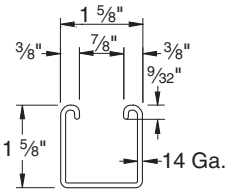
**Finish:** Plain, Painted Green, or Pregalvanized **Order By:** No., Length and Finish

POWER-STRUT®

## PS 210 – Steel Channel (1⅝" x 1⅝" x 14 ga.)



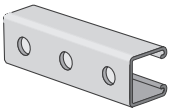


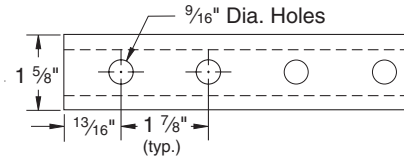




### ELEMENTS OF SECTION – PS 210

| Weight (lbs./100 ft.) | Area of Section (Inch²) | X-X Axis | | | Y-Y Axis | | |
|---|---|---|---|---|---|---|---|
| | | Moment of Inertia (Inch⁴) | Section Modulus (Inch³) | Radius of Gyration (Inch) | Moment of Inertia (Inch⁴) | Section Modulus (Inch³) | Radius of Gyration (Inch) |
| 142 | 0.418 | 0.145 | 0.162 | 0.589 | 0.176 | 0.217 | 0.650 |

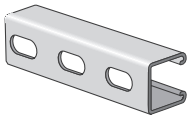
## PS 210 H - Channel with Holes

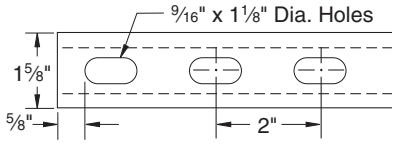





Weight: 137 lbs./100 ft.

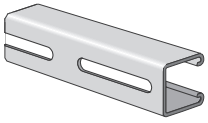
## PS 210 EH – Channel with Elongated Holes

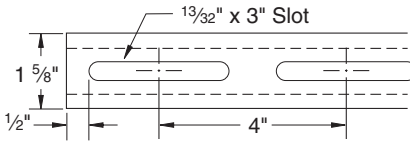





Weight: 137 lbs./100 ft.

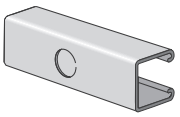
## PS 210 S - Channel with Slots

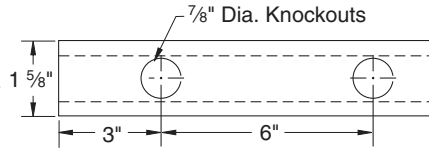





Weight: 137 lbs./100 ft.

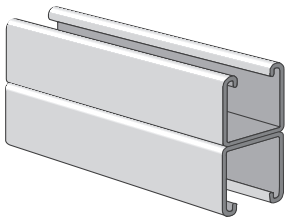
## PS 210 K06 – Channel with Knockouts

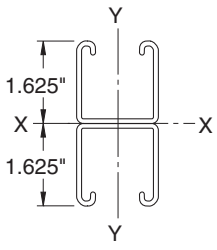


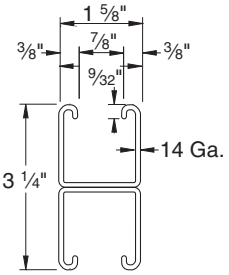



Weight: 141 lbs./100 ft.

## PS 210 2T3 – Steel Channel (1⅝" x 3¼" x 14 ga.)






### ELEMENTS OF SECTION – PS 210 2T3

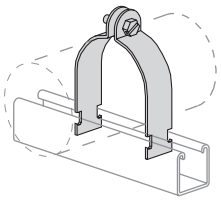
| Weight (lbs./100 ft.) | Area of Section (Inch²) | X-X Axis | | | Y-Y Axis | | |
|---|---|---|---|---|---|---|---|
| | | Moment of Inertia (Inch⁴) | Section Modulus (Inch³) | Radius of Gyration (Inch) | Moment of Inertia (Inch⁴) | Section Modulus (Inch³) | Radius of Gyration (Inch) |
| 284 | 0.835 | 0.733 | 0.451 | 0.937 | 0.353 | 0.434 | 0.650 |

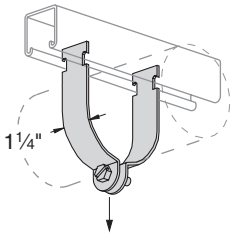
PERMIT #2026 2513934 - CM 04 | RSN:1975523

# PIPE & CONDUIT CLAMPS

**Finish:** Electro-galvanized **Order By:** No., and Finish

## PS 1000 – EMT Conduit Clamp

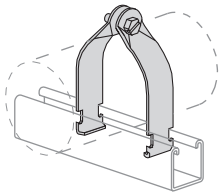


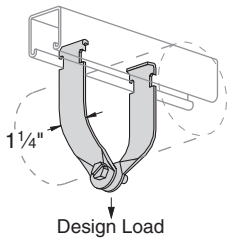



**Note:** For EMT larger than 2" use PS 1100

| EMT Size | Stock Thickness | Hanging Load Rating/lbs. | Wt./100 pcs |
|---|---|---|---|
| ½" | .060 | 400 | 11 |
| ¾" | | | 12 |
| 1" | .075 | 600 | 15 |
| 1¼" | | | 18 |
| 1½" | .105 | 800 | 29 |
| 2" | | | 33 |

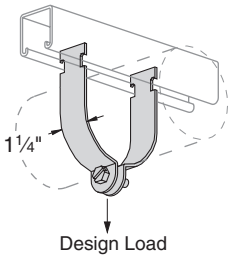
## PS 1300 – Universal Clamp for EMT, IMC & GRC

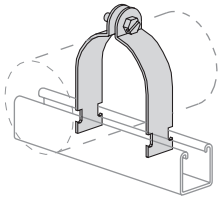





| Nominal Size | Fits O.D. | Stock Thickness | Hanging Load Rating/lbs. | Wt./100 pcs |
|---|---|---|---|---|
| ½" | 0.706-0.840 | .060 | 250 | 10 |
| ¾" | 0.922-1.050 | .060 | 400 | 11 |
| 1" | 1.163-1.315 | | | 12 |
| 1¼" | 1.510-1.660 | .075 | 400 | 18 |
| 1½" | 1.740-1.900 | .075 | 500 | 20 |
| 2" | 2.197-2.375 | | | 22 |

## PS 1100, PS 1116, PS 1117 – Standard Pipe Clamp (GRC, IMC and SCH 40/SCH 80 steel pipe)



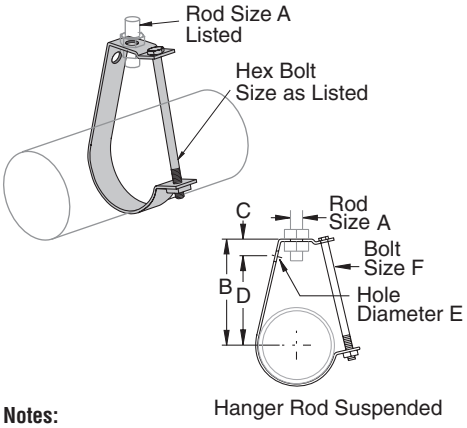



Material and finish are specified as:

**1100 AL** Alum. clamp, EG fasteners
**1100 HG** Clamp, Stainless Steel fasteners
**1116** Alum. clamp and fasteners
**1117** Alum. clamp, Stainless Steel fasteners
**1100SS** Stainless Steel clamp and fasteners

| Pipe Size | Stock Thickness | Hanging Load Rating/lbs. | Wt./100 pcs |
|---|---|---|---|
| ⅜" | .060 | 400 | 10 |
| ½" | | | 11 |
| ¾" | .075 | 600 | 15 |
| 1" | | | 17 |
| 1¼" | | | 19 |
| 1½" | .105 | 800 | 29 |
| 2" | | | 34 |
| 2½" | | | 40 |
| 3" | | | 47 |
| 3½" | .125 | 1,000 | 62 |
| 4" | | | 67 |
| 5" | | | 80 |
| 6" | .135 | | 102 |
| 8" | | | 130 |
| 10" | | | 143 |
| 12" | | | 174 |

## PS 67 – "J" Pipe or Conduit Hanger




Hanger Rod Suspended

| Conduit Size | A Rod Size | B | C | D | E | F | Load Rating/lbs. | Wt./100 pcs |
|---|---|---|---|---|---|---|---|---|
| ½ | ⅜ | 2⅝ | 1 | 2 | 13/32 | ¼ x 2¼ | 400 | 20 |
| ¾ | | 2⅞ | | 2¼ | | | | 21 |
| 1 | | 3 | | 2⅜ | | ¼ x 2½ | | 24 |
| 1¼ | | 3¼ | | 2½ | | ¼ x 2¾ | | 27 |
| 1½ | | 3½ | | 2⅝ | | ¼ x 3 | | 29 |
| 2 | | 3¾ | 1⅛ | 2⅝ | | ¼ x 3½ | | 33 |
| 2½ | ½ | 4⅜ | 1⅛ | 3⅝ | 9/16 | ⅜ x 4½ | 800 | 71 |
| 3 | | 4⅞ | | 4 | | ⅜ x 5 | | 78 |
| 3½ | | 5⅛ | | 4¼ | | ⅜ x 6 | | 85 |
| 4 | ⅝ | 6⅛ | | 5⅛ | | | | 178 |
| 5 | | 6¾ | | 5¾ | | ⅜ x 7½ | | 199 |
| 6 | ¾ | 7¾ | 1¼ | 6½ | | ⅜ x 8½ | 1,000 | 231 |
| 8 | ⅞ | 9¼ | 1¼ | 8 | | ⅜ x 10 | 1,200 | 449 |

**Notes:**
Plastic Coated hanger is available ("N" Suffix).
Please contact factory for additional information.
Maximum operating temperature is 300°F
Minimum safety factor of five (5) on ultimate load.

SHAMBAUGH & SON, L.P.
CONTRACTORS · ENGINEERS

# Hanger Rods

| | |
|---|---|
| Type: | All-Thread |
| Steel: | Low-carbon steel<br>Manufactured to ASTM A-307, grade A specification<br>60,000 PSI Tensile Strength |
| Plating: | Zinc Plated |
| | |
| 1/2”-13 | Rod for pipe 6” and 8” size |
| 3/8”-16 | Rod for pipe 4” and smaller in size |

SHAMBAUGH & SON, L.P.
CONTRACTORS - ENGINEERS

# Bolts and Nuts

## Bolts provided for Flanged connections are:

- Zinc Plated Hex Head Bolts
- Dimensions meeting ASME/ANSI B18.2.1
- SAE J429-Grade 2, or ASTM A307-Grade A
  Low or Medium Carbon steel
  60,000 PSI minimum tensile strength

## Nuts provided for Flanged connections are:

- Low Carbon Zinc Plated Heavy Hex
- Dimensions meeting ASME/ANSI B18.2.2
- ASTM A563-Grade A
  90,000 PSI Proof Load Stress

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## B3037 - Z-Purlin Malleable C-Clamp

**Material:** Malleable Iron

**Function:** Designed for attaching a 3/8"-16 hanger rod to the bottom flange of a Z-purlin.

**Approvals:** Underwriters Laboratories Listed **(cULus)** for up to 4" (100mm) pipe. Conforms to Federal Specification WW-H-171E & A-A-1192A, Type 23 and Manufacturers Standardization Society ANSI/MSS SP-69 & SP-58, Type 23.

**Finish:** Plain or Electro-Galvanized

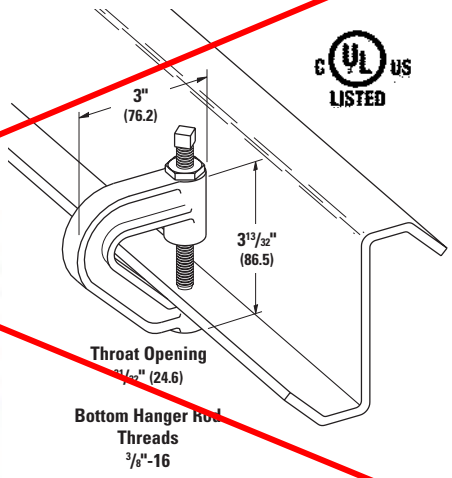
**Order By:** Figure number and finish.

**Weight:** Approx. Wt./100 90 Lbs. (40.8kg)

**Design Load:** 400 Lbs. (1.78kN)

**Setscrew Torque:** Per MSS SP-58 14.2.5
3/8" -16 set screws = 5 ft./lbs. (7 Nm)
Caution should be taken not to over-tighten set screws.






## B3033 - Wide Jaw Reversible C-Clamp

**Size Range:** 3/8"-16 thru 3/4"-10 rod

**Material:** Cast Malleable Steel with hardened cup point set screw and jam nut

**Function:** For attachment to structural shapes requiring wider throat especially under roof with bar joist construction.
This clamp may be used with the set screw in the up or down position.

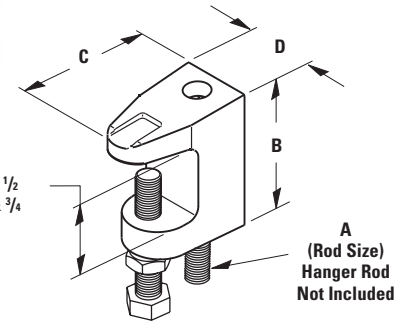
**Approvals:** Underwriters Laboratories Listed **(cULus)** and Factory Mutual Engineering Approved **(FM)** for 3/8"-16 and 1/2"-13 rod sizes. Conforms to Federal Specification WW-H-171E Type 19 & A-A-1192A, Type 19 & 23 and Manufacturers Standardization Society ANSI/MSS SP-69 & SP-58, Type 19 & 23. Factory Mutual Engineering Approved only with the setscrew in the down position.

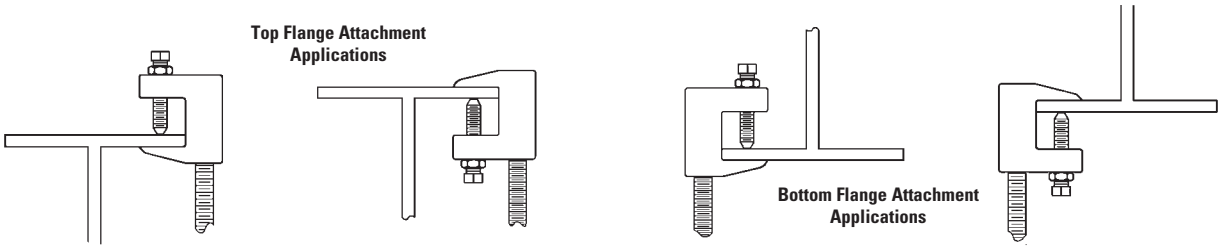
**Finish:** Plain. Contact customer service for alternative finishes and materials.

**Order By:** Figure number, rod size and finish

**Setscrew Torque:** Per MSS SP-58 14.2.5
3/8" -16 set screws = 5 ft./lbs. (7 Nm)
1/2" -13 set screws = 11 ft./lbs. (15 Nm)
5/8" -11 set screws = 21 ft./lbs. (28 Nm)
Caution should be taken not to over-tighten set screws.
Designed to meet or exceed requirements of FM DS 2-0.






| Part No. | Rod Size A | Set Screw Size | B in. | B (mm) | C in. | C (mm) | D in. | D (mm) | Maximum Iron Pipe Size Per UL in. | Maximum Iron Pipe Size Per UL (mm) | Approx. Wt./100 Lbs. | Approx. Wt./100 (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B3033-3/8 | 3/8"-16 | 3/9"-16 x 2" | 2 1/4" | (57.1) | 2" | (50.8) | 1 1/8" | (28.6) | 4" | (100) | 54 | (24.5) |
| B3033-1/2 | 1/2"-13 | 1/2"-13 x 2 1/2" | 2 5/16" | (58.7) | 2 3/16" | (55.6) | 1 1/4" | (31.7) | 8" | (200) | 51 | (23.1) |
| B3033-5/8 | 5/8"-11 | 1/2"-13 x 2 1/2" | 2 5/8" | (66.7) | 2 1/2" | (63.5) | 1 3/8" | (34.9) | 8" | (200) | 70 | (31.7) |
| B3033-3/4 | 3/4"-10 | 5/8"-11 x 2 1/2" | 2 11/16" | (68.3) | 2 1/2" | (63.5) | 1 7/16" | (36.5) | 10" | (250) | 98 | (44.4) |

All dimensions in charts and on drawings are in inches. Dimensions shown in parentheses are in millimeters unless otherwise specified.

## B3034 - C-Clamp

**Size Range:** 3/8"-16 thru 3/4"-10 rod

**Material:** Cast Malleable Steel with hardened cup point set screw and jam nut

**Function:** Recommended for hanging from steel beam where flange thickness does not exceed 3/4" (19.0mm).

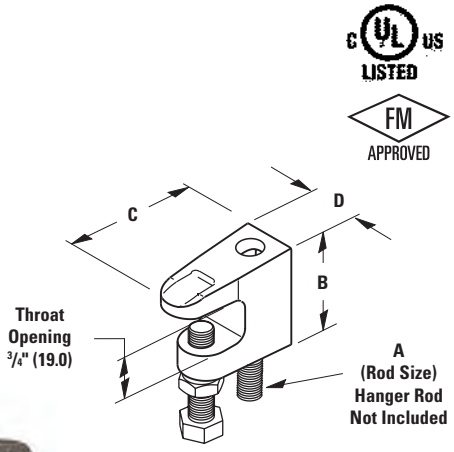
**Features:** May be used on top or bottom flange of the beam. Beveled lip allows hanging from top flange where clearance is limited. May be installed with the set screw in the up or down position. Offset design permits unlimited rod adjustment by allowing the rod to be threaded completely through the clamp. The rear window design permits inspection of thread engagement.

**Approvals:** Underwriters Laboratories Listed **(cULus)** and Factory Mutual Engineering Approved **(FM)** for 3/8"-16 and 1/2"-13 rod sizes. Conforms to Federal Specification WW-H-171E & A-A-1192A, Type 23 and Manufacturers Standardization Society ANSI/MSS SP-69 & SP-58, Type 19. 3/8"-16 is **(cULus)** Listed to support up to 4" (100mm) pipe with the set screw in the down position, up to 3" (75mm) pipe with the set screw in the up position. 1/2"-13 is **(cULus)** Listed to support up to 8" (200mm) pipe with the set screw in the down position, up to 6" (150mm) pipe with the set screw in the up position. Factory Mutual Engineering Approved only with the setscrew in the down position.

**Finish:** Plain. Contact customer service for alternative finishes and materials.

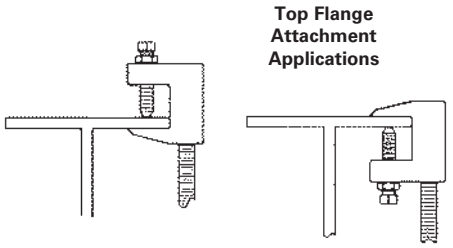
**Order By:** Figure number, rod size and finish

**Setscrew Torque:** Per MSS SP-58 14.2.5
3/8" -16 set screws = 5 ft./lbs. (7 Nm)
1/2" -13 set screws = 11 ft./lbs. (15 Nm)
Caution should be taken not to over-tighten set screws.

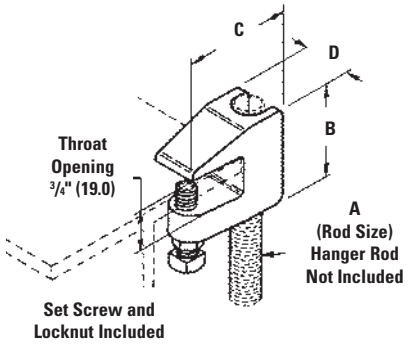


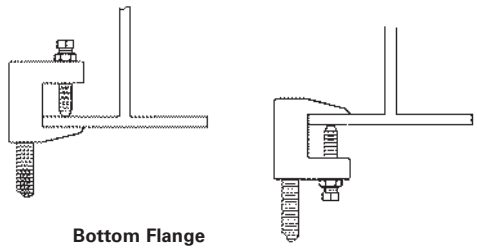


B3034-3/8" shown.




B3034-5/8" and B3034-3/4" sizes Attach only as shown.




| Part No. | Rod Size A | Set Screw Size | B | | C | | D | | Maximum Iron Pipe Size Per UL | | Approx. Wt/100 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | in. | (mm) | in. | (mm) | in. | (mm) | in. | (mm) | Lbs. | (kg) |
| B3034-3/8 | 3/8"-16 | 3/8"-16 x 1 1/2" | 1 5/8" | (41.3) | 2" | (50.8) | 7/8" | (19.0) | 4" | (100) | 30 | (13.6) |
| B3034-1/2 | 1/2"-13 | 1/2"-13 x 1 1/2" | 1 13/16" | (46.0) | 2 3/16" | (55.6) | 1 3/16" | (30.2) | 8" | (200) | 47 | (21.3) |
| B3034-5/8 | 5/8"-11 | 1/2"-13 x 2" | 1 3/4" | (44.5) | 2 1/8" | (54.0) | 1 1/4" | (31.7) | — | — | 58 | (26.3) |
| B3034-3/4 | 3/4"-10 | 1/2"-13 x 2" | 2" | (50.8) | 2 1/4" | (57.2) | 1 1/4" | (31.7) | — | — | 77 | (35.0) |

All dimensions in charts and on drawings are in inches. Dimensions shown in parentheses are in millimeters unless otherwise specified.

