

**Design No. D904**  
**BXUV.D904**  
**Fire-resistance Ratings - ANSI/UL 263**

**Design/System/Construction/Assembly Usage Disclaimer**

Authorities Having Jurisdiction should be consulted in all cases as to the particular requirements covering the installation and use of UL Certified products, equipment, systems, devices, and materials.

Fire resistance assemblies and products are developed by the design submitter and have been investigated by UL for compliance with applicable requirements. The published information cannot always address every construction nuance encountered in the field.

When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specific concerning alternate materials and alternate methods of construction.

Only products which bear the UL Mark are considered Certified.

1-1/2, 2, 3	1	W1029	9/16
1-1/2, 2, 3	1-1/2	W828	3/4
1-1/2, 2	1	W828	1/2

ISOLATEK INTERNATIONAL – Type D-CF, HP or Type II, Type EBS or Type X adhesive/sealant is optional.

7. **Shear-Connector Studs** – Optional – Studs, 3/4 in. diam by 3 in. long headed type or equivalent per AISC specifications. Welded to the top flange of the beam through the steel form units.

\* Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.

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**BXUV - Fire Resistance Ratings - ANSI/UL 263**

**BXUV7 - Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada**

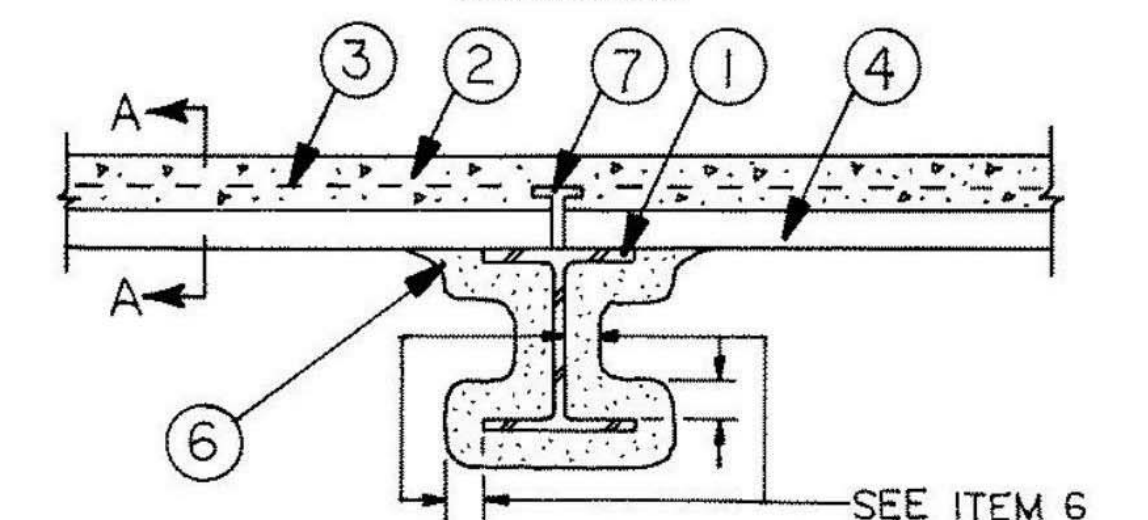
See General Information for Fire Resistance Ratings - ANSI/UL 263  
See General Information for Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada

**Design No. D904**

November 18, 2014  
Restrained Assembly Ratings – 1-1/2, 2 and 3 Hr. (See Items 2 and 6)  
Unrestrained Assembly Rating – 3/4 and 1-1/2 Hr. (See Item 4)  
Unrestrained Beam Rating – 1, 1-1/2 Hr. (See Item 6)

This design was evaluated using a load design method other than the Limit States Design Method (e.g., Working Stress Design Method). For jurisdictions employing the Limit States Design Method, such as Canada, a load restriction factor shall be used – See Guide BXUV or BXUV7.

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**Design No. LS21**  
**BXUV.L21**  
**Fire-resistance Ratings - ANSI/UL 263**

**Design/System/Construction/Assembly Usage Disclaimer**

Authorities Having Jurisdiction should be consulted in all cases as to the particular requirements covering the installation and use of UL Certified products, equipment, systems, devices, and materials.

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When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specific concerning alternate materials and alternate methods of construction.