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## TOLCO Fig. 65 - Reversible Steel C-Type Beam Clamp 3/4" (19.0mm) Throat Opening

**Size Range:**
Fig. 65 - 1/2"-13 rod sizes, and 5/8"-11 rod sizes
Fig. 65XT - 3/8"-16 rod size (see below)

**Material:** Steel with hardened cup point set screw and jam nut

**Function:** Recommended for hanging from steel beam where flange thickness does not exceed 3/4" (19.0mm).

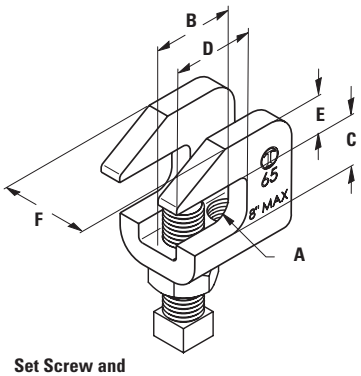
**Features:** All steel construction eliminates structural deficiencies associated with casting type beam clamps. May be used on top or bottom flange of beam. (Beveled lip allows hanging from top flange where clearance is limited.) May be installed with set screw in up or down position. Offset design permits unlimited rod adjustment by allowing the rod to be threaded completely through the clamp. Open design permits inspection of thread engagement.

**Approvals:** Underwriters Laboratories Listed in the USA **(UL)** and Canada **(cUL).** Exceeds requirements of the National Fire Protection Association **(NFPA)**, pamphlet 13,
3/8"-16 rod will support 1/2" (15mm) thru 4" (100mm) pipe
1/2"-13 rod will support thru 8" (200mm) pipe

**Finish:** Plain or Electro-Galvanized. Contact customer service for alternative finishes and materials.

**Order By:** Figure number and finish

*Fig. 65 Patent #4,570,885*



Set Screw and Locknut Included





| Part No. | Rod Size A | B in. | B (mm) | C in. | C (mm) | D in. | D (mm) | E in. | E (mm) |
|---|---|---|---|---|---|---|---|---|---|
| 65-1/2 | 1/2"-13 | 1 1/2" | (38.1) | 3/4" | (19.0) | 1" | (25.4) | 9/16" | (14.3) |
| 65-5/8 | 5/8"-11 | 1 1/2" | (38.1) | 3/4" | (19.0) | 1" | (25.4) | 9/16" | (14.3) |

| Part No. | F in. | F (mm) | Approx. Wt./100 Lbs. | Approx. Wt./100 (kg) |
|---|---|---|---|---|
| 65-1/2 | 1 1/4" | (31.7) | 55 | (24.9) |
| 65-5/8 | 1 1/4" | (31.7) | 55 | (24.9) |

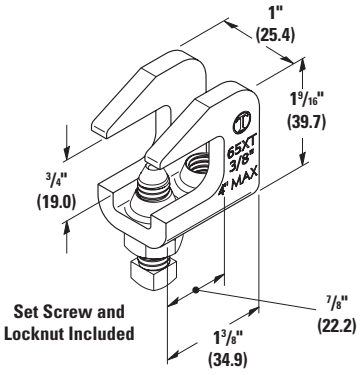
## TOLCO Fig. 65XT - Reversible Steel C-Type Beam Clamp 3/4" (19.0mm) Throat Opening

**Feature:** Extruded holes allows for more thread engagement of threaded rod and set screw.

**Finish:** Plain or Electro-Galvanized

**Order By:** Figure number and finish
**Approvals:** Underwriters Laboratories Listed **(cULus)** and FM Approved **(FM)** for up to 4" (100mm) pipe.

Designed to meet or exceed requirements of FM DS 2-0 and NFPA 13.



Set Screw and Locknut Included





| Part No. | For Rod Size | Approx. Wt./100 Lbs. | Approx. Wt./100 (kg) |
|---|---|---|---|
| 65XT | 3/8"-16 | 28.0 | (12.7) |

All dimensions in charts and on drawings are in inches. Dimensions shown in parentheses are in millimeters unless otherwise specified.

## TOLCO Fig. 66 - Reversible Steel C-Type Beam Clamp 1¼" (31.7mm) Throat Opening

**Size Range:** ⅜"-16, ½"-13 rod sizes, and ⅝"-11 rod sizes

**Material:** Steel with hardened cup point set screw and jam nut

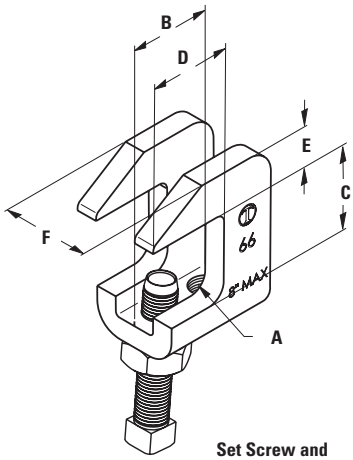
**Function:** Recommended for hanging from steel beam where flange thickness does not exceed 1¼" (31.7mm).

**Features:** All steel construction eliminates structural deficiencies associated with casting type beam clamps. May be used on top or bottom flange of beam. (Beveled lip allows hanging from top flange where clearance is limited.) May be installed with set screw in up or down position. Offset design permits unlimited rod adjustment by allowing the rod to be threaded completely through the clamp. Open design permits inspection of thread engagement.

**Approvals:** Underwriters Laboratories Listed in the USA **(UL)** and Canada **(cUL).** Exceeds requirements of the National Fire Protection Association **(NFPA**), pamphlet 13,
⅜"-16 rod will support ½" (15mm) thru 4" (100mm) pipe
½"-13 rod will support thru 8" (200mm) pipe

**Finish:** Plain or Electro-Galvanized. Contact customer service for alternative finishes and materials.

**Order By:** Figure number and finish




Set Screw and Locknut Included



| Part No. | Rod Size A | B in. | B (mm) | C in. | C (mm) | D in. | D (mm) | E in. | E (mm) |
|---|---|---|---|---|---|---|---|---|---|
| 66-⅜ | ⅜"-16 | 1 3/16" | (30.2) | 1¼" | (31.7) | 1" | (25.4) | 7/16" | (11.1) |
| 66-½ | ½"-13 | 1½" | (38.1) | 1¼" | (31.7) | 1" | (25.4) | 9/16" | (14.3) |
| 66-⅝ | ⅝"-11 | 1½" | (38.1) | 1¼" | (31.7) | 1" | (25.4) | 9/16" | (14.3) |

| Part No. | F in. | F (mm) | Approx. Wt./100 Lbs. | (kg) |
|---|---|---|---|---|
| 66-⅜ | 1" | (25.4) | 28 | (12.7) |
| 66-½ | 1¼" | (31.7) | 55 | (24.9) |
| 66-⅝ | 1¼" | (31.7) | 55 | (24.9) |

All dimensions in charts and on drawings are in inches. Dimensions shown in parentheses are in millimeters unless otherwise specified.

# HILTI TECHNICAL BULLETIN

**Date; February 28, 2018**

**Subject: KWIK HUS-EZ 3/8 X 2-1/8 I 1/2**

Hilti has introduced a new version of the KWIK HUS-EZ I anchor. The KWIK HUS-EZ 3/8"X2 ½" I ½" anchor is a 3/8-in. diameter screw anchor with an internally threaded head for attachment of 1/2-in. diameter threaded rods. The tables below provide installation parameters and design load data in Normal Weight Concrete and Lightweight Concrete Over Metal Deck. The anchor is also approved by Factory Mutual for sprinkler pipe up to 8-in. in diameter. This product will be included in the next revision of ESR-3027.

The design tables in Tables 2 to 6 are Hilti Simplified Design Tables. The load values were developed using the design parameters and variables that are expected to be included in ESR-3027 and the equations of ACI 318-14 Chapter 17. For a detailed explanation of the Hilti Simplified Design Tables, refer to section 3.1.8 of Hilti Product Technical Guide Vol. 2 Ed. 17. Tables 7 to 11 are based on Canadian Limit State Design. Table 12 contains allowable loads for installations in Hollow Core Concrete Panels.



**Figure 1 – KWIK HUS-EZ 3/8" X 2 ½" I ½"**

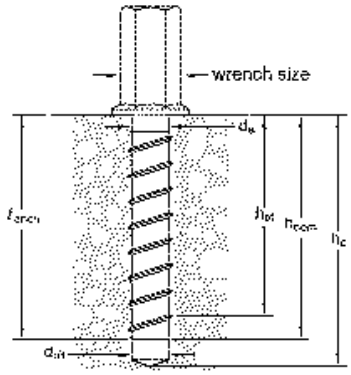



**Figure 2 – KWIK HUS-EZ anchor installation details**

**Table 1 – KWIK HUS EZ I installation specifications**

| Setting information | Symbol | Units | Nominal anchor diameter |
|---|---|---|---|
| | | | 3/8 |
| Nominal bit diameter | $d_{bit}$ | in. | 3/8 |
| Nominal embedment | $h_{nom}$ | in. | 2-1/8 |
| Effective embedment | $h_{ef}$ | in. | 1.54 |
| Minimum hole depth | $h_o$ | in. | 2-3/8 |
| Minimum Base Material Thickness | $h_{min}$ | in. | 3-5/8 |
| Installation torque | $T_{inst}$ | ft.-lb. | 40 |
| Wrench size | - | in. | 3/4 |
| Hilti impact setting tools | - | - | SID 4-A22/18-A and SIW 22/18-A |
| Insert diameter | - | in. | 1/2 |

**Table 2 - Hilti KWIK HUS-EZ I design strength with concrete / pullout failure in uncracked concrete [1,2,3,4]**

| Nominal anchor diameter in. | Nominal embed. depth in. (mm) | Tension - $\phi N_n$ | | | | Shear - $\phi V_n$ | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | $f'_c$ = 2500 psi (17.2 MPa) lb (kN) | $f'_c$ = 3000 psi (20.7 MPa) lb (kN) | $f'_c$ = 4000 psi (27.6 MPa) lb (kN) | $f'_c$ = 6000 psi (41.4 MPa) lb (kN) | $f'_c$ = 2500 psi (17.2 MPa) lb (kN) | $f'_c$ = 3000 psi (20.7 MPa) lb (kN) | $f'_c$ = 4000 psi (27.6 MPa) lb (kN) | $f'_c$ = 6000 psi (41.4 MPa) lb (kN) |
| 3/8 | 2-1/8 | 1,490 | 1,630 | 1,885 | 2,305 | 1,605 | 1,755 | 2,030 | 2,485 |
| | (54) | (6.6) | (7.3) | (8.4) | (10.3) | (7.1) | (7.8) | (9.0) | (11.1) |

**Table 3 - Hilti KWIK HUS-EZ I design strength with concrete / pullout failure in cracked concrete [1,2,3,4,5]**

| Nominal anchor diameter in. | Nominal embed. depth in. (mm) | Tension - $\phi N_n$ | | | | Shear - $\phi V_n$ | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | $f'_c$ = 2500 psi (17.2 MPa) lb (kN) | $f'_c$ = 3000 psi (20.7 MPa) lb (kN) | $f'_c$ = 4000 psi (27.6 MPa) lb (kN) | $f'_c$ = 6000 psi (41.4 MPa) lb (kN) | $f'_c$ = 2500 psi (17.2 MPa) lb (kN) | $f'_c$ = 3000 psi (20.7 MPa) lb (kN) | $f'_c$ = 4000 psi (27.6 MPa) lb (kN) | $f'_c$ = 6000 psi (41.4 MPa) lb (kN) |
| 3/8 | 2-1/8 | 1,055 | 1,155 | 1,335 | 1,635 | 1,135 | 1,245 | 1,435 | 1,760 |
| | (54) | (4.7) | (5.1) | (5.9) | (7.3) | (5.0) | (5.5) | (6.4) | (7.8) |

1 See Section 3.1.8.6 of Hilti Product Technical Guide Ed. 17 to convert design strength value to ASD value.
2 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
3 Tabulated values are for a single anchor with a minimum edge distance 2-3/4 inches and minimum spacing of 4-5/8 inches.
Compare table value to the steel value in Table 4. The lesser of the values is to be used for the design.
4 Tabular values are for normal weight concrete only. For lightweight concrete multiply design strength by $\lambda_a$ as follows:
For sand-lightweight, $\lambda_a$ = 0.68. For all-lightweight, $\lambda_a$ = 0.60.
5 Tabular values are for static loads only. For seismic tension loads, multiply cracked concrete tabular values by $\alpha_{N,seis}$ = 0.75:
No reduction needed for seismic shear. See Section 3.1.8.7 of Hilti Product Technical Guide Ed 17 for additional information on seismic applications.

**Table 4 - Steel design strength for Hilti KWIK HUS-EZ I anchors [1,2,6]**

| Nominal anchor diameter in. | Nominal internal thread diameter in. | Tensile [3] $\phi N_{sa}$ lb (kN) | Shear [4] $\phi V_{sa}$ lb (kN) | Seismic Shear [5] $\phi V_{sa}$ lb (kN) |
|---|---|---|---|---|
| 3/8 | 1/2-13 UNC | 5,990 (26.6) | 1,130 (5.0) | 1,130 (5.0) |

1 See Section 3.1.8.6 of Hilti Product Technical Guide Ed. 17 to convert design strength value to ASD value.
2 Hilti KWIK HUS-EZ I anchors are to be considered brittle steel elements.
3 Tensile $\phi N_{sa} = \phi A_{se,N} f_{uta}$ as noted in ACI 318-14 Ch. 17.
4 Shear values determined by static shear tests with $\phi V_{sa} < \phi\ 0.60\ A_{se,V} f_{uta}$ as noted in ACI 318-14 Ch. 17.
5 Seismic shear values determined by seismic shear tests with $\phi V_{sa} \leq \phi\ 0.60\ A_{se,V} f_{uta}$ as noted in ACI 318-14 Ch. 17.
See Section 3.1.8.7 of Hilti Product Technical Guide Ed 17 for additional information on seismic applications.
6 Values are for threaded rod or insert with $F_u \geq 125$ ksi. For use with inserts with Fu less than 125 ksi multiply the shear values by the ratio of Fu of insert and 125 ksi.

**Table 5 - Hilti KWIK HUS-EZ I in the soffit of uncracked lightweight concrete over metal deck [1,2,3,4,5,6]**

| Nominal anchor diameter in. | Nominal internal thread diameter in. | Nominal embed. depth in. (mm) | Installation in lower flute | | | | Installation in upper flute | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Tension - $\phi N_n$ | | Shear - $\phi V_n$ | | Tension - $\phi N_n$ | | Shear - $\phi V_n$ | |
| | | | $f'_c$ = 3000 psi (20.7 MPa) lb (kN) | $f'_c$ = 4000 psi (27.6 MPa) lb (kN) | $f'_c$ = 3000 psi (20.7 MPa) lb (kN) | $f'_c$ = 4000 psi (27.6 MPa) lb (kN) | $f'_c$ = 3000 psi (20.7 MPa) lb (kN) | $f'_c$ = 4000 psi (27.6 MPa) lb (kN) | $f'_c$ = 3000 psi (20.7 MPa) lb (kN) | $f'_c$ = 4000 psi (27.6 MPa) lb (kN) |
| 3/8 | 1/2-13 UNC | 2-1/8 (54) | 1,225 (5.4) | 1,415 (6.3) | 1,565 (7.0) | 1,565 (7.0) | 1,895 (8.4) | 2,190 (9.7) | 2,400 (10.7) | 2,400 (10.7) |

**Table 6 - Hilti KWIK HUS-EZ I in the soffit of cracked lightweight concrete over metal deck [1,2,3,4,5,6]**

| Nominal anchor diameter in. | Nominal internal thread diameter in. | Nominal embed. depth in. (mm) | Installation in lower flute | | | | Installation in upper flute | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Tension - $\phi N_n$ [7] | | Shear - $\phi V_n$ [7,8] | | Tension - $\phi N_n$ [7] | | Shear - $\phi V_n$ [7,8] | |
| | | | $f'_c$ = 3000 psi (20.7 MPa) lb (kN) | $f'_c$ = 4000 psi (27.6 MPa) lb (kN) | $f'_c$ = 3000 psi (20.7 MPa) lb (kN) | $f'_c$ = 4000 psi (27.6 MPa) lb (kN) | $f'_c$ = 3000 psi (20.7 MPa) lb (kN) | $f'_c$ = 4000 psi (27.6 MPa) lb (kN) | $f'_c$ = 3000 psi (20.7 MPa) lb (kN) | $f'_c$ = 4000 psi (27.6 MPa) lb (kN) |
| 3/8 | 1/2-13 UNC | 2-1/8 (54) | 855 (3.8) | 985 (4.4) | 1,565 (7.0) | 1,565 (7.0) | 1,325 (5.9) | 1,530 (6.8) | 2400 (10.7) | 2,400 (10.7) |

1 See Section 3.1.8.6 of Hilti Product Technical Guide Ed. 17 to convert design strength value to ASD value.

2 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.

3 Tabular value is for one anchor per flute. Minimum spacing along the length of the flute is 6-3/8 inches.

4 Tabular values are lightweight concrete and no additional reduction factor is needed.

5 No additional reduction factors for spacing or edge distance need to be applied.

6 Comparison of the tabular values to the steel strength is not necessary. Tabular values control.

7 Tabular values are for static loads only. For seismic conditions $\alpha_{N,seis}$ = 0.75.

8 For seismic shear, an additional factor must be applied to the cracked concrete tabular values for seismic conditions: $\alpha_{V,seis}$, = 0.85
See Section 3.1.8.6 of Hilti Product Technical Guide Ed. 17 for additional information on seismic applications.

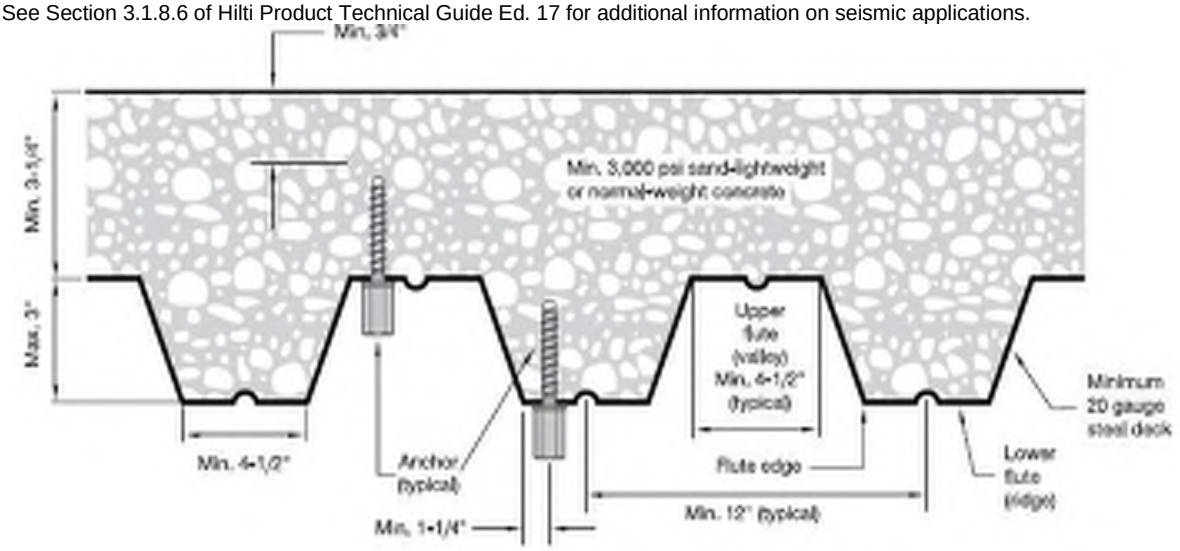



**Figure 3 – Installations of KWIK HUS EZ I (KH-EZ I) in soffit of concrete over metal deck assemblies**

## Canadian Limit State Design

Limit State Design of anchors is described in the provisions of CSA A23.3-14 Annex D for post -installed anchors tested and assessed in accordance with ACI 355.2 for mechanical anchors and ACI 355.4 for adhesive anchors. Tables 7 to 11 of this section contains the Limit State Design tables with factored characteristic loads that are based on the loads that are expected to be published in ESR-3027. The factored resistance tables have characteristic design loads that are pre-factored by the applicable reduction factors for a single anchor with no anchor-to-anchor spacing or edge distance adjustments for the convenience of the user of this document. All the figures in the previous ACI 318-14 Chapter 17 design section are applicable to Limit State Design and the tables will reference these figures.

For a detailed explanation of the tables developed in accordance with CSA A23.3-14 Annex D, refer to Section 3.1.8 of the Hilti Product Technical Guide Ed. 17.

**Table 7 - Hilti KWIK HUS-EZ I carbon steel screw anchor factored resistance with concrete / pullout failure in uncracked concrete [1,2,3,4,5]**

| Nominal anchor diameter in. | Nominal anchor diameter in. | Nominal embed. in. (mm) | Tension - $N_r$ | | | | Shear - $V_r$ | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | $f'_c$ = 20 MPa (2,900 psi) lb (kN) | $f'_c$ = 25 MPa (3,625 psi) lb (kN) | $f'_c$ = 30 MPa (4,350 psi) lb (kN) | $f'_c$ = 40 MPa (5,800 psi) lb (kN) | $f'_c$ = 20 MPa (2,900 psi) lb (kN) | $f'_c$ = 25 MPa (3,625 psi) lb (kN) | $f'_c$ = 30 MPa (4,350 psi) lb (kN) | $f'_c$ = 40 MPa (5,800 psi) lb (kN) |
| 3/8 | 3/8 (9.5) | 2-1/8 (54) | 1,595 (7.1) | 1,785 (7.9) | 1,955 (8.7) | 2,260 (10.0) | 1,595 (7.1) | 1,785 (7.9) | 1,955 (8.7) | 2,260 (10.0) |

**Table 8 - Hilti KWIK HUS-EZ I carbon steel screw anchor factored resistance with concrete / pullout failure in cracked concrete [1,2,3,4,5]**

| Nominal anchor diameter in. | Nominal anchor diameter in. | Nominal embed. in. (mm) | Tension - $N_r$ | | | | Shear - $V_r$ | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | $f'_c$ = 20 MPa (2,900 psi) lb (kN) | $f'_c$ = 25 MPa (3,625 psi) lb (kN) | $f'_c$ = 30 MPa (4,350 psi) lb (kN) | $f'_c$ = 40 MPa (5,800 psi) lb (kN) | $f'_c$ = 20 MPa (2,900 psi) lb (kN) | $f'_c$ = 25 MPa (3,625 psi) lb (kN) | $f'_c$ = 30 MPa (4,350 psi) lb (kN) | $f'_c$ = 40 MPa (5,800 psi) lb (kN) |
| 3/8 | 3/8 (9.5) | 2-1/8 (54) | 1,120 (5.0) | 1,250 (5.6) | 1,370 (6.1) | 1,580 (7.0) | 1,120 (5.0) | 1,250 (5.6) | 1,370 (6.1) | 1,580 (7.0) |

1 See Section 3.1.8.6 of Hilti Product Technical Guide Ed 17 to convert design strength value to ASD value.

2 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.

3 Tabulated values are for a single anchor with a minimum edge distance of 70mm (2-3/4 inches) and minimum spacing of 117mm (4-5/8 inches). Compare table value to the steel value in Table 9. The lesser of the values is to be used for the design.

4 Tabular values are for normal weight concrete only. For lightweight concrete multiply design strength by $\lambda_a$ as follows: For sand-lightweight, $\lambda_a$ = 0.68. For all-lightweight, $\lambda_a$ = 0.60.

5 Tabular values are for static loads only. For seismic tension loads, multiply cracked concrete tabular values by $\alpha_{N,seis}$ = 0.75: No reduction needed for seismic shear. See Section 3.1.8.7 of Hilti Product Technical Guide Ed 17 for additional information on seismic applications.

**Table 9 - Steel resistance for Hilti KWIK HUS-EZ I carbon steel screw anchor [1,2,6]**

| Nominal anchor diameter in. | Internal thread diameter (UNC) | Tensile[3] $N_{sar}$ lb (kN) | Shear[4] $V_{sar}$ lb (kN) | Seismic Shear[5] $V_{sar,eq}$ lb (kN) |
|---|---|---|---|---|
| 3/8 | 1/2-13 UNC | 5,515 (24.5) | 1,040 (4.6) | 1,040 (4.6) |

1 See Section 3.1.8.6 of Hilti Product Technical Guide Ed 17 to convert factored resistance value to ASD value.

2 Hilti KWIK HUS-EZ I carbon steel screw anchors are to be considered brittle steel elements.

3 Tensile $N_{sar} = A_{se,N}\ \phi_s\ f_{uta}$ R as noted in CSA A23.3-14 Annex D.

4 Shear determined by static shear tests with $V_{sar} < 0.6\ A_{se,V}\ \phi_s\ f_{uta}$ R as noted in CSA A23.3-14 Annex D.

5 Seismic shear values determined by seismic shear tests with $V_{sar,eq} \leq 0.60\ A_{se,V}\ \phi_s\ f_{uta}$ R as noted in CSA A23.3-14 Annex D.
See Section 3.1.8.7 of Hilti Product Technical Guide Ed17 for additional information on seismic applications.

6 Values are for threaded rod or insert with $F_u \geq 125$ ksi. For use with inserts with Fu less than 125 ksi multiply the shear values by the ratio of Fu of insert and 125 ksi.

**Table 10 - Hilti KWIK HUS-EZ I in the soffit of uncracked lightweight concrete over metal deck [1,2,3,4,5,6]**

| Nominal anchor diameter in. | Nominal internal thread diameter in. | Nominal embed. depth in. (mm) | Installation in lower flute | | | | Installation in upper flute | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Tension - $N_r$ | | Shear - $V_r$ | | Tension - $N_r$ | | Shear - $V_r$ | |
| | | | $f'_c$ = 20 MPa (2,900 psi) lb (kN) | $f'_c$ = 30 MPa (4,350 psi) lb (kN) | $f'_c$ = 20 MPa (2,900 psi) lb (kN) | $f'_c$ = 30 MPa (4,350 psi) lb (kN) | $f'_c$ = 20 MPa (2,900 psi) lb (kN) | $f'_c$ = 30 MPa (4,350 psi) lb (kN) | $f'_c$ = 20 MPa (2,900 psi) lb (kN) | $f'_c$ = 30 MPa (4,350 psi) lb (kN) |
| 3/8 | 1/2-13 UNC | 2-1/8 (54) | 1,205 (5.4) | 1,475 (6.6) | 1,440 (6.4) | 1,440 (6.4) | 1,865 (8.3) | 2,280 (10.1) | 2,210 (9.8) | 2,210 (9.8) |

**Table 11 - Hilti KWIK HUS-EZ I in the soffit of cracked lightweight concrete over metal deck [1,2,3,4,5,6]**

| Nominal anchor diameter in. | Nominal internal thread diameter in. | Nominal embed. depth in. (mm) | Installation in lower flute | | | | Installation in upper flute | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Tension - $N_r$ | | Shear - $V_r$ | | Tension - $N_r$ | | Shear - $V_r$ | |
| | | | $f'_c$ = 20 MPa (2,900 psi) lb (kN) | $f'_c$ = 30 MPa (4,350 psi) lb (kN) | $f'_c$ = 20 MPa (2,900 psi) lb (kN) | $f'_c$ = 30 MPa (4,350 psi) lb (kN) | $f'_c$ = 20 MPa (2,900 psi) lb (kN) | $f'_c$ = 30 MPa (4,350 psi) lb (kN) | $f'_c$ = 20 MPa (2,900 psi) lb (kN) | $f'_c$ = 30 MPa (4,350 psi) lb (kN) |
| 3/8 | 1/2-13 UNC | 2-1/8 (54) | 845 (3.8) | 1,030 (4.6) | 1,440 (6.4) | 1,440 (6.4) | 1,305 (5.8) | 1,595 (7.1) | 2,210 (9.8) | 2,210 (9.8) |

1 See Section 3.1.9.4 of Hilti Product Technical Guide Ed 17 to convert design strength value to ASD value.

2 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.

3 Tabular value is for one anchor per flute across the flute. Minimum spacing along the length of the flute is the greater of 1.5 X flute width or 4 5/8 inches.

4 Tabular value is for lightweight concrete and no additional reduction factor is needed.

5 No additional reduction factors for spacing or edge distance need to be applied.

6 Comparison of the tabular values to the steel strength is not necessary. Tabular values control.

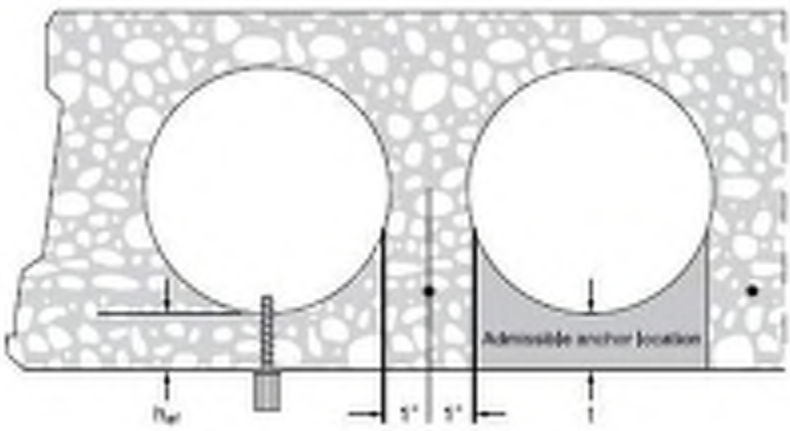
7 Tabular values are for static loads only. For seismic conditions $\alpha_{N,seis} = 0.75$

8 For seismic shear, an additional factor must be applied to the cracked concrete tabular values for seismic conditions: $\alpha_{v,seis}$, = 0.85
See Section 3.1.8.6 of Hilti Product Technical Guide Ed. 17 for additional information on seismic applications.

**Table 12 - Hilti KWIK HUS-EZ I allowable stress tension design values for installation into hollow core concrete panels[1,2]**

| Hanger rod size | Minimum effective embedment $h_{ef}$ in. | Allowable Tension Load[3] lb. | Ultimate Tension Load lb. |
|---|---|---|---|
| 1/2-13 UNC | 1-1/8 | 435 | 1750 |

**Figure 4 – Installation of KWIK HUS-EZ I (KH-EZ I) in hollow core concrete panels**




1 The admissible anchor location must be established to prevent damage to the prestressed cable during the drilling process. Verify the location and height of the cable with the hollow core plank supplier to confirm admissible anchor location.
2 Minimum compressive strength of prestressed concrete is 7,000 psi. Published ultimate loads represent the average results conducted in local base materials. Due to variations in materials and dimensional configurations, on-site testing is required to determine the actual performance.
3 Allowable loads calculated with a factor of safety of 4

Please feel free to contact our Engineering Technical Services department for more information or any questions.

Hilti Engineering Technical Services – United States
(877) 749-6337 toll free
hnatechnicalservices@hilti.com

Hilti Engineering Technical Services – Canada
(800) 363-4458 toll free
CATechnicalServices@hilti.com

# MISC. EQUIPMENT

# AG-18500/25000

ECS Advanced**IQ** Nitrogen Generator

Engineered Corrosion Solutions




## Features

ECS Advanced**IQ** Nitrogen Generator (U.S. Patents 8,720,591, 9,144,700 and 9,186,533)

- Interactive LCD touchscreen display
- Electronic bypass with alarm indication and sleep mode
- Programmable audible alarm
- Optional remote monitoring and email alerts

Isolation ball valve included

Up to 25,000 gallons of total sprinkler system capacity

No nitrogen storage tank

Contains cULus Listed Open Type Industrial Control Panel

Meets Canadian Standard CSA C22.2 No. 14-13

FM APPROVED CE

## General Description

The ECS Advanced**IQ** Stand Alone Nitrogen Generator is designed to facilitate the Dry Pipe Nitrogen Inerting (DPNI) process for controlling oxygen corrosion in dry pipe and preaction fire sprinkler systems. The nitrogen generator utilizes membrane separation technology that produces 98%+ nitrogen gas. The nitrogen generator can be used in cold storage/freezer applications due to the added benefit of ice plug mitigation. Cold storage application requirements vary based on the temperature of refrigerated space, contact ECS for design assistance.

The Advanced**IQ** HMI display screen allows for easy operation and complete control of the nitrogen generator as well as the ability to communicate with the nitrogen generator from anywhere in the world. Access to nitrogen generator operation, maintenance, diagnostics and stored historical data is easily obtained through the HMI screen on the nitrogen generator or remotely through the internet.

The nitrogen generator supplies single or multiple sprinkler systems depending on the number of systems, the volume of the largest system, and the cumulative volume of all systems being supplied. The generator includes an external bypass valve for maintenance or “fast fill” needs to meet the NFPA 13 30-minute fill requirement.

The nitrogen generator is designed to inert the supervised sprinkler systems within 14 days and then automatically provide nitrogen gas for pressure maintenance. When paired with either the Standard Vent (PAV-D/DQ) or the SMART Vent (PSV-D/DE) installed on the sprinkler riser, the nitrogen generator facilitates our patented “fill and purge” breathing process to remove all the corrosive oxygen gas in the sprinkler systems without the need for a nitrogen storage tank.

## Maintenance

Nitrogen generators require limited maintenance; however, it is advisable to routinely check the generator to ensure functionality. Improper maintenance can potentially damage/shorten the service life of the nitrogen generator and/or air compressor. See owner’s manual for required maintenance procedures.

## Specifications

| | |
|---|---|
| **Cabinet Dimensions** | 28.5” (W) x 52.5” (H) x 13.5” (D) |
| **Weight** | 250 Lbs |
| **Power Supply Available In (dedicated circuit)** | 120-240VAC/1 phase/50-60Hz |
| **Power Consumption** | 1 Amp (cabinet only) |
| **Nitrogen/Air Connection** | ½” NPT Female |
| **Drain Connection** | ¼” NPT Female |
| **Temperature Range** | 40˚F - 105˚F (5˚C - 40˚C) |
| **Replacement Filters** | FKSA-FS (annual maintenance) |

## Operating Performance

| **Model Number** | AG-18500 | AG-25000 |
|---|---|---|
| **Total System Capacity Gallons (Liters)** | 18,500 (70,030) | 25,000 (94,635) |
| **Single System Capacity† @ 40 psig (2.8 bar) Gallons (Liters)** | 2,025 (7,666)†† | 2,900 (10,978)†† |
| **Single System Capacity† @ 20 psig (1.4 bar) Gallons (Liters)** | 4,050 (15,331)†† | 5,800 (21,955)†† |

† Capacity based on NFPA 13 30-minute fill requirement of largest single system
†† Capacity based on using 7.5hp air compressor provided by ECS

## Installation

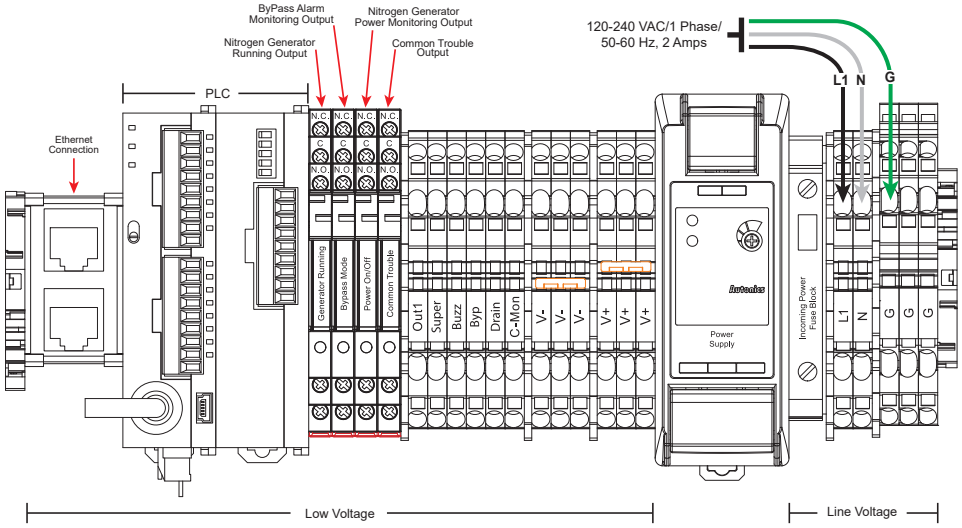
The ECS Nitrogen Generator is designed to be mounted directly to the floor and/or to the wall at the installation location. Allow access to the front of the cabinet for service and place the unit in a location that is located near fire sprinkler system connections, a drain, and a dedicated electrical connection. Allow for clearance around vents on side and bottom for proper cabinet ventilation. Install included isolation ball valve on the outlet of the cabinet. For detailed installation and operation please refer to the ECS Advanced**IQ** Nitrogen Generator Manual.

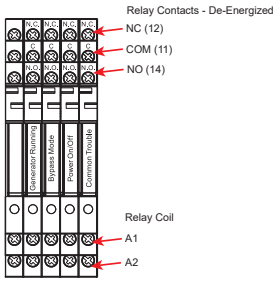
# AG-18500/25000

ECS Advanced**IQ** Nitrogen Generator

Engineered Corrosion Solutions

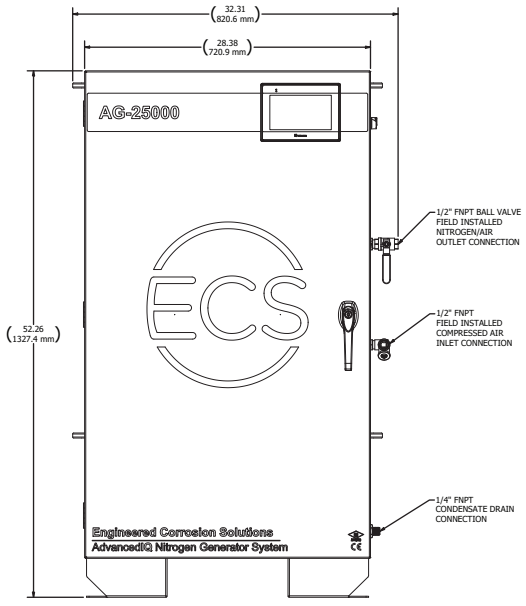
## Wiring Diagrams

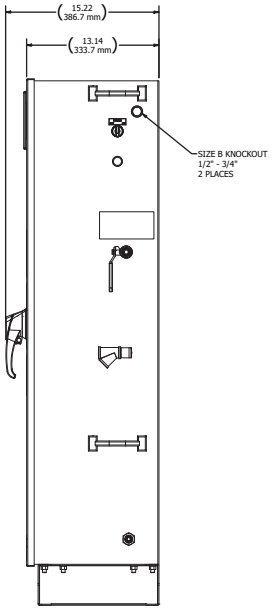


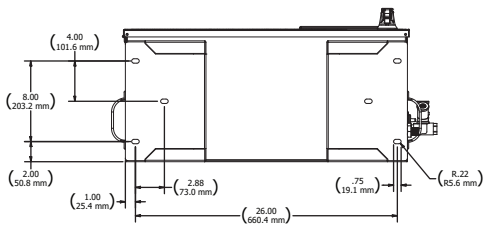




| Description | Normally Open Contact Connections (Building Alarm System) | | | Normally Closed Contact Connection (Building Management System) | | |
|---|---|---|---|---|---|---|
| | Relay | LED | Connections | Relay | LED | Connections |
| Nitrogen Generator Running Output (Running) | Energized | ON | 11 & 14 | Energized | ON | 11 & 12 |
| Bypass Alarm Monitoring Output | De-Energized | OFF | 11 & 14 | De-Energized | OFF | 11 & 12 |
| Nitrogen Generator Power Monitoring Output | Energized | ON | 11 & 12 | Energized | ON | 11 & 14 |
| Common Trouble Monitoring Output | De-Energized | OFF | 11 & 14 | De-Energized | OFF | 11 & 12 |

## Cabinet Dimensions



# PHGA-1

ECS Protector Handheld Gas Analyzer



For use under U.S. Patents
9,144,700 and 9,186,533

- One touch calibration
- Small, convenient, and portable
- 24 month warranty
- Compatible with all ECS products

## Specifications

| | |
|---|---|
| **Sensor Type:** | Galvanic Cell w/ temperature compensation |
| **Measured Range:** | 0.0% to 99.9% nitrogen |
| **Response Time:** | <15 seconds for 90% step change |
| **Accuracy:** | ±1.0% of full scale at constant operating temperature, relative humidity and pressure |
| **Temperature:** | Operating: 59°F - 104°F (15°C - 40°C)<br>Storage: 5°F - 122°F (-15°C - 50°C) |
| **Operating Pressure:** | Atmospheric pressure to 3 psig |
| **Sample Connection:** | ECS compatible brass quick connect |
| **Expected Life:** | 2 years |
| **Expected Storage Life:** | 2 months; special seal on sensor |
| **Battery Life:** | Approximately 1850 hours |
| **Power:** | Internal, non-replaceable, Lithium battery |
| **Auto-Off:** | 80 second time-out |
| **Environmental:** | Housing equivalent to NEMA 1; not waterproof |
| **Weight:** | 2.1 oz (60 grams) |

## Ordering information

**Stock Number:** PHGA-1

## General Description

The ECS Protector Handheld Gas Analyzer (PHGA-1) provides the concentration of nitrogen gas when connected to an ECS product with a gas sample port. The handheld analyzer can be used to verify nitrogen concentration inside a fire sprinkler system or at the outlet of an ECS Nitrogen Generator System. The ECS Protector Handheld Gas Analyzer provides the end user with a simple, cost effective method of gas concentration monitoring.

# AVC-1

ECS AdvancedIQ Vent Controller

Engineered Corrosion Solutions




## Specifications

| | |
|---|---|
| **Stock Number:** | AVC-1 |
| **Dimensions:** | 12" (W) x 14" (H) x 8" (D) |
| | 305mm (W) x 356mm (H) x 203mm (D) |
| **Temperature Range:** | 40°F - 105°F (5°C - 40°C) |
| **Power Supply:** | 120-240VAC, 50-60Hz/.5A |
| **Sensing Inputs:** | Six (6) |
| **Sensor Type :** | Zirconium Dioxide |
| **Signal Output:** | Common Trouble |
| **Output Display:** | Full Function LCD |
| **Resolution:** | 1dp (nn.n%) |
| **Accuracy:** | 1% |
| **Sample Connection:** | 5/32" plastic tubing quick connect |

## General Description

The ECS Advanced**IQ** Vent Controller provides automatic oxygen venting and a continuous real-time monitoring of nitrogen/oxygen concentration levels within each dry/preaction fire sprinkler system. As a fire sprinkler system is filled with a continuous supply of nitrogen gas from the ECS Protector Nitrogen Generator System, the ECS Protector Vent, installed on the sprinkler system riser, allows oxygen rich gas to be vented from the fire sprinkler system. The ECS AVC-1 samples the discharge gas from each ECS Protector Vent connected to the controller. Over a fourteen (14) day period, the ECS Protector Vent will dilute the oxygen concentration in the fire sprinkler system to <2% oxygen. The gas flows out of the restricted orifice on the vent through pressure-rated tubing to provide slow controlled flow to the Advanced**IQ** Controller. Once the desired system gas composition is reached the controller will automatically close and stop the venting process thereby preventing continuous venting. One AVC-1 Controller is capable of individually controlling and monitoring six (6) ECS Protector Vents on six (6) separate fire sprinkler systems.