Only products which bear the UL Mark are considered Certified.

**BXUV - Fire Resistance Ratings - ANSI/UL 263**

**BXUV7 - Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada**

See General Information for Fire Resistance Ratings - ANSI/UL 263  
See General Information for Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada

**Design No. LS21**

December 12, 2014  
Unrestrained Assembly Rating – 1 Hr  
Unrestrained Beam Rating – 25 Min (See Items 5 and 8)

This design was evaluated using a load design method other than the Limit States Design Method (e.g., Working Stress Design Method). For jurisdictions employing the Limit States Design Method, such as Canada, a load restriction factor shall be used – See Guide BXUV or BXUV7.

\* Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.

**SEC.A.A**

Restrained Assembly Rating	Concrete (Type)	1.5 in. deep Deck Concrete Thickness (in.)	3.0 in. deep Deck Concrete Thickness (in.)
1-1/2	NW	3-1/4	3-1/4
2	NW	3-1/4	3-1/4
2	SLW	3-1/2	3
2	LW	3	2-1/2
3	NW	5-1/4	4-3/4
3	LS	3-3/4	3-1/4
3	NW	4-1/2	4

1. **Beam** – W10x29 or W10x23, min size. (See Item 6).

2. **Normal Weight, Lightweight or Semi-Lightweight Concrete** – Normal weight concrete, carbonate or siliceous aggregate, 147 psi unit weight, 3500 psi compressive strength. Lightweight concrete, expanded shale, clay or slate aggregate by weight with method or equivalent dry or fresh aggregate bulk specific gravity, 115 lb/cu ft. Minimum 28-day compressive strength. Semi-Lightweight concrete, consisting of lightweight aggregate as described above and carbonate or siliceous normal weight aggregate, 130 pcf, 3500 psi compressive strength. Concrete thickness measured from the top of the cast-in-place deck.

3. **Spray-Applied Fire Resistive Materials** – Applied by mixing with water and spraying in more than one coat to steel beam surfaces which are clean and free of dirt, loose scale, and oil. Min average and min individual density of 15 and 14 pcf, respectively. For Type 3000K, 300K, 300S, 300NS, 300N, 300A, 300C, 300D, 300E, 300F, 300G, 300H, 300I, 300J, 300K, 300L, 300M, 300N, 300O, 300P, 300Q, 300R, 300S, 300T, 300U, 300V, 300W, 300X, 300Y, 300Z, 300AA, 300AB, 300AC, 300AD, 300AE, 300AF, 300AG, 300AH, 300AI, 300AJ, 300AK, 300AL, 300AM, 300AN, 300AO, 300AP, 300AQ, 300AR, 300AS, 300AT, 300AU, 300AV, 300AW, 300AX, 300AY, 300AZ, 300BA, 300BB, 300BC, 300BD, 300BE, 300BF, 300BG, 300BH, 300BI, 300BJ, 300BK, 300BL, 300BM, 300BN, 300BO, 300BP, 300BQ, 300BR, 300BS, 300BT, 300BU, 300BV, 300BW, 300BX, 300BY, 300BZ, 300CA, 300CB, 300CC, 300CD, 300CE, 300CF, 300CG, 300CH, 300CI, 300CJ, 300CK, 300CL, 300CM, 300CN, 300CO, 300CP, 300CQ, 300CR, 300CS, 300CT, 300CU, 300CV, 300CW, 300CX, 300CY, 300CZ, 300DA, 300DB, 300DC, 300DD, 300DE, 300DF, 300DG, 300DH, 300DI, 300DJ, 300DK, 300DL, 300DM, 300DN, 300DO, 300DP, 300DQ, 300DR, 300DS, 300DT, 300DU, 300DV, 300DW, 300DX, 300DY, 300DZ, 300EA, 300EB, 300EC, 300ED, 300EE, 300EF, 300EG, 300EH, 300EI, 300EJ, 300EK, 300EL, 300EM, 300EN, 300EO, 300EP, 300EQ, 300ER, 300ES, 300ET, 300EU, 300EV, 300EW, 300EX, 300EY, 300EZ, 300FA, 300FB, 300FC, 300FD, 300FE, 300FF, 300FG, 300FH, 300FI, 300FJ, 300FK, 300FL, 300FM, 300FN, 300FO, 300FP, 300FQ, 300FR, 300FS, 300FT, 300FU, 300FV, 300FW, 300FX, 300FY, 300FZ, 300GA, 300GB, 300GC, 300GD, 300GE, 300GF, 300GG, 300GH, 300GI, 300GJ, 300GK, 300GL, 300GM, 300GN, 300GO, 300GP, 300GQ, 300GR, 300GS, 300GT, 300GU, 300GV, 300GW, 300GX, 300GY, 300GZ, 300HA, 300HB, 300HC, 300HD, 300HE, 300HF, 300HG, 300HH, 300HI, 300HJ, 300HK, 300HL, 300HM, 300HN, 300HO, 300HP, 300HQ, 300HR, 300HS, 300HT, 300HU, 300HV, 300HW, 300HX, 300HY, 300HZ, 300IA, 300IB, 300IC, 300ID, 300IE, 300IF, 300IG, 300IH, 300II, 300IJ, 300IK, 300IL, 300IM, 300IN, 300IO, 300IP, 300IQ, 300IR, 300IS, 300IT, 300IU, 300IV, 300IW, 300IX, 300IY, 300IZ, 300JA, 300JB, 300JC, 300JD, 300JE, 300JF, 300JG, 300JH, 300JI, 300JJ, 300JK, 300JL, 300JM, 300JN, 300JO, 300JP, 300JQ, 300JR, 300JS, 300JT, 300JU, 300JV, 300JW, 300JX, 300JY, 300JZ, 300KA, 300KB, 300KC, 300KD, 300KE, 300KF, 300KG, 300KH, 300KI, 300KJ, 300KL, 300KM, 300KN, 300KO, 300KP, 300KQ, 300KR, 300KS, 300KT, 300KU, 300KV, 300KW, 300KX, 300KY, 300KZ, 300LA, 300LB, 300LC, 300LD, 300LE, 300LF, 300LG, 300LH, 300LI, 300LJ, 300LK, 300LL, 300LM, 300LN, 300LO, 300LP, 300LQ, 300LR, 300LS, 