The AVC-1 is equipped with a programmable logic controller (PLC) LCD display to monitor and control the venting process as well as continuous monitoring of the nitrogen purity levels in the sprinkler systems. The AVC-1 includes a history log for reviewing data compiled from the sprinkler systems as well as the ability to remove the historical information for permanent storage.

### The ECS Advanced**IQ** Controller includes the following functions:

- Individual pressure & purity monitoring for up to 6 zones
- Datalogging & historical trends for each zone
- Leak rate checks for each zone
- Quick purity check for each zone
- Quick pressure check for each zone
- Removeable datalog (flash drive)
- Form C dry contact supervisory

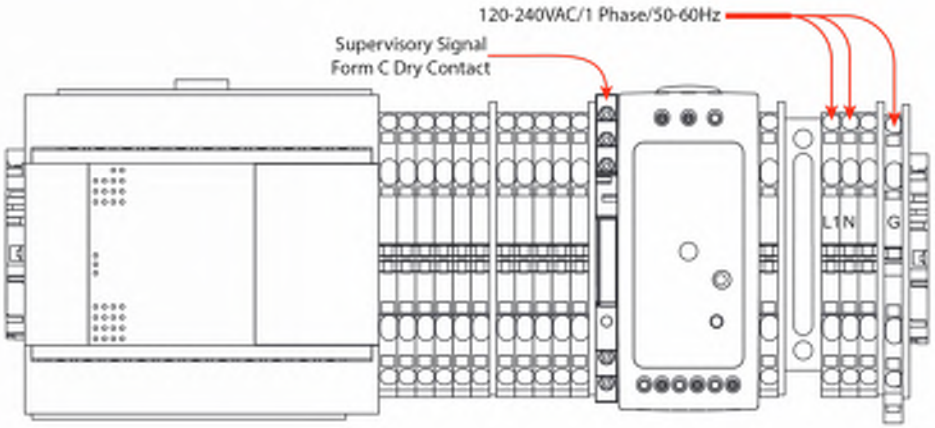
# AVC-1

ECS AdvancedIQ Vent Controller

Engineered Corrosion Solutions

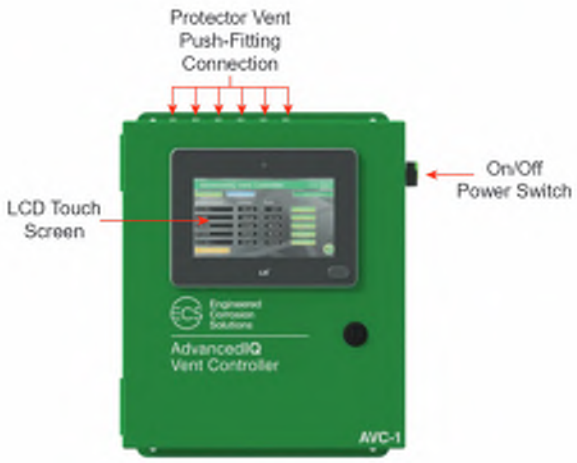
## Installation Instructions

1. Mount the ECS AdvancedIQ Controller on a wall in the sprinkler riser room adjacent to the ECS Protector Vents installed on the sprinkler system riser (not included).
2. Remove the muffler from the restricted orifice on the Protector Vent and install a 5/32" push-connect fitting.
3. Connect the 5/32" tubing to the push-connect fitting on the Protector Vent.
4. Connect the opposite end of the 5/32" tubing to the appropriate push-connect fitting on the top of the AVC-1.
5. Repeat steps 2, 3, and 4 for each additional ECS Protector Vent connected to the AVC-1.
6. With the incoming power off, connect the incoming 120-240VAC/50-60Hz power supply to terminal block connects L1, N (Neutral), and G (Ground).
7. If AVC-1 is remotely monitored, connect the monitoring connection from building monitoring system to the Supervisory Signal Form-C (Common (C) and Normally Open (N.O.) or Normally Closed (N.C.)) contacts.

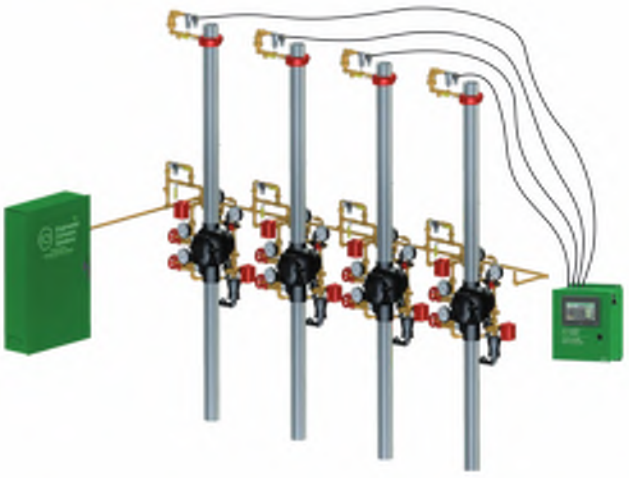



## Operating Instructions

1. Turn on/off power switch to "On" position and allow AVC-1 to initialize.
2. Depress the "Vent" button on the LCD display to initiate the fourteen (14) day dry pipe nitrogen inerting (DPNI) venting process to all vents connected to the controller.
    a. The DPNI venting process can be initiated on an individual system basis, if desired.




ECS Nitrogen Generator with AdvancedIQ Controller:
(typical installation schematic)



PERMIT #2026 2513934 - CM 04 | RSN:1975523

# PAV-D/DQ

ECS Protector Vent

Engineered Corrosion Solutions



## Features

ECS Protector Vent (U.S. Patents 8,720,591, 9,144,700, 9,186,533 and 9,610,466)

- Float Valve - Prevent water discharge if system trips
- Backpressure Regulator - Prevent total system depressurization
- Quick Connect - Easy installation and maintenance
- Isolation Ball Valve Included

## General Description

The ECS Protector Vent (PAV-D/DQ) provides oxygen venting in dry pipe fire sprinkler systems. As a fire sprinkler system is filled with a continuous supply of nitrogen gas from the ECS Advanced**IQ** Nitrogen Generator System, the PAV-D/DQ allows oxygen rich gas to be vented from the fire sprinkler system. Over a short period of time (typically less than 14 days) the ECS Protector Vent will almost completely remove oxygen from the fire sprinkler system (<2% oxygen).

The ECS Protector Vent is equipped with a levered float valve that prevents water from passing through the restricted venting orifice when water enters the fire sprinkler system. The in-line filter protects the restricted venting orifice from contaminants from the sprinkler system. A backpressure regulator is included to prevent total system depressurization from the vent assembly during the venting process. The restricted venting orifice allows oxygen to be vented from the fire sprinkler system at a controlled rate to achieve a minimum nitrogen concentration of 98%.

## Maintenance

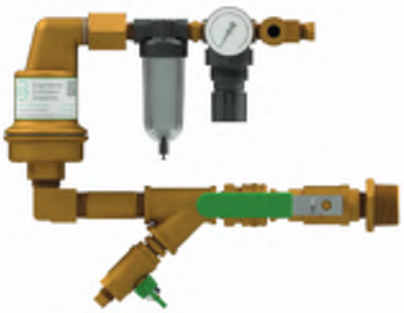
ECS Protector Vents require limited maintenance. ECS recommends inspecting and cleaning Y-Strainer and filter annually, replace as necessary. See owner's manual for required maintence procedures.

## Specifications

| | |
|---|---|
| **Dimensions** | 13.5" (W) x 7.5" (H) x 4.25" (D) |
| **Weight** | 7 Lbs |
| **Service Pressure** | Up to 175 PSIG (12 Bar) |
| **System Connection** | 1" NPT Male |
| **Temperature Range** | 40˚F - 125˚F (5˚C - 51˚C) |

## Installation

The ECS Protector Vent is to be installed as shown on the engineering design documents. If a location is not specified install the PAV-D/DQ vent on the fire sprinkler system riser on the system side of the main control valve. The PAV-D vent can be used to provide source gas for the ECS Protector SMART Gas Analyzer (SGA-1). The PAV-DQ includes the special 5/32" tubing fitting for use with the ECS Advanced**IQ** Vent Controller. For detailed installation and operation please refer to the ECS Advanced**IQ** Nitrogen Generator Manual or PAV-D/DQ installation sheet.



PAV-D



PAV-DQ

Rev 5



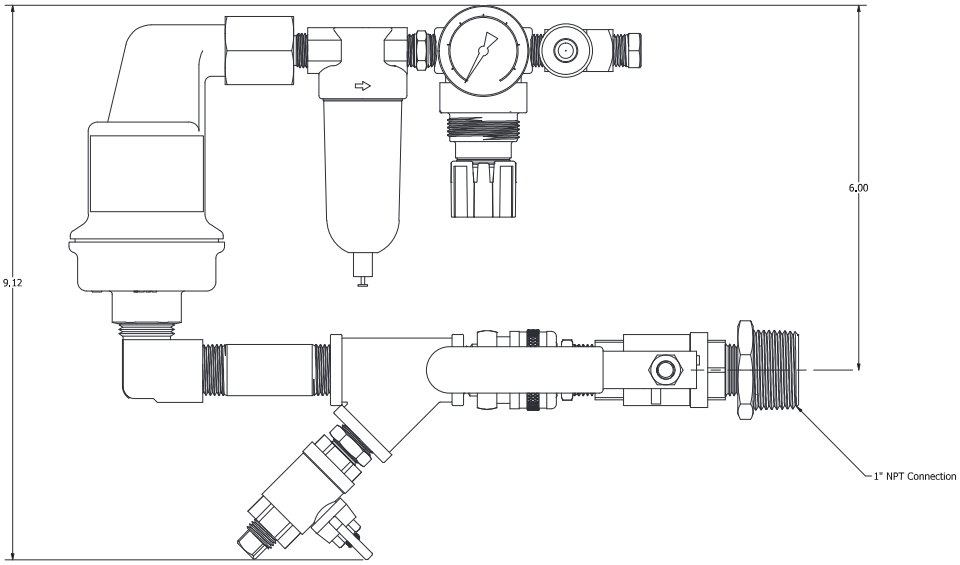
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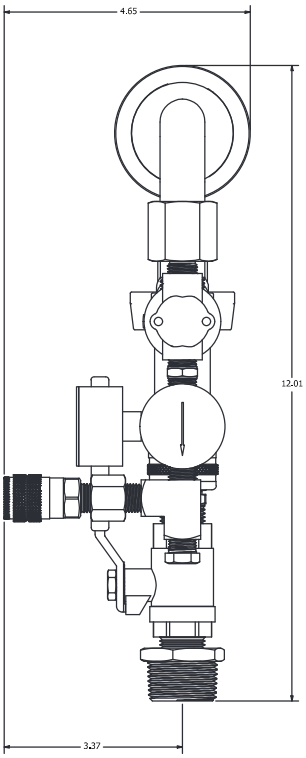
# PAV-D/DQ

ECS Protector Vent

Engineered Corrosion Solutions

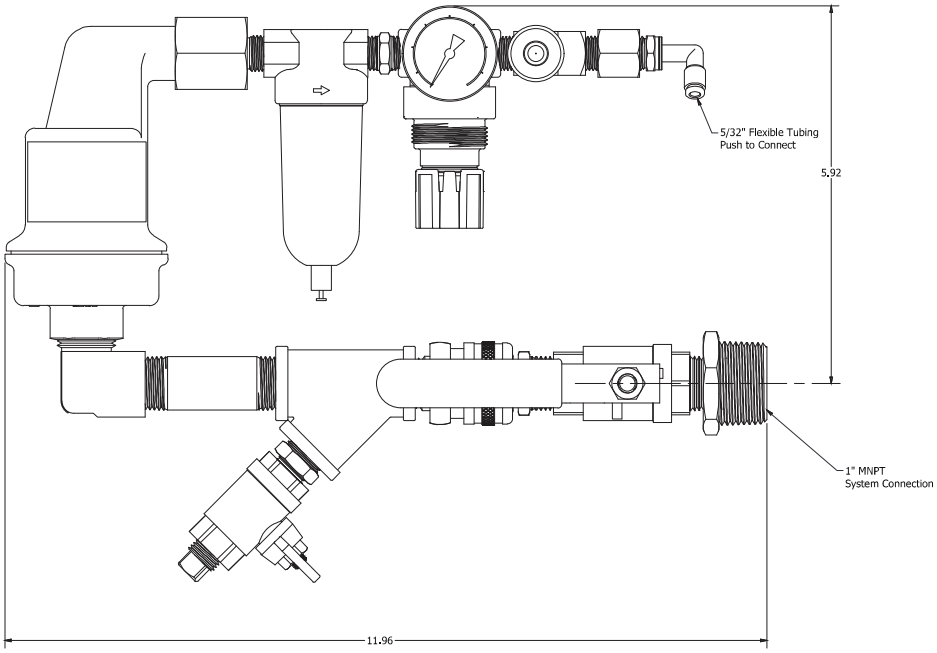
## PAV-D

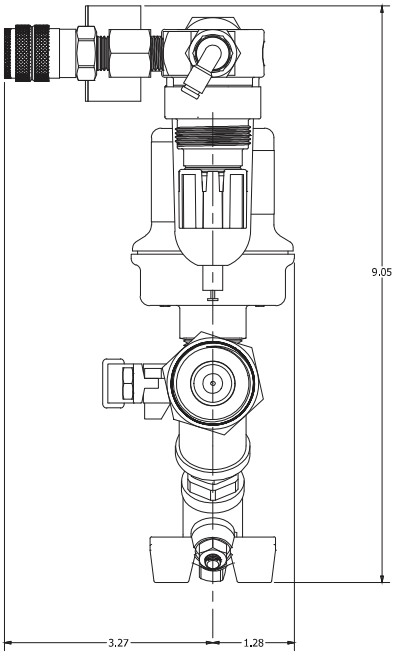



## PAV-DQ

*For use with Advanced**IQ** Vent Controller*

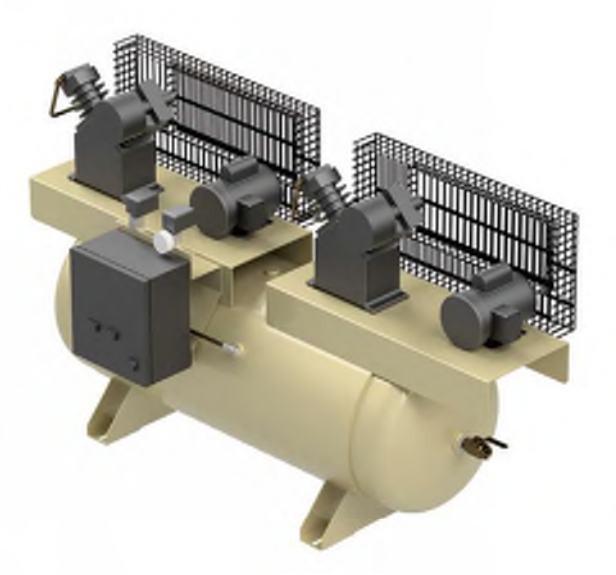


# COMP-5/7.5/10-2

ECS Air Compressor

Engineered Corrosion Solutions



## Features

Aftercooler included

Low Oil Level Sensor - Automatically shuts down compressor

1" NPT Female Outlet

Automatic condensate drain – ¼" NPT Female

## Warranty Requirements

Vibration Pads (Supplied) - must be installed (one (1) vibration pad) under each foot of the air receiver tank.

Braided Hose (Supplied) - must be installed in-line and directly to the isolation valve on the air supply outlet of the air receiver tank.

## General Description

The ECS Air Compressors are paired with the ECS Protector Nitrogen Generators in facilitating the **Dry Pipe Nitrogen Inerting (DPNI)** process in dry pipe and preaction fire sprinkler systems. COMP-5/7.5/10-2 when paired with the AG-18500/22500 nitrogen generators can be used as a plant nitrogen source in facilitating the **Wet Pipe Nitrogen Inerting (WPNI)** process in wet pipe sprinkler systems.

## Specifications

| | |
|---|---|
| **Cabinet Dimensions**<br>**COMP-5/7.5-2**<br>**COMP-10-2** | <br>84.2" (L) x 34.6" (W) x 48.2" (H)<br>87.5" (L) x 35.8" (W) x 51.5" (H) |
| **Weight** | COMP-5-2 (1,265 Lbs)<br>COMP-7.5-2 (1,315 Lbs)<br>COMP-10-2 (1,545 Lbs) |
| **Horsepower** | COMP-5-2 (5 HP)<br>COMP-7.5-2 (7.5 HP)<br>COMP-10-2 (10 HP) |
| **Power Supply Compressor** | *Requires two (2) dedicated circuits<br>480VAC/3 phase/60Hz (Standard)<br>208VAC/3 phase/60Hz (Optional) |
| **Power Supply Auto Drain** | 120VAC/1 phase/60Hz (can be connected to the nitrogen generator cabinet power supply) |
| **Air Connection** | COMP-5/7.5/10-2 (1" NPT Female) |
| **Drain Connection** | ¼" NPT Female |
| **Temperature Range** | 40˚F - 105˚F (5˚C - 40˚C) |

## Operating Performance

| **Model Number** | COMP-5-2 | COMP-7.5-2 | COMP-10-2 |
|---|---|---|---|
| **Air Supply SCFM (L/min)** | 34 (962) | 48 (1,360) | 70 (1,984) |
| **Single System Capacity† @ 40 psig (2.8 bar) Gal. (L)** | 2,880 (10,902) | 4,500 (17,034) | 6,000 (22,713) |
| **Single System Capacity† @ 20 psig (1.4 bar) Gal. (L)** | 5,760 (21,804) | 9,000 (34,068) | 12,000 (45,426) |

† Capacity based on NFPA 13 30-minute fill requirement of largest single system

## Power Requirements

| **Model Number** | COMP-5-2 | COMP-7.5-2 | COMP-10-2 |
|---|---|---|---|
| **208VAC/3 Ph** | 17.5 Amps | 25.3 Amps | 32.2 Amps |
| **480VAC/3 Ph** | 7.6 Amps | 11 Amps | 14 Amps |

## Installation

The air compressors are designed to be mounted directly to the floor in the fire sprinkler riser room. Vibration pads (supplied) must be installed under the feet of the air compressor to ensure warranty of the air compressor. Allow access to the power supply (two (2) dedicated circuits), access to the nitrogen generator inlet ½" supply line and access to a drain for the condensate discharge line. Allow for clearance to access air compressor for servicing. For detailed installation and operation please refer to the ECS Advanced**IQ** Nitrogen Generator Manual.

## Maintenance

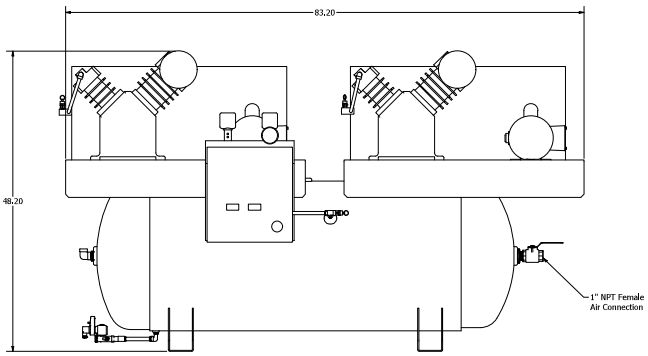
Please refer to manufacturer owners manual for recommended maintenance.

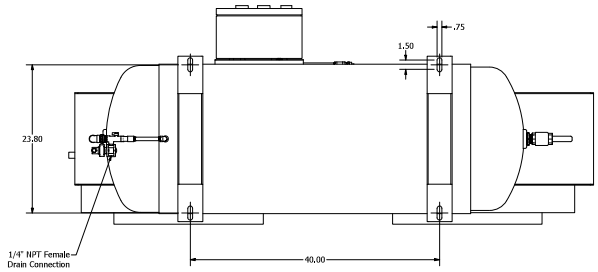
# COMP-5/7.5/10-2

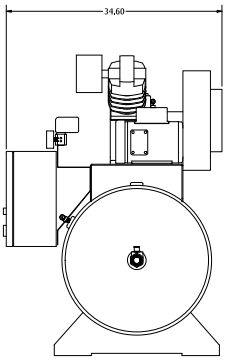
ECS Air Compressor

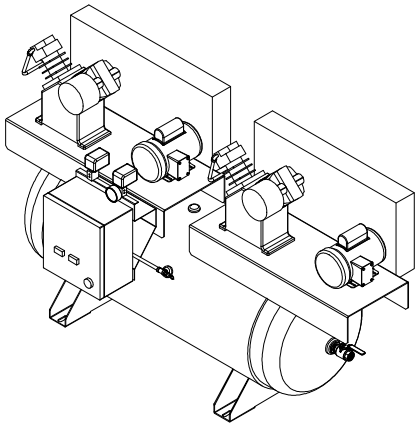
Engineered Corrosion Solutions

COMP-5/7.5-2

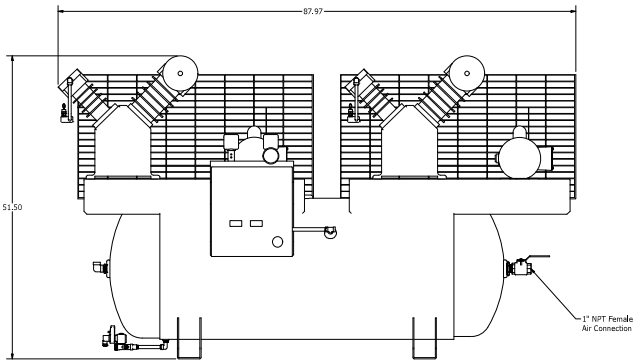


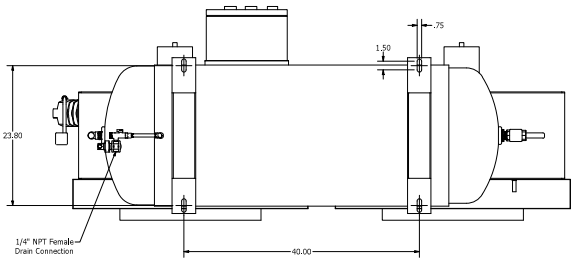



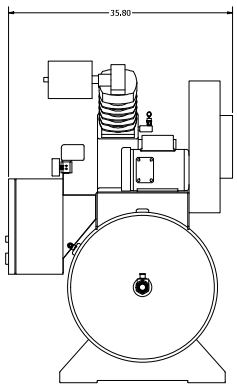



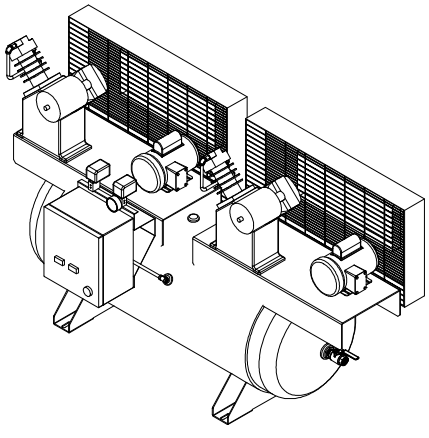



COMP-10-2



# AMD

ECS Approved Fire Sprinkler Air Maintenance Devices

Engineered Corrosion Solutions

(Provided by Others)



## Victaulic - Series 757

The Victaulic Series 757 FireLock Air Maintenance Trim Package is designed to control the system air pressure for dry sprinkler applications. The Victaulic® Air Maintenance Trim Assembly should be used with a reliable source of continuous nitrogen equipped with an attached pressure control switch. The high pressure of the supply air is reduced by the integral adjustable regulator in the Air Maintenance Trim Assembly to the recommended air pressure based on the water supply pressure.



## Reliable - Model A

The Reliable Model A - Pressure Maintenance Device (PMD) is designed for use with a source of nitrogen. The regulator in the Model A PMD reduces higher pressure nitrogen to a level required by a dry pipe valve, dry pilot line, or a deluge valve based preaction system. The Model A PMD will maintain a constant pressure in the system regardless of any pressure fluctuations from the nitrogen source.



## Tyco - Model AMD-1

The TYCO Model AMD-1 Automatic Air Maintenance Device is an automatic, field-adjustable, pressure reducing device. It is used to control the pressure in a dry pipe sprinkler system, pre-action system, or dry pilot line system of a dry pilot actuated deluge or preaction valve.

The Model AMD-1 Device is utilized in applications where there is a nitrogen source controlled at a higher pressure than the desired system pressure.

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## AG Series or PGEN Series Wall Mount Nitrogen Generators with a Single Dry Pipe or Pre-Action System

When a AG Series and PGEN Series Wall Mount Nitrogen Generator is used with a single dry pipe or pre-action system an AMD is not required or needed. The wall mount nitrogen generator will control the system nitrogen pressure.

**NFPA 13 - Standard for the Installation of Sprinkler Systems**
**Section 8.2.6.6.2 (2019), Section 7.2.6.6.2 (2013 & 2016), Section 7.2.6.5.2 (2010)**

Where the air compressor supplying the dry pipe system has a capacity less than 5.5 $ft^3$/min (160L/min) at 10 psi (0.7 bar), an air receiver or air maintenance device shall not be required.

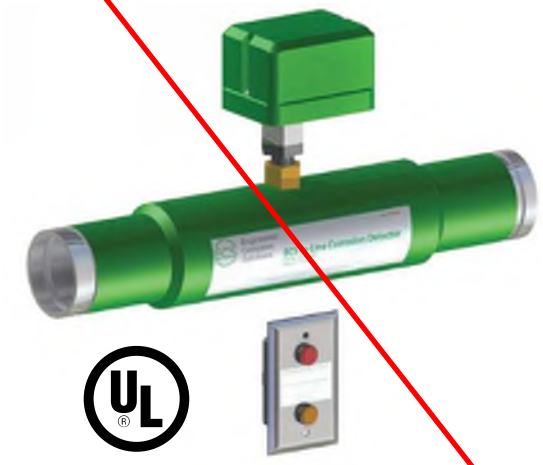
**AG Series and PGEN Series Wall Mount Nitrogen Generators Meet This Requirement**

PERMIT #2026 2513934 - CM 04 | RSN:1975523

# ILD-X

ECS IN-LINE CORROSION DETECTOR

Engineered Corrosion Solutions



US. PAT. NO. 9,095,736
and 9,839,802

## Specifications

| | |
|---|---|
| **Stock Number:** | ILD-X |
| **Service Pressure:** | 175 psi (12 bar) |
| **Temperature Rating:** | -40°F - 120°F (-40°C - 49°C) |
| **Elec. Connection:** | Dry Contact |
| **Pipe Size:** | 1.25" - 6" |
| **Pipe Schedule:** | Sch. 10 or Sch. 40 |
| **Pipe Material:** | Black Steel or Galvanized |

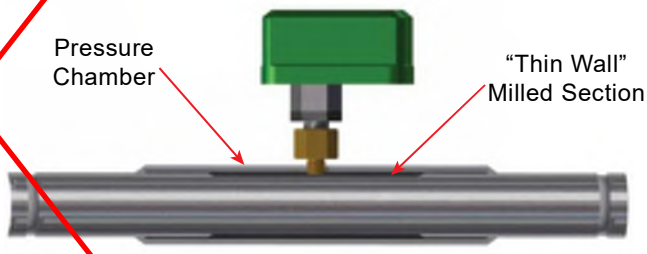
## How to Order

ILD- ___ ___ ___

| Size | Pipe Material | Pipe Schedule |
|---|---|---|
| 1.25" - 6" | G - Galvanized<br>B - Black Steel | 10 - Schedule 10<br>40 - Schedule 40 |

Example: ILD-1.5B40

→ 1.5" Schedule 40 Black Steel Chamber




## General Description

The ECS In-Line Corrosion Detector is designed to provide an early warning indication of internal corrosion activity in water-based fire protection systems. A cross-section of the device shows the two key attributes that allow for early detection of corrosion: an externally milled section of the pipe that creates a "thin wall" section and a pressure chamber created by an external sleeve welded over the pipe.

The device is designed to be installed where corrosion is most likely to occur: the air/water interface. In wet pipe fire sprinkler systems this area is generally found on high branch lines where trapped air is present. In dry pipe fire sprinkler systems this area is generally found on low mains where trapped water is present. The thin wall section of the device will fail before other system piping to provide an early warning indication. The pressure switch will detect the pressure change caused by the failure in the thin wall section.

The ECS In-Line Corrosion Detector is equipped with a pressure switch to monitor the pressure chamber. The ECS In-Line Detector can be remotely monitored through a building monitoring system, or locally through the ECS Detector Remote Test Station. The ECS Detector Remote Test Station can be located adjacent to the In-Line Detector in an accessible location and includes a self-contained power supply eliminating the costly wiring of the unit for monitoring or power.



SHEET 375 of 403

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The ECS In-Line Corrosion Detector easily installs in-line as an integral spool piece within the fire sprinkler system piping to monitor real time corrosion activity. By placing the ECS In-Line Corrosion Detector within the system piping all of the environmental factors that directly affect the corrosion rate within the fire sprinkler system can be monitored. This approach is much more accurate and representative than other methods which utilize corrosion coupons installed on the fire sprinkler system riser or other dead-end locations within the system that are not representative of worst case conditions.

## Match System Piping

In order to accurately monitor the corrosion rates within the fire sprinkler system piping several factors must be considered before an ECS In-Line Corrosion detector is ordered:

- Location within the fire sprinkler system piping for installation of the ECS In-Line Corrosion Detector (to be specified by design engineer or ECS)
- Pipe size diameter to match the fire sprinkler piping that will be monitored
- Type of fire sprinkler system (wet or dry)
- Pipe material for construction (Galvanized Steel or Black Steel)
- Pipe schedule for construction (schedule 10 or 40)

## Installation Location

*Wet Pipe Systems*

On wet pipe systems install ILD on a branch line near the highest elevation of the system, or adjacent to area where trapped air is likely to collect. On existing systems separate branch line at fitting and inspect pipe interior for signs of air/water interface. If pipe section is fully water packed move to higher system elevation. If pipe is fully gas packed move to lower system elevation.

*Dry Pipe/Preaction Systems*

On dry pipe systems install ILD on a horizontal portion of a feed main at low elevation near riser where water is likely to collect. On existing systems separate main at fitting and inspect pipe for small pools of trapped water. If no trapped water is present move to lower system elevation.

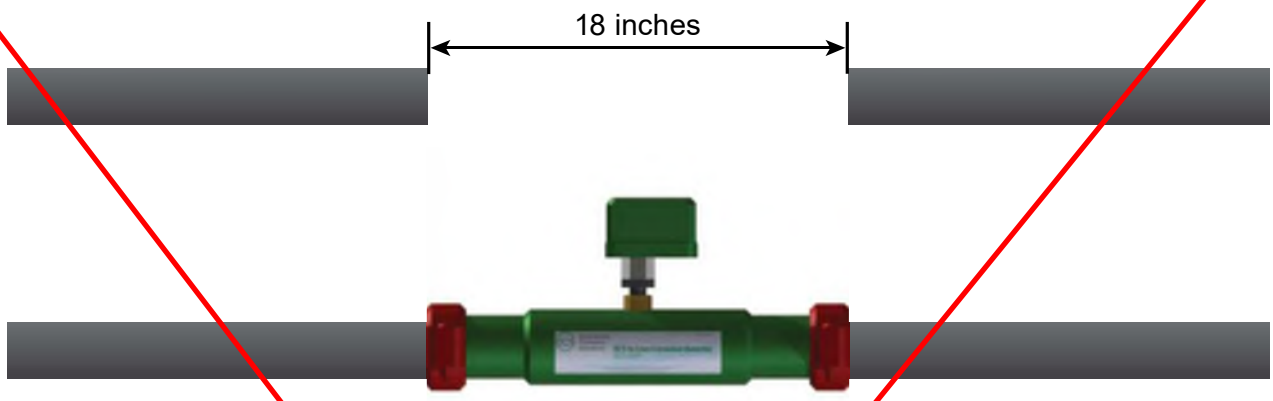
## Installation Instructions

The ECS In-Line Corrosion Detector is manufactured as a spool of piping with roll grooved ends for easy insertion into the fire sprinkler piping using standard mechanical couplings (supplied by others). All models of the ECS In-Line Corrosion Detectors are eighteen (18) inches in length. The variety of pipe schedules and metal are listed in the table under ordering information.

1. Contact design engineer or ECS to determine a location within the sprinkler system where corrosion is likely to occur.
2. At the chosen location in the fire sprinkler piping remove an eighteen (18) inch pipe section from the fire sprinkler system.
3. Roll groove the remaining ends of the fire sprinkler system piping to receive a standard mechanical coupling.
4. Install the ECS In-Line Corrosion Detector of matching pipe material, diameter and schedule into the section space that has been created with the removal of the eighteen (18) inch pipe section. Orient the ECS In-Line Corrosion Detector so that the pressure switch is accessible for maintenance. Tighten the mechanical couplings as per the manufacturer's specifications.

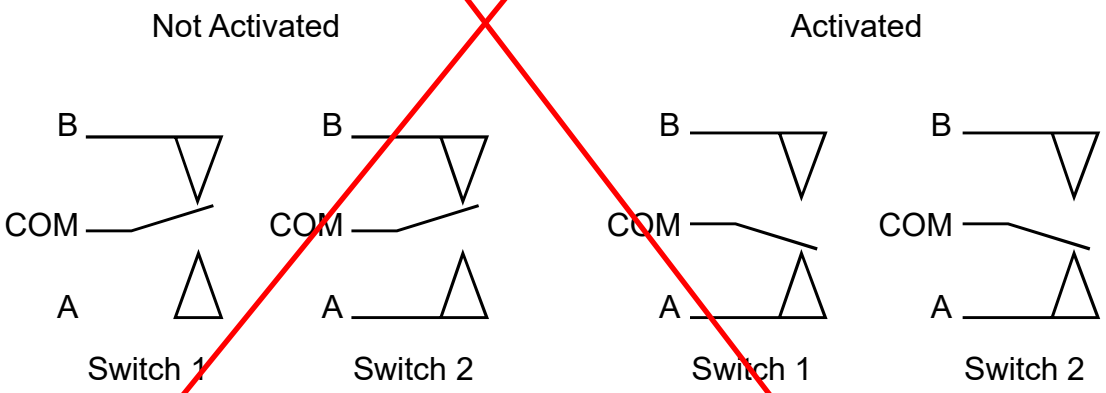
**NOTE:** The ECS In-Line Corrosion Detector has been specifically designed for use in fire sprinkler systems and does not present any obstruction risk or have any negative impact on hydraulic calculations.

**FIGURE 1 - In-Line Detector Installation Schematic**




**RECOMMENDED:** Connect the wiring from the monitoring system to the pressure switch (dry contact) in accordance with the manufacturer's wiring instructions. Activation of the ECS In-Line Corrosion Detector should be identified as a supervisory signal.

**FIGURE 2 - Model EPS10-2 Pressure Switch Electrical Connections**

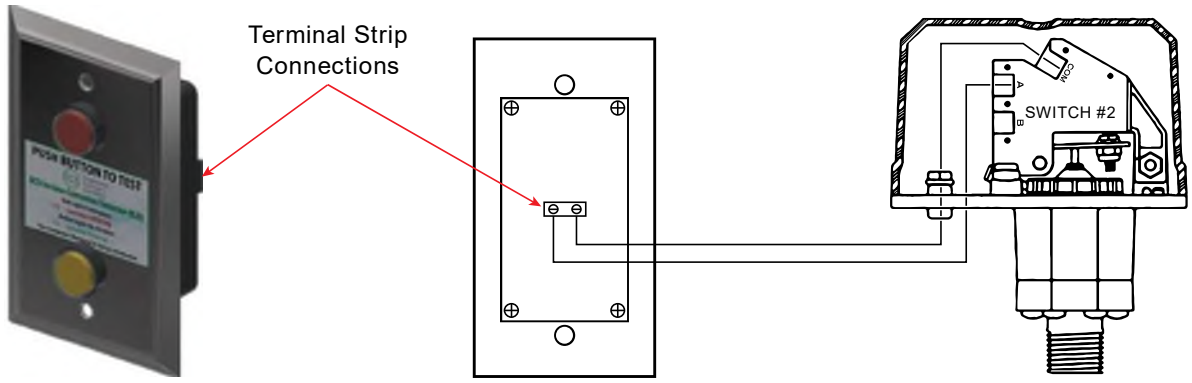



## Detector Remote Test Station Installation Instructions

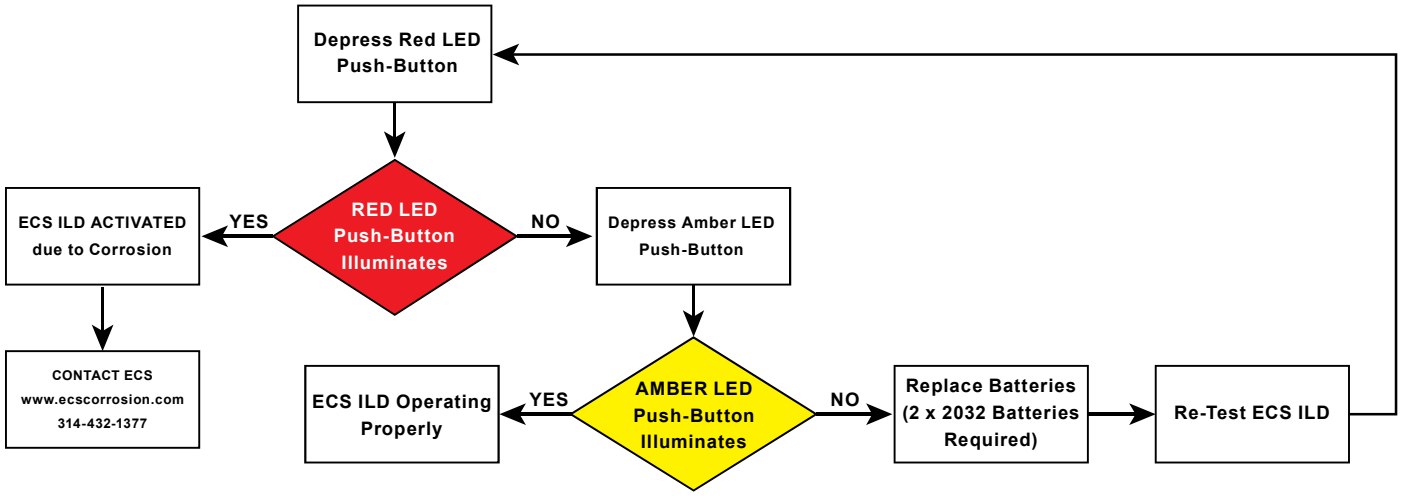
The Detector Remote Test Station mounts to a 2" x 4" x 2-1/8" minimum depth handy box (Raco model 670RAC or approved equal), in an accessible location near the In-Line Corrosion Detector.

1. Recommended mounting height 72" AFF
2. Connect 2-conductor, in accordance with applicable national and/or local codes (i.e. NFPA70), between the In-Line Detector and the Remote Test Station (Recommended 18 AWG cable).
   **NOTE:** The conduit/cabling must enter through the top or bottom knockout of the 2" x 4" handy box.
3. Provide any required raceway or mechanical protection, as required.
4. Connect the terminals of the Remote Station to the common (COM) and normally open (A) of the pressure switch.

## FIGURE 3 - ECS Detector Remote Test Station




## Detector Remote Test Station Operation Flowchart




## Response to Device Activation

Activation of the pressure switch indicates that the thin wall section of the device has failed and the pressure chamber is exposed to system pressure. Contact ECS for instructions regarding replacement and testing of the failed In-Line Corrosion Detector.

## Battery Test and Replacement

1. Depress Amber LED Push Button. If Amber LED does not illuminate, battery replacement is required.
2. Remove Remote Test Station from electrical mounting box, remove four (4) back cover screws, remove two (2) 2032 batteries from battery holder.
3. Replace Battery with two (2) Energizer Part No. CR2032 Only*, re-install battery holder in back box, reinstall back cover with four (4) screws and reinstall Remote Test Station in electrical mounting box.

* Use Of Another Battery May Present A risk Of Fire Or Explosion.

**CAUTION:** Battery May Explode if Mistreated. Do Not Recharge, Disassemble Or Dispose Of In Fire
These cells are intended for use at ordinary temperatures where anticipated high temperature excursions are not expected to exceed 212º F (100º C).

# Victaulic® FireLock NXT™ Dry Valve
# Series 768N

31.80



Patented

## 1.0 PRODUCT DESCRIPTION

**Available Sizes:**

- 1 ½ – 8" /40 – 200 mm

**Pressure Class:**

- Up to 300 psi/2068 kPa/20 Bar

**Minimum Air Pressure:**

- 13 psi/90 kPa/.90 Bar

**Actuation Options:**

- Series 776 Low Pressure Actuator
- Optional: Series 746-LPA Dry Accelerator

**Valve Configurations:**

- Bare
- Pre-trimmed: Completely assembled with all necessary trim components.
- Vic-Quick Riser: Pre-trimmed and includes:
  - Shut Off Valve (1 ½"/40 mm: Series 728 Ball Valve, 2" – 8"/50 – 200 mm: Series 705 FireLock Butterfly Valve)
  - Pre-set high or low air and alarm pressure switches
  - Drain kit
- Fire-Pac Series 745 (refer to Victaulic submittal 30.23)

**Pipe Preparation:**

- Victaulic Original Groove System

**Application/Media:**

- For use on fire protection systems only

## 2.0 CERTIFICATION/LISTINGS

EN 12259-3: 2000
Cert/LPCB ref. 104c/02

2809

1725

**NOTE**

- CCC approval for DN80, DN100, DN150, DN200.