300LT, 300LU, 300LV, 300LW, 300LX, 300LY, 300LZ, 300MA, 300MB, 300MC, 300MD, 300ME, 300MF, 300MG, 300MH, 300MI, 300MJ, 300MK, 300ML, 300MN, 300MO, 300MP, 300MQ, 300MR, 300MS, 300MT, 300MU, 300MV, 300MW, 300MX, 300MY, 300MZ, 300NA, 300NB, 300NC, 300ND, 300NE, 300NF, 300NG, 300NH, 300NI, 300NJ, 300NK, 300NL, 300NM, 300NO, 300NP, 300NQ, 300NR, 300NS, 300NT, 300NU, 300NV, 300NW, 300NX, 300NY, 300NZ, 300OA, 300OB, 300OC, 300OD, 300OE, 300OF, 300OG, 300OH, 300OI, 300OJ, 300OK, 300OL, 300OM, 300ON, 300OO, 300OP, 300OQ, 300OR, 300OS, 300OT, 300OU, 300OV, 300OW, 300OX, 300OY, 300OZ, 300PA, 300PB, 300PC, 300PD, 300PE, 300PF, 300PG, 300PH, 300PI, 300PJ, 300PK, 300PL, 300PM, 300PN, 300PO, 300PP, 300PQ, 300PR, 300PS, 300PT, 300PU, 300PV, 300PW, 300PX, 300PY, 300PZ, 300QA, 300QB, 300QC, 300QD, 300QE, 300QF, 300QG, 300QH, 300QI, 300QJ, 300QK, 300QL, 300QM, 300QN, 300QO, 300QP, 300QQ, 300QR, 300QS, 300QT, 300QU, 300QV, 300QW, 300QX, 300QY, 300QZ, 300RA, 300RB, 300RC, 300RD, 300RE, 300RF, 300RG, 300RH, 300RI, 300RJ, 300RK, 300RL, 300RM, 300RN, 300RO, 300RP, 300RQ, 300RR, 300RS, 300RT, 300RU, 300RV, 300RW, 300RX, 300RY, 300RZ, 300SA, 300SB, 300SC, 300SD, 300SE, 300SF, 300SG, 300SH, 300SI, 300SJ, 300SK, 300SL, 300SM, 300SN, 300SO, 300SP, 300SQ, 300SR, 300SS, 300ST, 300SU, 300SV, 300SW, 300SX, 300SY, 300SZ, 300TA, 300TB, 300TC, 300TD, 300TE, 300TF, 300TG, 300TH, 300TI, 300TJ, 300TK, 300TL, 300TM, 300TN, 300TO, 300TP, 300TQ, 300TR, 300TS, 300TT, 300TU, 300TV, 300TW, 300TX, 300TY, 300TZ, 300UA, 300UB, 300UC, 300UD, 300UE, 300UF, 300UG, 300UH, 300UI, 300UJ, 300UK, 300UL, 300UM, 300UN, 300UO, 300UP, 300UQ, 300UR, 300US, 300UT, 300UU, 300UV, 300UW, 300UX, 300UY, 300UZ, 300VA, 300VB, 300VC, 300VD, 300VE, 300VF, 300VG, 300VH, 300VI, 300VJ, 300VK, 300VL, 300VM, 300VN, 300VO, 300VP, 300VQ, 300VR, 300VS, 300VT, 300VU, 300VV, 300VW, 300VX, 300VY, 300VZ, 300WA, 300WB, 300WC, 300WD, 300WE, 300WF, 300WG, 300WH, 300WI, 300WJ, 300WK, 300WL, 300WM, 300WN, 300WO, 300WP, 300WQ, 300WR, 300WS, 300WT, 300WU, 300WV, 300WW, 300WX, 300WY, 300WZ, 300XA, 300XB, 300XC, 300XD, 300XE, 300XF, 300XG, 300XH, 300XI, 300XJ, 300XK, 300XL, 300XM, 300XN, 300XO, 300XP, 300XQ, 300XR, 300XS, 300XT, 300XU, 300XV, 300XW, 300XX, 300XY, 300XZ, 300YA, 300YB, 300YC, 300YD, 300YE, 300YF, 300YG, 300YH, 300YI, 300YJ, 300YK, 300YL, 300YM, 300YN, 300YO, 300YP, 300YQ, 300YR, 300YS, 300YT, 300YU, 300YV, 300YW, 300YX, 300YY, 300YZ, 300ZA, 300ZB, 300ZC, 300ZD, 300ZE, 300ZF, 300ZG, 300ZH, 300ZI, 300ZJ, 300ZK, 300ZL, 300ZM, 300ZN, 300ZO, 300ZP, 300ZQ, 300ZR, 300ZS, 300ZT, 300ZU, 300ZV, 300ZW, 300ZX, 300ZY, 300ZZ