**ALWAYS REFER TO ANY NOTIFICATIONS AT THE END OF THIS DOCUMENT REGARDING PRODUCT INSTALLATION, MAINTENANCE OR SUPPORT.**


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## 3.0 SPECIFICATIONS - MATERIAL

**Body:** Ductile iron conforming to ASTM A536, grade 65-45-12.

**Clapper:** Aluminum bronze UNS-C95500

**Latch:** Aluminum bronze UNS-C95500

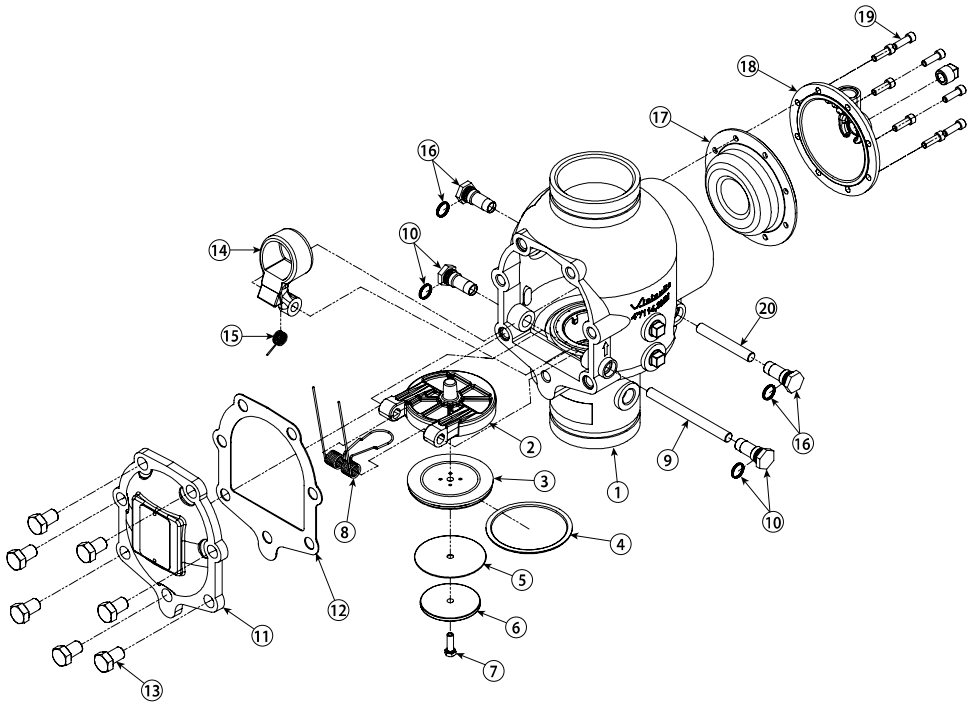
**Shafts:** Stainless 17-4

**Clapper Seal:** Peroxide cured EPDM, ASTM D2000

**Bushings/Seat O-rings:** Nitrile

**Springs:** Stainless Steel (300 Series)

**Diaphragm:** Peroxide cured EPDM with fabric reinforcement




The 1½-inch/48.3-mm and 2-inch/60.3-mm valve sizes contain washers under the heads of the cover plate bolts.

| Item | Description |
|---|---|
| 1 | Valve Body |
| 2 | Clapper |
| 3 | Clapper Seal |
| 4 | Seal Ring |
| 5 | Seal Washer |
| 6 | Seal Retaining Ring |
| 7 | Seal Assembly Bolt |
| 8 | Clapper Spring |
| 9 | Clapper Shaft |
| 10 | Clapper Shaft Bushing and O-Ring (Qty. 2) |

| Item | Description |
|---|---|
| 11 | Cover Plate |
| 12 | Cover Plate Gasket |
| 13 | Cover Plate Bolts |
| 14 | Latch |
| 15 | Latch Spring |
| 16 | Latch Spring Bushing and O-Ring (Qty. 2) |
| 17 | Diaphragm |
| 18 | Diaphragm Cover |
| 19 | Diaphragm Cover Cap Screws (Qty. 8) |
| 20 | Latch Shaft |

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## 3.0 SPECIFICATIONS – MATERIAL (CONTINUED)

☐ **Standard Trim Package:**

- Series 776 Low Pressure Actuator – The Series 776 Low Pressure Actuator is pneumatically actuated and requires only 13 psi/90 kPa minimum air pressure, regardless of the system supply pressure. This actuator allows the system to operate with a low air or gas pressure of 7 psi/48 kPa.
- All required pipe nipples and fittings - standard galvanized finish
- All standard trim accessories
- All required gauges

☐ **Optional Trim Package:** Black Trim for Foam Systems – If the valve is intended for use in a foam system, black trim must be ordered, per NFPA requirements. Specify this requirement on the order.

**Optional Accessories:**

☐ **Alarm Pressure Switch –** Alarm Pressure Switches are designed to activate electrical alarms and control panels when a sustained flow of water occurs (such as with an open sprinkler). Included in VQR trim.

☐ **Air Supervisory Pressure Switch** – Air Pressure Supervisory Switches are used to monitor low and high system air pressure and are factory pre-set. Included in VQR trim.

☐ **Series 746-LPA Dry Accelerator –** The Series 746-LPA Dry Accelerator is required when the Series 768N Dry Valve is installed in large systems to improve response time. Refer to Victaulic submittal 30.64.

☐ **Series 760 Water Motor Alarm** – The Series 760 Water Motor Alarm is a mechanical device that sounds when a sustained flow of water occurs (such as with an open sprinkler). Refer to Victaulic submittal 30.32.

☐ **Series 75B Supplemental Alarm Device –** The Series 75B Supplemental Alarm Device is designed to provide a continuous alarm for systems equipped with a mechanical device. Refer to Victaulic submittal 30.33.

☐ **Series 75D Water Column Kit** – The Series 75D Water Column Kit is designed to minimize residual water in the riser from collecting above the clapper. Refer to Victaulic submittal 30.34.

☐ **Air Supply System** – The air supply system contains all components for establishing and maintaining air in the system. The compressor, low-pressure alarms, ball valves, and required trim are included in the air supply system.

☐ **Air Compressor** (See page 6 for more on the Victaulic Series 7C7 Compressor Package)

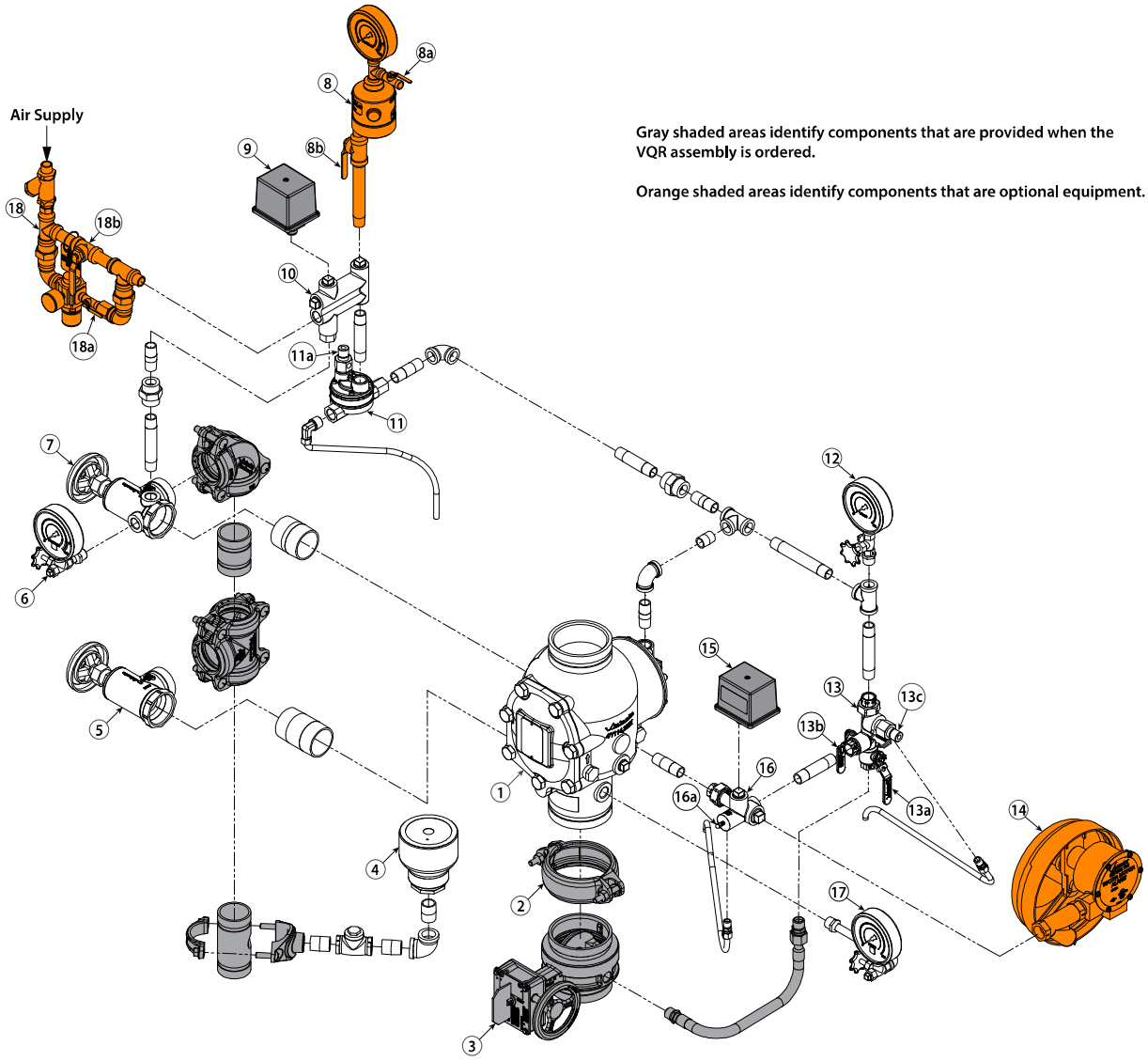
☐ **Air Maintenance Trim Assembly**

☐ **Fire Alarm Control Panels**

☐ **Drain Connection Kit** – Included in VQR option.

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## 3.0 SPECIFICATIONS – MATERIAL (CONTINUED)

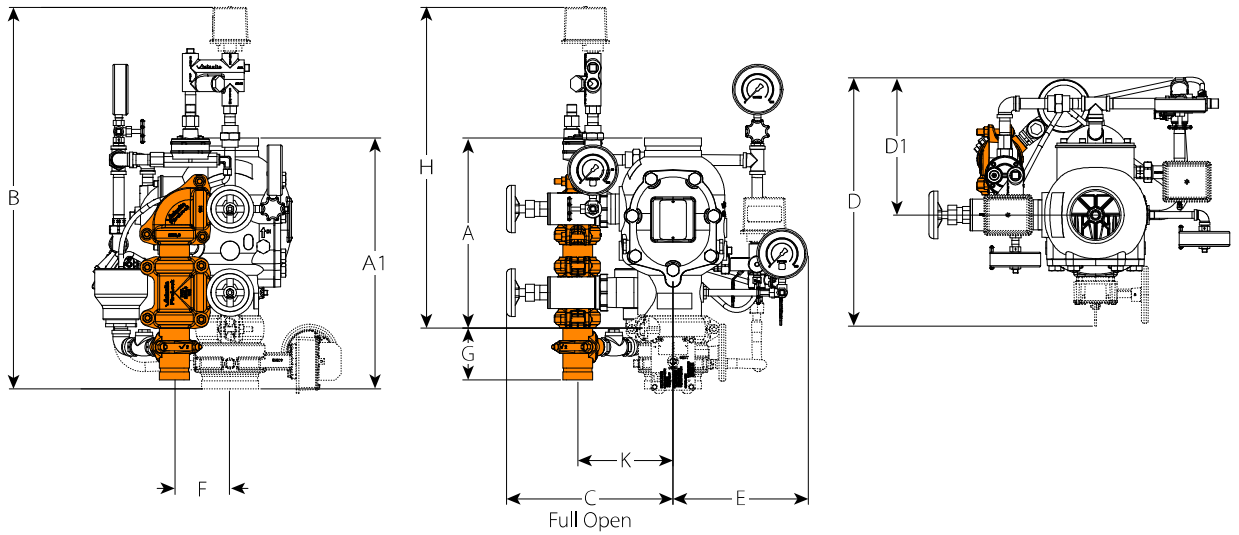



| Item | Description |
|---|---|
| 1 | Series 768N FireLock NXT Dry Valve |
| 2 | FireLock Rigid Coupling |
| 3 | Water Supply Main Control Valve |
| 4 | Drip Cup |
| 5 | Water Supply Main Drain Valve – Flow Test |
| 6 | System Pressure Gauge/Gauge Valve Assembly |
| 7 | System Main Drain Valve |
| 8 | Series 746-LPA Dry Accelerator Assembly |
| 8a | Series 746-LPA Dry Accelerator ¼-Turn Vent Ball Valve |
| 8b | Series 746-LPA Dry Accelerator Isolation Ball Valve |
| 9 | Air Supervisory Pressure Switch |
| 10 | Air Manifold |
| 11 | Series 776 Low-Pressure Actuator |
| 11a | Auto Vent Sleeve of Series 776 Low-Pressure Actuator |

| Item | Description |
|---|---|
| 12 | Charge Line Pressure Gauge/Gauge Valve Assembly |
| 13 | Priming Manifold Assembly |
| 13a | Charge Line Ball Valve |
| 13b | Alarm Test Ball Valve |
| 13c | Auto Drain Sleeve |
| 14 | Series 760 Water Motor Alarm Assembly |
| 15 | Alarm Pressure Switch |
| 16 | Alarm Manifold Assembly |
| 16a | Ball Drip Plunger |
| 17 | Water Supply Pressure Gauge/Gauge Valve Assembly |
| 18 | Victaulic Air Maintenance Trim Assembly (AMTA) |
| 18a | Slow-Fill Ball Valve of the Victaulic AMTA |
| 18b | Fast-Fill Ball Valve of the Victaulic AMTA |

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## 4.0 DIMENSIONS




| Size | Dimensions | | | | | | | | | | | Weight | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | Approx. (Each) | |
| Nominal inches DN | A inches mm | A1 inches mm | B inches mm | C inches mm | D inches mm | D1 inches mm | E inches mm | F inches mm | G inches mm | H inches mm | K inches mm | Without Trim lbs kg | With Trim lbs kg |
| 1½ DN40 | 9.00 228.60 | 16.37 415.80 | 31.50 800 | 9.25 235 | 15.25 387 | 10.00 254 | 9.25 235 | 3.25 83 | 10.25 260 | 21.75 552 | 6.00 152 | 16.7 7.6 | 43.0 19.5 |
| 2 DN50 | 9.00 228.60 | 13.83 351.28 | 31.50 800 | 9.25 235 | 16.25 413 | 10.00 254 | 9.25 235 | 3.25 83 | 10.25 260 | 21.75 552 | 6.00 152 | 17.0 7.7 | 43.0 19.5 |
| 2½ | 12.61 320.29 | 16.51 419.35 | 29.75 756 | 11.25 286 | 17.25 438 | 9.75 248 | 9.75 248 | 4.00 102 | 6.25 159 | 23.75 603 | 6.50 165 | 41.0 18.7 | 65.0 29.5 |
| 76.1 mm | 12.61 320.29 | 16.51 419.35 | 29.75 756 | 11.25 286 | 17.25 438 | 9.75 248 | 9.75 248 | 4.00 102 | 6.25 159 | 23.75 603 | 6.50 165 | 41.0 18.7 | 65.0 29.5 |
| 3 DN80 | 12.61 320.29 | 16.51 419.35 | 29.75 756 | 11.25 286 | 17.25 438 | 9.75 248 | 9.75 248 | 4.00 102 | 6.25 159 | 23.75 603 | 6.50 165 | 41.0 18.7 | 65.0 29.5 |
| 4 DN100 | 15.03 381.76 | 19.85 504.19 | 31.50 800 | 13.50 343 | 20.00 508 | 11.25 286 | 11.00 279 | 4.75 121 | 4.50 114 | 25.75 654 | 8.00 203 | 59.0 26.7 | 95.0 43.0 |
| 165.1 mm | 16.00 406.40 | 22.13 562.10 | 31.00 787 | 14.00 356 | 23.25 591 | 11.75 298 | 11.25 286 | 4.50 114 | 4.25 108 | 27.00 686 | 8.25 210 | 80.0 36.2 | 116.0 52.6 |
| 6 DN150 | 16.00 406.40 | 22.13 562.10 | 31.00 787 | 14.00 356 | 23.25 591 | 11.75 298 | 11.25 286 | 4.50 114 | 4.25 108 | 27.00 686 | 8.25 210 | 80.0 36.2 | 116.0 52.6 |
| 8 DN200 | 17.50 444.50 | 23.02 584.71 | 32.75 832 | 14.75 375 | 25.75 654 | 12.50 318 | 12.25 311 | 4.75 121 | 4.25 108 | 29.00 737 | 9.25 235 | 122.0 55.3 | 158.0 71.6 |

**NOTES**

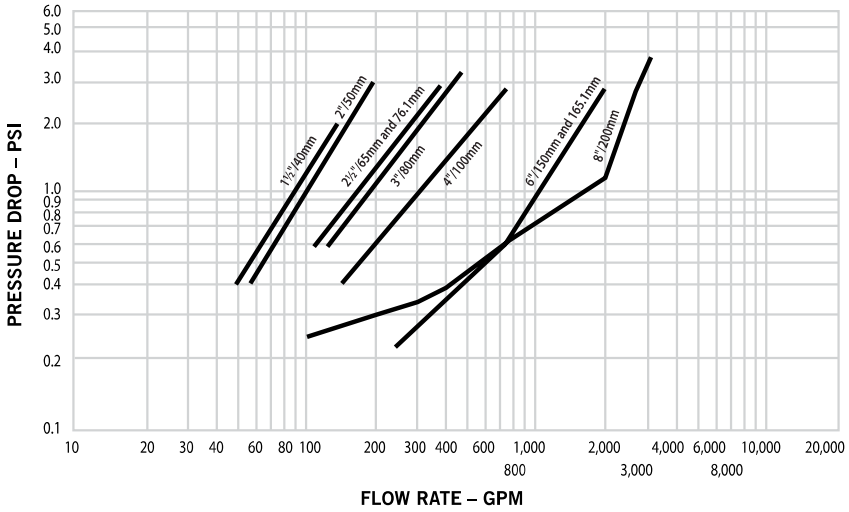
- The "A" dimension is the actual takeout dimension of the valve body.
- The "A1" dimension is the actual takeout dimension of the valve body with water supply main control valve.
- For systems with the optional Series 746-LPA Dry Accelerator, add 11.50 inches/292 mm to the "B" dimension to account for the additional height.
- The "D" and "D1" dimensions are not fixed measurements. The drip cup can be rotated to provide more clearance at the back of the trim.
- Components shown as dotted lines denote optional equipment.
- The recommended drain connection kit (shaded in orange) is for reference and takeout dimensions. This drain connection comes standard when the VQR assembly is ordered.

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## 5.0 PERFORMANCE

### Hydraulic Friction Loss

The chart below expresses the flow of water at 65°F/18°C through an open valve.




### Frictional Resistance

The chart below expresses the frictional resistance of Victaulic Series 768N FireLock NXT.
Dry Valve in equivalent feet of straight pipe.

| Nominal Size<br>inches<br>DN | Actual Outside Diameter<br>inches<br>mm | Equivalent Length of Pipe<br>feet<br>meters |
|---|---|---|
| 1 ½<br>DN40 | 1.900<br>48.3 | 3.00<br>0.914 |
| 2<br>DN50 | 2.375<br>60.3 | 9.00<br>2.743 |
| 2 ½ | 2.875<br>73.0 | 8.00<br>2.438 |
| 76.1 mm | 3.000<br>76.1 | 8.00<br>2.439 |
| 3<br>DN80 | 3.500<br>88.9 | 17.00<br>5.182 |
| 4<br>DN100 | 4.500<br>114.3 | 21.00<br>6.401 |
| 165.1 mm | 6.500<br>165.1 | 22.00<br>6.706 |
| 6<br>DN150 | 6.625<br>168.3 | 22.00<br>6.706 |
| 8<br>DN200 | 8.625<br>219.1 | 50.00<br>15.240 |

### Cv Values:

Cv values for flow of water at +60°F/+16°C through a fully open valve are shown in the table below.

**Formulas for Cv values**

$\Delta P = Q^2/Cv^2$

$Q = Cv \times \sqrt{\Delta P}$

Where:

| | |
|---|---|
| Flow Coefficient | Cv |
| Q (Flow) | GPM |
| ΔP (Pressure Drop) | psi |

| Valve Size | | Full Open |
|---|---|---|
| Nominal Size<br>inches<br>DN | Actual Outside Diameter<br>inches<br>mm | Flow Coefficient<br>Cv<br>Kv |
| 1 ½<br>DN40 | 1.900<br>48.3 | 60<br>52.0 |
| 2<br>DN50 | 2.375<br>60.3 | 110<br>95.0 |
| 2 ½ | 2.875<br>73.0 | 180<br>156.0 |
| 76.1 mm | 3.000<br>76.1 | 180<br>156.0 |
| 3<br>DN80 | 3.500<br>88.9 | 200<br>173.0 |
| 4<br>DN100 | 4.500<br>114.3 | 350<br>302.8 |
| 165.1 mm | 6.500<br>165.1 | 1000<br>865.0 |
| 6<br>DN150 | 6.625<br>168.3 | 1000<br>865.0 |
| 8<br>DN200 | 8.625<br>219.1 | 1500<br>1499.1 |

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## 5.0 PERFORMANCE (CONTINUED)

**Air Supply Requirements**

- Minimum: 13 psi/90 kPA/.9 Bar regardless of the system water pressure
- Maximum Recommended: 18 psi/124 kPa/1.24 Bar
- Multiple Series 768N FireLock NXT Dry Valves with a common air supply:
  - Isolate systems with a Victaulic spring –loaded, soft-seated ball check valve to ensure air integrity and serviceability of each system.
- Sizing the compressor:
  - Engineer/system designer is responsible
  - Entire system must be charged to the required air pressure within 30 minutes to meet NFPA requirements
  - An oversized compressor will slow down or possibly prevent valve operation
  - Compressor filling the system too fast:
    - May be necessary to restrict the air supply
    - Ensure that air exhausted from an open sprinkler or manual release valve is not replaced by the air supply system as fast as it is exhausted
- Compressor Requirements
  - Base or Riser Mounted Compressors:
    - “On” or “low” pressure setting: 13 psi/90 kPA/.9 Bar
    - “Off” or “high” pressure setting: 18 psi/124 kPa/1.24 Bar
    - Victaulic Series 7C7 riser mounted and pre-set for pressure requirements (refer to Victaulic submittal 30.22).
    - If the compressor is not equipped with a pressure switch, the Series 757P Air Maintenance Trim Assembly with pressure switch should be installed (refer to Victaulic submittal 30.36).
- Shop Air or Tank-Mounted Air Compressors:
  - Series 757 Regulated Air Maintenance Trim Assembly should be installed (refer to Victaulic submittal 30.35)
  - 13 psi/90 kPA/.9 Bar should be used as the set point for the air regulator
  - The compressor cut-in (turn-on) pressure setting should be at least 5 psi/34kPa/34 Bar above the set point of the air regulator.
  - Exploded View Trim: Series 757 Regulated Air Maintenance Trim Assembly (refer to Victaulic submittal 30.35)
- Compressor Requirements and settings for systems installed with series 746 or series 746-LPA dry accelerators
  - A tank-mounted air compressor with a Series 757 Regulated AMTA must be used to supply air to system installed with a Series 746 or Series 746-LPA Dry Accelerator.
  - In the event a compressor becomes inoperative, a properly sized tank-mounted air compressor provides the greatest protection, since air can be supplied continuously to the sprinkler system for an extended time period.

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## 6.0 NOTIFICATIONS

**⚠ WARNING**



- **Read and understand all instructions before attempting to install, remove, adjust, or maintain any Victaulic piping products.**
- **Depressurize and drain the piping system before attempting to install, remove, adjust, or maintain any Victaulic piping products.**
- **Wear safety glasses, hardhat, and foot protection.**

**Failure to follow these instructions could result in death or serious personal injury and property damage.**

## 7.0 REFERENCE MATERIALS

30.35: FireLock™ Air Maintenance Trim Assembly Series 757 Submittal
30.36: FireLock™ Air Maintenance Trim Assembly Series 757P Submittal
30.22: FireLock® Compressor Package Series 7C7 Submittal
30.32: FireLock™ Water Motor Alarm Series 760 Submittal
30.64: FireLock™ Dry Accelerator Series 746-LPA
30.65: FireLock™ Low Pressure Actuator Series 776 Submittal
I-768N: FireLock NXT™ Dry Valve Series 768N Installation Manual

**User Responsibility for Product Selection and Suitability**
Each user bears final responsibility for determining the suitability of Victaulic products for their end-use application, in accordance with industry standards, project specifications, and Victaulic's published performance, maintenance, and safety data, as well as all warnings and installation instructions. Nothing in this or any other document, nor any verbal recommendation, advice, or opinion from any Victaulic employee, shall be deemed to alter, vary, supersede, or waive any provision of Victaulic Company's standard conditions of sale, warranty, installation instructions, or this disclaimer.

**Installation**
Always refer to and follow the Victaulic Installation Handbook or installation instructions for the product you are installing. Handbooks are included with each shipment of Victaulic products, providing complete installation and assembly data, and are available in PDF format on our website at victaulic.com.

**Warranty**
Refer to the Warranty section of the current Price List or contact Victaulic for details.

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PERMIT #2026 2513934 - CM 04 | RSN:1975523



# PrePaK™ Fully Integrated System

## Features

- Compact with small footprint
- Fits through standard 36” door
- 18-gauge powder coated steel
- Integral release control panel
- Multiple air compressor options
- Select models available with integral nitrogen generator




Representative photo, actual product may vary

## Product Description

The Reliable Model DDX PrePaK is a completely self-contained, supervised system that can be readily installed within a floor space (not including door swing) of 4.7 $ft^2$ (0.43 $m^2$) for 2” through 4” systems, and 6.5 $ft^2$ (0.60 $m^2$) for the 6” and 8” systems and those systems incorporating a nitrogen generator.

This document is intended to provide basic information for the proper selection of equipment. Additional PrePaK information can be found on the Installation, Operation, and Maintenance Manual (Bulletin 761).

Installation of the PrePaK requires three piping connections: the water supply, the sprinkler system, and the drain. Reference locations of these piping connections, along with general PrePaK dimensions are shown on pages 2 and 3 of this bulletin. Individual power connections are required for the release control panel, air compressor, and nitrogen generator, where so equipped. A clear sight glass is provided as standard equipment on the system drain of each unit for verification of flow testing and drainage.

Table A provides a summary of the models and sizes available along with related agency approvals. Additional information for each model will be found on pages referenced in Table A.

**Product Summary** **Table A**

| System Type/Operation | Sizes | Approvals | See Page |
|---|---|---|---|
| 1. Type D Single/Double Interlock Preaction, Electric | 2” – 8” | UL, FM | 4 |
| 2. Type F Double Interlock Preaction, Electric/Pneumatic | 2” – 8” | UL, FM | 5 |
| 3. DDX-LP (Low Pressure) Dry | 2” – 8” | UL, FM | 6 |
| 4. DDX Deluge, Wet Pilot Line | 2” – 8” | UL, FM | 7 |
| 5. DDX Deluge, Dry Pilot Line | 2” – 8” | UL, FM | 8 |
| 6. DDX Deluge, Electric | 2” – 8” | UL, FM | 9 |
| 7. DDX Single Interlock Preaction, Dry Pilot Line | 2” – 8” | UL, FM | 10 |
| 8. Single Interlock Preaction, Wet Pilot Line | 2” – 8” | UL, FM | 11 |
| 9. Type PL Double Interlock Preaction, Pneumatic/Pneumatic | 2” – 8” | UL, FM | 12 |
| 10. Non-Interlock Preaction System | 2” - 8” | UL | 13 |
| 11. DDX-LP to Type F Convertible | 2” - 8” | UL, FM | 14 |

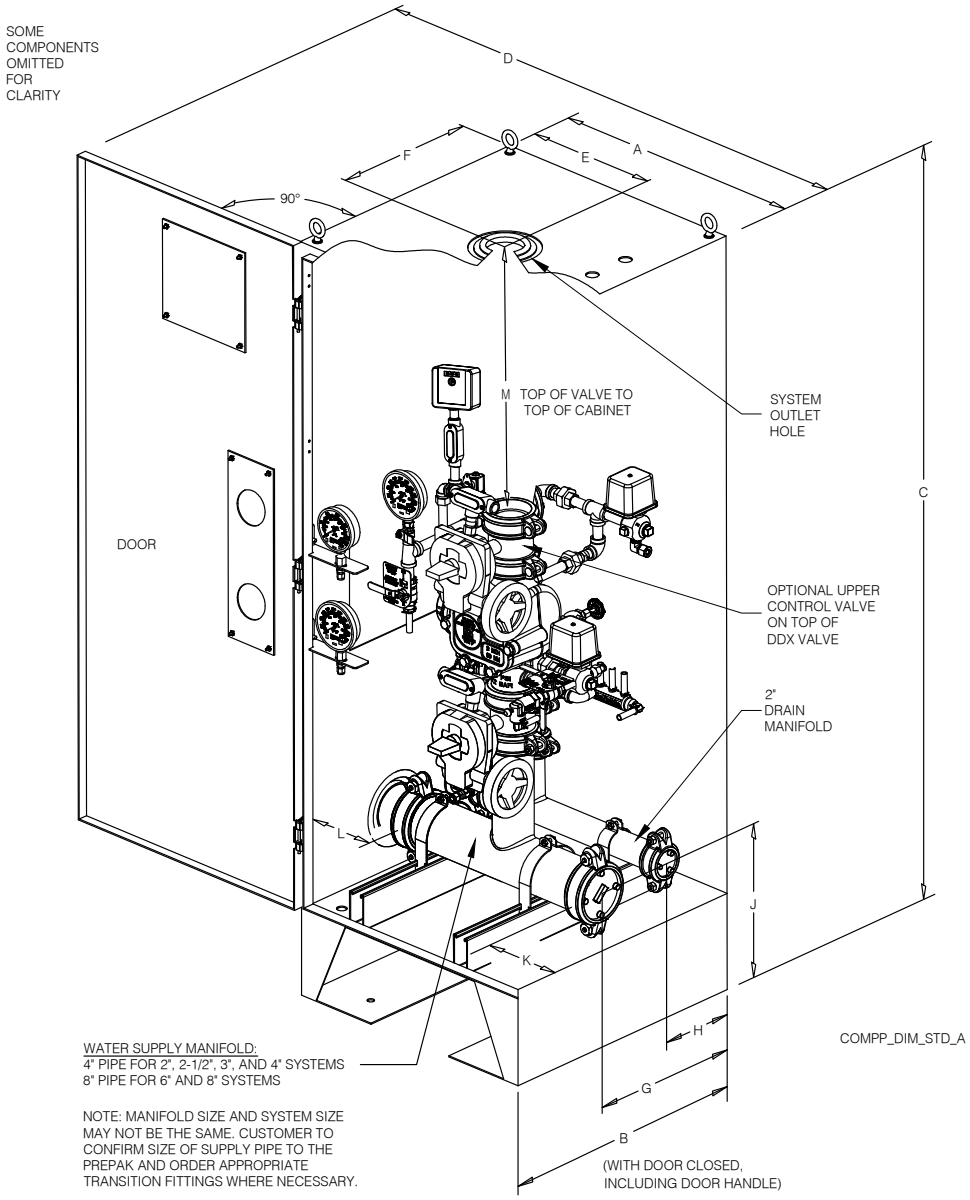
**Note:** For units with integral nitrogen generator, the generator is FM Approved to Standard 1035, Nitrogen Generators for Corrosion Mitigation. Nitrogen generator available for system types 1, 2, 3, and 11 above only, and are limited to 2” (50 mm) through 6” (150 mm) systems.

## Standard Unit PrePaK Dimensions

**Figure 1**

STANDARD UNIT DIMENSIONS INCHES [CM]

| SYSTEM SIZE | A | B | C | D | E | F | G | H | J | K | L | M WITHOUT UPPER VALVE | M WITH UPPER VALVE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2" (50MM) | 25.0 [63.5] | 28.3 [71.8] | 70.0 [177.8] | 50.0 [127.0] | 13.1 [33.2] | 14.3 [36.3] | 14.3 [36.3] | 6.3 [16.0] | 13.6 [34.5] | 1.8 [4.5] | 3.3 [8.3] | 27.2 [69.0] | 24.1 [61.2] |
| 2-1/2" (65MM) | 25.0 [63.5] | 28.3 [71.8] | 70.0 [177.8] | 50.0 [127.0] | 13.1 [33.2] | 14.3 [36.3] | 14.3 [36.3] | 6.3 [16.0] | 13.6 [34.5] | 1.8 [4.5] | 3.3 [8.3] | 27.9 [70.8] | 24.1 [61.2] |
| 3" (80MM) | 25.0 [63.5] | 28.3 [71.8] | 70.0 [177.8] | 50.0 [127.0] | 13.1 [33.2] | 14.3 [36.3] | 14.3 [36.3] | 6.3 [16.0] | 13.6 [34.5] | 1.8 [4.5] | 3.3 [8.3] | 27.9 [70.8] | 24.1 [61.2] |
| 4" (100MM) | 25.0 [63.5] | 28.3 [71.8] | 70.0 [177.8] | 50.0 [127.0] | 13.1 [33.2] | 14.3 [36.3] | 14.3 [36.3] | 6.3 [16.0] | 13.6 [34.5] | 1.8 [4.5] | 3.3 [8.3] | 28.5 [72.3] | 24.1 [61.2] |
| 6" (150MM) | 30.0 [76.2] | 33.0 [88.8] | 74.0 [188.0] | 60.0 [152.4] | 14.8 [37.5] | 15.0 [38.1] | 15.0 [38.1] | 7.0 [17.7] | 13.6 [34.5] | 5.3 [13.4] | 4.8 [12.1] | 29.3 [74.4] | 24.1 [61.2] |
| 8" (200MM) | 30.0 [76.2] | 33.0 [88.8] | 74.0 [188.0] | 60.0 [152.4] | 14.8 [37.5] | 15.0 [38.1] | 15.0 [38.1] | 7.0 [17.7] | 13.6 [34.5] | 5.3 [13.4] | 4.8 [12.1] | 26.2 [66.5] | 20.5 [52.0] |

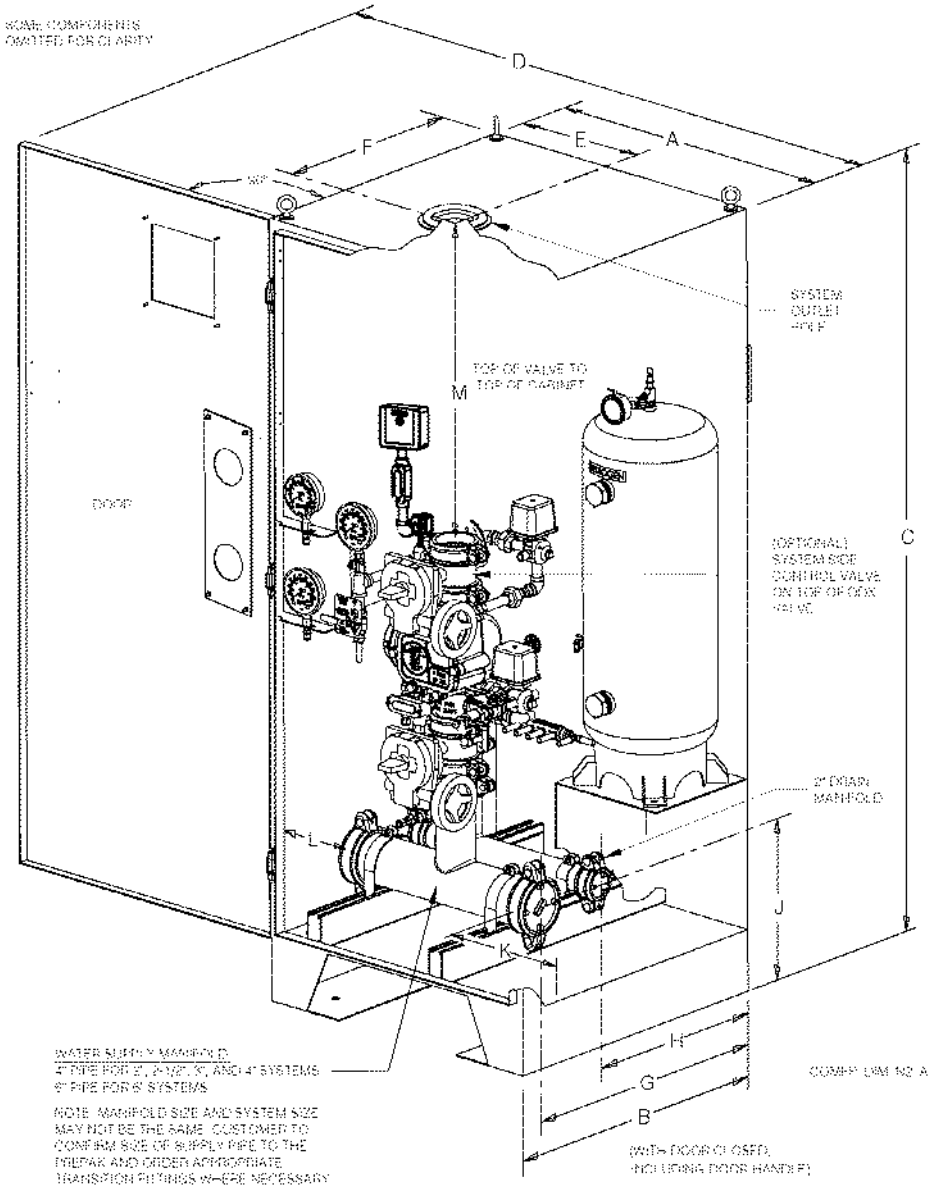


**Nitrogen Generator Unit PrePaK Dimensions** **Figure 2**

NITROGEN GENERATOR UNIT DIMENSIONS

NOTES (DIM)

| SYSTEM SIZE | A | B | C | D | E | F | G | H | J | K | L | M WITHOUT UPPER VALVE | M WITH UPPER VALVE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2" (50MM) | 30.0 [76.2] | 33.1 [84.0] | 74.0 [188.0] | 60.0 [152.4] | 12.8 [32.4] | 19.7 [50.0] | 19.7 [50.0] | 11.6 [29.4] | 11.6 [29.4] | 8.0 [20.3] | 2.0 [5.1] | 34.0 [86.3] | 30.0 [76.2] |
| 2-1/2" (65MM) | 30.0 [76.2] | 33.1 [84.0] | 74.0 [188.0] | 60.0 [152.4] | 12.8 [32.4] | 19.7 [50.0] | 19.7 [50.0] | 11.6 [29.4] | 11.6 [29.4] | 8.0 [20.3] | 2.0 [5.1] | 34.0 [86.3] | 30.0 [76.2] |
| 3" (80MM) | 30.0 [76.2] | 33.1 [84.0] | 74.0 [188.0] | 60.0 [152.4] | 12.8 [32.4] | 19.7 [50.0] | 19.7 [50.0] | 11.6 [29.4] | 11.6 [29.4] | 8.0 [20.3] | 2.0 [5.1] | 34.0 [86.3] | 30.0 [76.2] |
| 4" (100MM) | 30.0 [76.2] | 33.1 [84.0] | 74.0 [188.0] | 60.0 [152.4] | 12.8 [32.4] | 19.7 [50.0] | 19.7 [50.0] | 11.6 [29.4] | 11.6 [29.4] | 8.0 [20.3] | 2.0 [5.1] | 34.0 [86.3] | 29.5 [74.9] |
| 6" (150MM) | 30.0 [76.2] | 33.1 [84.0] | 74.0 [188.0] | 60.0 [152.4] | 12.0 [32.0] | 18.0 [46.7] | 18.0 [46.7] | 10.0 [25.4] | 11.0 [28.4] | 8.1 [20.6] | 2.0 [5.1] | 31.6 [80.3] | 26.4 [67.1] |



## DDX PrePaK™ Type F Double Interlock Preaction System, Electric/Pneumatic Release

**Technical Specifications**
**System Sizes:** 2” (50mm), 2-1/2” (65mm), 3” (80mm), 4” (100mm), 6” (150mm), and 8” (200mm)
**Manifold Size:** 4” (100mm) for sizes up to 4”, 8” (200mm) for 6” (150mm) and 8” (200mm) systems
**Drain Manifold Size:** 2” (50mm) for all systems

**Minimum Required Pressure:** 20 psi (1.4 bar)
**Maximum Working Pressure:** 175 psi (12 bar) or 250 psi (17.2 bar) depending on solenoid selection

**Releasing Devices(s):**
- (Standard) Parker Hannifin 73218BN4UNLVNOC111C2, 24 VDC, 10 watt solenoid valve rated at 175 psi (12 bar)
- (Alternate) Parker Hannifin 73212BN4TNLVNOC322C2, 24 VDC, 22 watt solenoid rated at 300 psi (20.0 bar)
- Model LP Low Pressure Dry Pilot Actuator (Secondary)

**Minimum Water Temperature:** 40°F (4°C)
**Maximum Water Temperature:** 140°F (60°C)

**Friction Loss (Equivalent Length of Schedule 40 Pipe, C-Factor = 120, including manifold)**

| | |
|---|---|
| 2” (50mm) | 19.4 ft (5.9 m) |
| 2-1/2” (65mm) | 24.5 ft (7.5 m) |
| 3” (80mm) | 28.9 ft (8.8 m) |
| 4” (100mm) | 32.8 ft (17.7 m) |
| 6” (150mm) | 54.7 ft (21.8 m) |
| 8” (200mm) | 79.3 ft (24.2 m) |

**Supervisory Air Pressure:** 8 psi (0.6 bar) to 24 psi (1.7 bar) depending on incoming water supply pressure. See Installation, Operation, and Maintenance Manual.

**Approximate Weight:**

| | |
|---|---|
| 2” (50mm), 2-1/2” (65mm), & 3” (80mm) | 575 lbs (261 kg) |
| 4” (100mm) | 695 lbs (315 kg) |
| 6” (150mm) | 855 lbs (388 kg) |
| 8” (200mm) | 945 lbs (429 kg) |

**Approvals:**
- cULus Listed as an assembled unit in the “Special System Water Control Valves Assembled Units” category (VKYL)
- FM Approved for applications where FM Global Data Sheets allow the use of double interlock preaction systems
- FM Approved as a Refrigerated Area Sprinkler System in accordance with FM DS 2-0
- OSHPD Special Seismic Certification Preapproval (OSP) for SDS=2.50 and z/H=1 when installed with optional seismic kit




Representative photo.
Actual product may vary.