4. **Steel Form and Form Units** – Composite. All 1-1/2 or 2 in. deep, 18 or 24 in. wide, 22 HSG min gully filled units. Welded to supports 12 in. O.C., max. Adhesive used before concrete. UL Mark should be considered to be Certified and covered under UL's Follow-Up Service. Always look for the Mark on the product.

5. **Joint Cover** – Optional – (Not shown) – 2 in. wide cloth adhesive tape applied following the contour of the steel form units or around the end of each open joint.

6. **Spray-Applied Fire Resistive Materials** – Applied by mixing with water and spraying in more than one coat to steel beam surfaces which are clean and free of dirt, loose scale, and oil. Min average and min individual density of 15 and 14 pcf, respectively. For Type 3000K, 300K, 300S, 300NS, 300N, 300A, 300C, 300D, 300E, 300F, 300G, 300H, 300I, 300J, 300K, 300L, 300M, 300N, 300O, 300P, 300Q, 300R, 300S, 300T, 300U, 300V, 300W, 300X, 300Y, 300Z, 300AA, 300AB, 300AC, 300AD, 300AE, 300AF, 300AG, 300AH, 300AI, 300AJ, 300AK, 300AL, 300AM, 300AN, 300AO, 300AP, 300AQ, 300AR, 300AS, 300AT, 300AU, 300AV, 300AW, 300AX, 300AY, 300AZ, 300BA, 300BB, 300BC, 300BD, 300BE, 300BF, 300BG, 300BH, 300BI, 300BJ, 300BK, 300BL, 300BM, 300BN, 300BO, 300BP, 300BQ, 300BR, 300BS, 300BT, 300BU, 300BV, 300BW, 300BX, 300BY, 300BZ, 300CA, 300CB, 300CC, 300CD, 300CE, 300CF, 300CG, 300CH, 300CI, 300CJ, 300CK, 300CL, 300CM, 300CN, 300CO, 300CP, 300CQ, 300CR, 300CS, 300CT, 300CU, 300CV, 300CW, 300CX, 300CY, 300CZ, 300DA, 300DB, 300DC, 300DD, 300DE, 300DF, 300DG, 300DH, 300DI, 300DJ, 300DK, 300DL, 300DM, 300DN, 300DO, 300DP, 300DQ, 300DR, 300DS, 300DT, 300DU, 300DV, 300DW, 300DX, 300DY, 300DZ, 300EA, 300EB, 300EC, 300ED, 300EE, 300EF, 300EG, 300EH, 300EI, 300EJ, 300EK, 300EL, 300EM, 300EN, 300EO, 300EP, 300EQ, 300ER, 300ES, 300ET, 300EU, 300EV, 300EW, 300EX, 300EY, 300EZ, 300FA, 300FB, 300FC, 300FD, 300FE, 300FG, 300FH, 300FI, 300FJ, 300FK, 300FL, 300FM, 300FN, 300FO, 300FP, 300FQ, 300FR, 300FS, 300FT, 300FU, 300FV, 300FW, 300FX, 300FY, 300FZ, 300GA, 300GB, 300GC, 300GD, 300GE, 300GF, 300GG, 300GH, 300GI, 300GJ, 300GK, 300GL, 300GM, 300GN, 300GO, 300GP, 300GQ, 300GR, 300GS, 300GT, 300GU, 300GV, 300GW, 300GX, 300GY, 300GZ, 300HA, 300HB, 300HC, 300HD, 300HE, 300HF, 300HG, 300HH, 300HI, 300HJ, 300HK, 300HL, 300HM, 300HN, 300HO, 300HP, 300HQ, 300HR, 300HS, 300HT, 300HU, 300HV, 300HW, 300HX, 300HY, 300HZ, 300IA, 300IB, 300IC, 300ID, 300IE, 300IF, 300IG, 300IH, 300II, 300IJ, 300IK, 300IL, 300IM, 300IN, 300IO, 300IP, 300IQ, 300IR, 300IS, 300IT, 300IU, 300IV, 300IW, 300IX, 300IY, 300IZ, 300JA, 300JB, 300JC, 300JD, 300JE, 300JF, 300JG, 300JH, 300JI, 300JJ, 300JK, 300JL, 300JM, 300JN, 300JO, 300JP, 300JQ, 300JR, 300JS, 300JT, 300JU, 300JV, 300JW, 300JX, 300JY, 300JZ, 300KA, 300KB, 300KC, 300KD, 300KE, 300KF, 300KG, 300KH, 300KI, 300KJ, 300KL, 300KM, 300KN, 300KO, 300KP, 300KQ, 300KR, 300KS, 300KT, 300KU, 300KV, 300KW, 300KX, 300KY, 300KZ, 300LA, 300LB, 300LC, 300LD, 300LE, 300LF, 300LG, 300LH, 300LI, 300LJ, 300LK, 