## System Operation

The Reliable Model DDX Type F double interlock preaction system is an electric/pneumatic release system that incorporates a 24VDC normally closed solenoid valve in series with a Model LP low-pressure dry pilot actuator on the deluge valve releasing trim.

The activation of a supplemental electric detection system, either on a single zone or two zones (cross zoned) will energize the solenoid valve. Subsequent operation of the low-pressure dry pilot actuator due to loss of system pneumatic pressure (presumed due to a fire sprinkler opening) releases water into the system and initiates a water flow alarm.

**Note:** Cross zone detection may only be used where specifically approved by the authority having jurisdiction.

In the event of pneumatic pressure loss on the system with no active electric detection, the pressure switch will operate independently, and a supervisory signal will report to the fire alarm system, however, water will not be released into the system.

This system, in sizes 2” through 6” (50 mm to 150 mm), is also available with an integral SouthTek Systems FPS-900 N2-Blast® nitrogen generator, FM Approved to Standard 1035, Nitrogen Generators for Corrosion Mitigation.

## Options (also Reference page 16 and 17)

Based upon the type of system, some or all of the following optional equipment is available.

1. Solenoid Valve: 300 psi rated [Default is 175 psi rated]
2. Coil supervisory device: Potter Electric CoilKeeper™ [Default is NO device]
3. Releasing Control Panel: Potter Electric PFC-4410G3 with integral releasing circuit disable switch. [Default is NO panel]
4. Tank-Mounted Air Compressor: 1/2 HP, 1 HP, or 1.5 HP/115 or 220 VAC 60 Hz/220 VAC 50 Hz [Default is NO compressor]
5. Air Devices: Nitrogen cylinder supply kit, nitrogen cylinder supply kit with B-1 accelerator, NS-ASAM, NS-ASAM with B-1 accelerator, B-1 accelerator only, desiccant kit, desiccant kit with B-1 accelerator, nitrogen generator, nitrogen generator with B-1 accelerator [Default is Model A Pressure Maintenance Device only, or NO Device for Deluge Systems]

**Notes:**

1. Refer to technical bulletin 718 for solenoid valve information.
2. Customer supplied releasing control panels must be compatible with Reliable supplied solenoid valves and must incorporate a method of temporarily disabling the releasing circuit for testing.
3. Selection of air compressor is based upon system capacity, system pressure, and allowable fill time. Refer to technical bulletin 256 for 1/2 HP and 1 HP (QRM2) air compressors; refer to General Air Products for 1-1/2 HP (OL915150AC) air compressor.
4. Refer to technical bulletin 254 for additional information on nitrogen cylinder supply kit and NS-ASAM multiple-source panel.
5. Refer to technical bulletin 323 for additional information on Model B-1 accelerator.
6. Refer to publication SouthTek Operation Manual for additional information on nitrogen generator.
7. Air compressor sizes for units equipped with nitrogen generator are limited to 1/2 and 1 HP only, 110 or 220 VAC 60 Hz only.

## Installation

Reliable Model DDX PrePaKs shall be installed in accordance with NFPA 13, “Standard for the Installation of Sprinkler Systems,” as well as the requirements of any authorities having jurisdiction. Failure to follow installation instructions and/or revisions to the product may void the warranty and listing of the system. Verify compatibility of the Model DDX PrePaK materials with the water supply and the environment where the product will be installed prior to installation. The Model DDX PrePaK valve must be installed in a location where the temperature is maintained as a minimum of 40°F (4°C). Heat tracing of components is not permitted. Drain should be piped to a location that will avoid damage to property and injury to personnel.

Design and installation of the detection and release system must be performed in accordance with applicable NFPA standards and the authority having jurisdiction.

Additional maintenance information can be found on the Installation, Operation, and Maintenance Manual (Bulletin 761).

## Maintenance

The owner is responsible for maintaining the fire protection system in proper operating condition. Any system maintenance or testing that involves placing a control valve or detection/control system out of service may eliminate the fire protection that is provided by the fire protection system. The Reliable Model DDX PrePaK and associated equipment shall periodically be given a thorough inspection and test. NFPA 25, “Inspection, Testing and Maintenance of Water Based Fire Protection Systems,” provides minimum maintenance requirements. System components shall be tested, operated, cleaned, and inspected at least annually, and parts replaced as required.

Additional maintenance information can be found on the Installation, Operation, and Maintenance Manual (Bulletin 761).

## Guarantee

For Reliable Automatic Sprinkler Co., Inc. guarantee, terms, and conditions, visit www.reliablesprinkler.com.

## Ordering Information

See next page. Replace alpha character in the table header with appropriate option selection in the related column to create the 10-digit production number.

**Example:**

*PN 6554221290* would define a PrePaK (655; first three digits) that is 4” in size (U = 4) with a Type F double interlock system (V = 2) fitted with a 300-psi solenoid valve (W = 2), a Potter PFC-4410G3 control panel (X = 1), a 1 HP 115VAC 60HZ compressor (Y = 1 from lower section since Z = 9), an FPS-900 nitrogen generator with B-1 accelerator (Z = 9). The final character (0) is withheld for future use.

For assistance with option selection and configuration of production part number, please contact your local Reliable sales representative.

**Note:** Each Reliable Automatic Sprinkler Company PrePaK™ is custom manufactured to specific customer requirements. Field modifications that affect functionality of the system, including but not limited to altering the system type, adding devices or components, and removing factory installed devices or components, are strictly prohibited unless approved and/or performed by a Reliable Automatic Sprinkler Company authorized representative. Non-approved modifications performed by unauthorized personnel may void all guarantees, warranties, listings, and approvals.

## Reliable PrePaK™ Part Number Configurator (Standard Units)

| PrePaK | Size[1] | System Type | Solenoid[2][3] | Release Control Panel[5] | Air Compressor[6][7] | Air Devices[9][10] | Future |
|---|---|---|---|---|---|---|---|
| 655 | U | V | W | X | Y | Z | 0 |
| | 2 = 2" | 1 = Type D Single/ Double Interlock Preaction | 0 = Not required | 0 = No control panel | 0 = None[8] | 0 = Model A PMD (or None for Deluge) | |
| | 0 = 2-1/2" | 2 = Type F Double Interlock Preaction | 1 = 175 psi rated | 1 = Potter PFC-4410G3 | 1 = 1/2 hp 115vac 60hz QRM2-50115T | 1 = Nitrogen cylinder supply kit | |
| | 3 = 3" | 3 = DDX LP (Low Pressure) Dry | 2 = 300 psi rated | 2 = Potter PFC-4410G3 with RLY-5 module | 2 = 1 hp 115vac 60hz QRM2-100115T | 2 = Nitrogen cylinder supply kit & B-1 accelerator | |
| | 4 = 4" | 4 = Wet Pilot Line Deluge | 5 = 175 psi rated with coil supervisory switch[4] | 3 = Potter PFC-4410G3 with IDC-6 module | 3 = 1-1/2 hp 115vac 60hz GAP OL915150AC | 3 = NS-ASAM | |
| | 6 = 6" | 5 = Dry Pilot Line Deluge | 6 = 300 psi rated with coil supervisory switch[4] | 4 = Potter PFC-4410G3 with CA-4064 module | 4 = 1/2 hp 220vac 60hz QRM2-50220T | 4 = NS-ASAM & B-1 accelerator | |
| | 8 = 8" | 6 = Electric Release Deluge | | 5 = Potter PFC-4410G3 with IDC-6 & CA-4064 modules | 5 = 1 hp 220vac 60hz QRM2-100220T | 5 = B-1 accelerator | |
| | A = 2" with system side control valve | 7 = Single Interlock Dry Pilot Line | | 6 = Potter PFC-4410G3 with CA-4064 & RLY-5 modules | 6 = 1-1/2 hp 220vac 60hz GAP OL915150AC | 6 = Desiccant Kit | |
| | B = 2-1/2" with system side control valve | 8 = Single Interlock Wet Pilot Line | | 7 = Potter PFC-4410G3 with IDC-6 & RLY-5 modules | 7 = 1/2 hp 220vac 50hz QRM2-50220T-50hz | 7 = Desiccant Kit & B-1 accelerator | |
| | C = 3" with system side control valve | 9 = Type PL Double Interlock | | | 8 = 1 hp 220vac 50hz QRM2-100220T-50hz | **Note:** Model A Pressure Maintenance is provided for all Air Device (Z) options except for deluge systems. | |
| | D = 4" with system side control valve | C = Non-Interlock | | | 9 = 1-1/2 hp 220vac 50hz GAP OL2870150AC-50 | | |
| | E = 6" with system side control valve | D = DDX-LP to Type F Preaction Convertible | | | | | |
| | F = 8" with system side control valve | | | | | | |

**Notes:**

1. Manifold size may differ from system size. Customer to confirm size of supply pipe to PrePaK™ and provide appropriate transition fittings/couplings if necessary (see pages 2 and 3 of this document).
2. "W" must be "0" when "V" is 3, 4, 5, 7, 8, or 9. (Solenoid valve is only used with system types 1, 2, 6, C, and D.)
3. Reference technical bulletin 718 for solenoid model numbers and details.
4. cULus listed Potter Electric Signal Company CoilKeeper™. (In accordance with NFPA 13 2019 edition, effective January 1, 2021, all systems incorporating an electric solenoid shall be capable of providing an audible and visual indication of system impairment should the actuator be removed from the deluge or preaction system trim.)
5. If "0 = None" option is selected, customer to provide separate UL and/or FM release control panel for systems utilizing electric solenoid release. Panel must be compatible with the Parker Hannifin solenoid valve provided with the unit and include a method to temporarily disable the releasing circuit for testing.
6. Air compressor is not used when "V" (system type) is 4 or 6 (deluge wet pilot and deluge electric).
7. Air compressor selection depends on system size and normal system pressure; customer to specify.
8. If "0 = None" option is selected, customer to provide separate compressed air or nitrogen source.
9. Use "0 = Model A PMD" for systems utilizing a separate compressor or separate nitrogen generator. Connect to inlet side of Model A Pressure Maintenance Device. **Note:** Compressor or nitrogen generator must incorporate a tank.
10. Air device "Z" options 2, 4, 5, and 7 (B-1 accelerator) is not available when system type "V" is 1, 4, 5, 6, 7, or 8. Accelerator is only used with Type F Double Interlock, DDX-LP Low Pressure Dry, Type PL Double Interlock, Non-Interlock, and DDX-LP to Type F Convertible Systems.

**Optional Seismic Kit (order separately):** Seismic upgrade kit, Reliable part number 6501200041 (for 30" x 33" cabinet; up to and including 4" systems) or part number 6501200042 (for 25" x 28.3" cabinet; 6" and 8" systems) is required to make the Reliable PrePaK OSHPD compliant. One kit is required for each PrePaK (reference Caution Sheet 331).

## Reliable PrePaK™ Part Number Configurator (Units Equipped with Nitrogen Generator)

| PrePaK | Size[1] | System Type | Solenoid[2][3] | Release Control Panel[5] | Air Compressor[6] | Air Devices[8][9] | Future |
|---|---|---|---|---|---|---|---|
| 655 | U | V | W | X | Y | Z | 0 |
| | 2 = 2" | 1 = Type D Single/ Double Interlock Preaction | 0 = Not required | 0 = No control panel | 0 = None[7] | 8 = FPS 900 nitrogen generator | |
| | 0 = 2-1/2" | 2 = Type F Double Interlock Preaction | 1 = 175 psi rated | 1 = Potter PFC-4410G3 | 1 = 1/2 hp 115vac 60hz QRM2-50115T | 9 = FPS 900 nitrogen generator & B-1 accelerator | |
| | 3 = 3" | 3 = DDX LP (Low Pressure) Dry | 2 = 300 psi rated | 2 = Potter PFC-4410G3 with RLY-5 module | 2 = 1 hp 115vac 60hz QRM2-100115T | | |
| | 4 = 4" | 4 = DDX-LP to Type F Preaction Convertible | 5 = 175 psi rated with coil supervisory switch[4] | 3 = Potter PFC-4410G3 with IDC-6 module | 3 = 1/2 hp 220vac 60hz QRM2-50220T | | |
| | 6 = 6" | | 6 = 300 psi rated with coil supervisory switch[4] | 4 = Potter PFC-4410G3 with CA-4064 module | 4 = 1 hp 220vac 60hz QRM2-100220T | | |
| | A = 2" with system side control valve | | | 5 = Potter PFC-4410G3 with IDC-6 & CA-4064 modules | | | |
| | B = 2-1/2" with system side control valve | | | 6 = Potter PFC-4410G3 with CA-4064 & RLY-5 modules | | | |
| | C = 3" with system side control valve | | | 7 = Potter PFC-4410G3 with IDC-6 & RLY-5 modules | | | |
| | D = 4" with system side control valve | | | | | | |
| | E = 6" with system side control valve | | | | | | |

**Notes:**

1. Manifold size may differ from system size. Customer to confirm size of supply pipe to PrePaK™ and provide appropriate transition fittings/couplings if necessary (see pages 2 and 3 of this document).
2. "W" must be "0" when "V" is 3. (Solenoid valve is only used with system types 1, 2, and 4.)
3. Reference technical bulletin 718 for solenoid model numbers and details.
4. cULus listed Potter Electric Signal Company CoilKeeper™. (In accordance with NFPA 13 2019 edition, effective January 1, 2021, all systems incorporating an electric solenoid shall be capable of providing an audible and visual indication of system impairment should the actuator be removed from the deluge or preaction system trim.)
5. If "0 = None" option is selected, customer to provide separate UL and/or FM release control panel for systems utilizing electric solenoid release. Panel must be compatible with the Parker Hannifin solenoid valve provided with the unit and include a method to temporarily disable the releasing circuit for testing.
6. Air compressor selection depends on system size and normal system pressure; customer to specify.
7. If "0 = None" option is selected, customer to provide separate compressed air source.
8. Air device "Z" option 9 (B-1 accelerator) is not available when system type "V" is 1. Accelerator is only used with Type F double interlock, DDX-LP, and DDX-LP to TYpe F Convertible systems .
9. One N2-Blast AutoPurge® and one Quick-Check® Portable Nitrogen Purity Sensor device is included with each PrePaK™ that incorporates a nitrogen generator.

**Optional Seismic Kit (order separately):** Seismic upgrade kit, Reliable part number 6501200042 is required to make the Reliable N2Blast PrePaK OSHPD compliant. One kit is required for each PrePaK (reference Caution Sheet 331).

# IDENTIFACTION SIGNS


FDC




Edit Sign

**Item #:** 25722-FPW

**Sign Reads:** Fire Pump Room

**Sign Design:** Text Size 1.5" High With 0.25" Stroke

Other configurations of this product are LEED Compliant and ECCN Certification.

Data Sheet

# Fire Pump Room Sign

★★★★★ 8 Reviews

**Size:**

12" Square | 18" Square

**Material:**

- ○ 3.5 Mil Peel and Stick Vinyl Label
- ○ .055" Polyethylene Plastic
- ○ .040" Rust-Free Aluminum
- ○ .040" Engineering Grade Reflective Aluminum
- ○ .040" High Intensity Prismatic Reflective Aluminum
- ◉ .040" Diamond Grade Reflective Aluminum

**Laminate:** None

**Mounting:** Four 7/32" holes (one in each corner)




Edit Sign

| | |
|---|---|
| **Item #:** | 25777 |
| **Sign Reads:** | Normally Closed |
| **Compliance:** | NFPA |

# Normally Closed Sign

***NFPA 13 Compliant***

★★★★★ 2 Reviews

**Size:** 6 × 2"

**Material:** .020" Rust-Free Aluminum

**Mounting:** Four 7/32" holes (one in each corner)

**Packaging:** Sold Individually




# Normally Open Sign

***NFPA 13 Compliant***

★★★★★ 2 Reviews

**Size:** 6 × 2"

Edit Sign

**Item #:** 25778

**Sign Reads:** Normally Open

**Compliance:** NFPA

**Material:** .020" Rust-Free Aluminum

**Mounting:** Four 7/32" holes (one in each corner)

**Packaging:** Sold Individually




# Backflow Test Header Sign

Edit Sign

**Item #:** 25930-R1K

**Sign Reads:** Backflow Test Header

Other configurations of this product are ECCN Certification.

**Note: Text Heights:**
**For 10 x 7":** 1½"

**For 14 x 10":** 2"

**For 18 x 12":** 2½"

Data Sheet

**Size:**

7 × 5" | 10 × 7" | **14 × 10"** | 18 × 12"

**Material:**

- ○ 3.5 Mil InfiniStick™ Vinyl Label
- ○ .055" Polyethylene Plastic
- ○ .040" Rust-Free Aluminum
- ◉ .040" 3M Engineering Grade Reflective Aluminum

**Mounting:** Four 7/32" holes (one in each corner)

**Packaging:** Sold Individually




Design Your Own Sign

**Item #:** 25752

**Sign Reads:** Main Drain

**Compliance:** NFPA

# Main Drain Sign

***NFPA 13 Compliant***

**Size:** 6 × 2"

**Material:** .020" Rust-Free Aluminum

**Mounting:** Four 7/32" holes (one in each corner)

**Packaging:** Sold Individually




Design Your Own Sign

**Item #:** 25760

**Sign Reads:** Fire Sprinkler Control Valve

**Compliance:** NFPA

# Fire Sprinkler Control Valve Sign

***NFPA 13 Compliant***

★★★★★ 2 Reviews

**Size:** 6 × 2"

**Material:** .020" Rust-Free Aluminum

**Mounting:** Four 7/32" holes (one in each corner)

**Packaging:** Sold Individually

S&S
CONTRACTORS – ENGINEERS

SHAMBAUGH & SON, L.P.
7614 OPPORTUNITY DRIVE
FORT WAYNE, IN 46825

24 HOUR SERVICE •• 888-217-7055

**HYDRAULIC DESIGN INFORMATION:**

AS SHOWN ON PRINT NO. FP4.01 DATED: 10/14/20

PROJECT: ___

ADDRESS: ___

FOR REFERNCE ONLY

SYSTEM NO. _____ CONTRACT NO. 227020

IS DESIGNED FOR 12 SPRINKLERS TO DISCHARGE AT A STARTING PRESSURE OF 52 P.S.I. WHEN SUPPLIED WITH WATER AT A RATE OF 1460.63 G.P.M. AT A PRESSURE OF 122.43 P.S.I.

AT BASE OF RISER

"K" FACTOR: 16.8 ORIFICE: 3/4" TEMPERATURE: 205°F

HOSE ALLOWANCE: 250

OCCUPANCY CLASS: S-1

**GENERAL INFORMATION:**

[X] YES [ ] NO HIGH PILED/RACK STORAGE PRESENT

COMMODITY CLASS: I-IV

MAX. STORAGE HEIGHT: 35'-0" AISLE WIDTH: 4'-0"

[ ] YES [X] NO ENCAPSULATED PALLET LOADS PRESENT
[ ] YES [X] NO SOLID SHELVING STORAGE PRESENT
[ ] YES [X] NO FLAMMABLE/COMBUSTIBLE LIQUIDS PRESENT
[ ] YES [X] NO HAZARDOUS MATERIALS PRESENT
[X] YES [ ] NO OTHER SPECIAL STORAGE PRESENT

IF SO, EXPLAIN: CARTONED UNEXPANDED GRP-A PLASTICS

**FLOW TEST DATA:** DATE OF TEST: 8/24/20

STATIC PSI: 50 RESIDUAL PSI: 40 FLOW GPM: 1211

LOCATION OF TEST: 650 E. OWENS AVE.

**ORIGINAL MAIN DRAIN TEST RESULTS:**

STATIC PSI: _____ RESIDUAL PSI: _____

**AUX OR LOW POINT DRAINS** [X] YES [ ] NO

LOCATION: AT LOW POINTS & SECONDARY MAINS

**DRY OR PRE-ACTION SYSTEMS** [ ] YES [X] NO

TRIP POINT AIR PSI: _____ WATER TO REACH TEST OUTLET SEC: _____

**VENTING VALVE PRESENT** [X] YES [ ] NO

LOCATION: HIGH POINT OF SYSTEM

**SYSTEM TO TREAT MIC/CORROSION** [ ] YES [X] NO

CHEMICAL: _____ CONCENTRATION: _____

SPRINKLER HEAD LIST

| | |
|---|---|
| FACILITY: | DLV7 |
| LOCATION: | 650 E. Owens Ave. |
| ISSUE OR REVISION DATE: | 5/4/2021 |
| SHAMBAUGH & SON JOB #: | 227020 |

*SHAMBAUGH & SON, LP*
*FIRE PROTECTION DIVISION*
*LAS VEGAS, NEVADA*
*702-832-4545*

| GENERAL DESCRIPTION | TEMP | SIN# | QTY. | GENERAL DESCRIPTION | TEMP | SIN# | QTY. |
|---|---|---|---|---|---|---|---|
| 16.8K ESFR BASS PEN. | 205°F | VK503 | 24 | 11.2K SR BRASS PEN. | 200°F | VK530 | 2 |
| 5.6K QR EC CHROME PEN. | 155°F | VK600 | 3 | 11.2K QR BRASS PEN. | 200°F | VK531 | 2 |
| 5.6K QR CHROME PEN. | 155°F | VK3021 | 3 | | | | |
| 5.6K QR BRASS UPR. | 200°F | VK3001 | 12 | | | | |
| HEAD WRENCH # 13635W/B, 20901M/B, 21475M/B | | | | HEAD WRENCH # 05118CW/B | | | |

TRIM ON DASHED LINES

FOR REFERNCE ONLY