300LL, 300LM, 300LN, 300LO, 300LP, 300LQ, 300LR, 300LS, 300LT, 300LU, 300LV, 300LW, 300LX, 300LY, 300LZ, 300MA, 300MB, 300MC, 300MD, 300ME, 300MF, 300MG, 300MH, 300MI, 300MJ, 300MK, 300ML, 300MN, 300MO, 300MP, 300MQ, 300MR, 300MS, 300MT, 300MU, 300MV, 300MW, 300MX, 300MY, 300MZ, 300NA, 300NB, 300NC, 300ND, 300NE, 300NF, 300NG, 300NH, 300NI, 300NJ, 300NK, 300NL, 300NM, 300NO, 300NP, 300NQ, 300NR, 300NS, 300NT, 300NU, 300NV, 300NW, 300NX, 300NY, 300NZ, 300OA, 300OB, 300OC, 300OD, 300OE, 300OF, 300OG, 300OH, 300OI, 300OJ, 300OK, 300OL, 300OM, 300ON, 300OO, 300OP, 300OQ, 300OR, 300OS, 300OT, 300OU, 300OV, 300OW, 300OX, 300OY, 300OZ, 300PA, 300PB, 300PC, 300PD, 300PE, 300PF, 300PG, 300PH, 300PI, 300PJ, 300PK, 300PL, 300PM, 300PN, 300PO, 300PP, 300PQ, 300PR, 300PS, 300PT, 300PU, 300PV, 300PW, 300PX, 300PY, 300PZ, 300QA, 300QB, 300QC, 300QD, 300QE, 300QF, 300QG, 300QH, 300QI, 300QJ, 300QK, 300QL, 300QM, 300QN, 300QO, 300QP, 300QQ, 300QR, 300QS, 300QT, 300QU, 300QV, 300QW, 300QX, 300QY, 300QZ, 300RA, 300RB, 300RC, 300RD, 300RE, 300RF, 300RG, 300RH, 300RI, 300RJ, 300RK, 300RL, 300RM, 300RN, 300RO, 300RP, 300RQ, 300RR, 300RS, 300RT, 300RU, 300RV, 300RW, 300RX, 300RY, 300RZ, 300SA, 300SB, 300SC, 300SD, 300SE, 300SF, 300SG, 300SH, 300SI, 300SJ, 300SK, 300SL, 300SM, 300SN, 300SO, 300SP, 300SQ, 300SR, 300SS, 300ST, 300SU, 300SV, 300SW, 300SX, 300SY, 300SZ, 300TA, 300TB, 300TC, 300TD, 300TE, 300TF, 300TG, 300TH, 300TI, 300TJ, 300TK, 300TL, 300TM, 300TN, 300TO, 300TP, 300TQ, 300TR, 300TS, 300TT, 300TU, 300TV, 300TW, 300TX, 300TY, 300TZ, 300UA, 300UB, 300UC, 300UD, 300UE, 300UF, 300UG, 300UH, 300UI, 300UJ, 300UK, 300UL, 300UM, 300UN, 300UO, 300UP, 300UQ, 300UR, 300US, 300UT, 300UU, 300UV, 300UW, 300UX, 300UY, 300UZ, 300VA, 300VB, 300VC, 300VD, 300VE, 300VF, 300VG, 300VH, 300VI, 300VJ, 300VK, 300VL, 300VM, 300VN, 300VO, 300VP, 300VQ, 300VR, 300VS, 300VT, 300VU, 300VV, 300VW, 300VX, 300VY, 300VZ, 300WA, 300WB, 300WC, 300WD, 300WE, 300WF, 300WG, 300WH, 300WI, 300WJ, 300WK, 300WL, 300WM, 300WN, 300WO, 300WP, 300WQ, 300WR, 300WS, 300WT, 300WU, 300WV, 300WW, 300WX, 300WY, 300WZ, 300XA, 300XB, 300XC, 300XD, 300XE, 300XF, 300XG, 300XH, 300XI, 300XJ, 300XK, 300XL, 300XM, 300XN, 300XO, 300XP, 300XQ, 300XR, 300XS, 300XT, 300XU, 300XV, 300XW, 300XX, 300XY, 300XZ, 300YA, 300YB, 300YC, 300YD, 300YE, 300YF, 300YG, 300YH, 300YI, 300YJ, 300YK, 300YL, 300YM, 300YN, 300YO, 300YP, 300YQ, 300YR, 300YS, 300YT, 300YU, 300YV, 300YW, 300YX, 300YZ, 300ZA, 300ZB, 300ZC, 300ZD, 300ZE, 300ZF, 300ZG, 300ZH, 300ZI, 300ZJ, 300ZK, 300ZL, 300ZM, 300ZN, 300ZO, 300ZP, 300ZQ, 300ZR, 3



**System No. W-L-1175**  
**F Ratings — 1 and 2 Hr (See Item 1)**  
**T Rating — 0 Hr**  
**L Rating at Ambient — Less Than 1 CFM/Sq Ft**  
**L Rating at 400 F — Less Than 1 CFM/Sq Ft**

1. Wall Assembly — The 1 or 2 hr fire-rated wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:  
**A. Studs** — Wall framing shall consist of either wood studs or channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 2-1/2 in. wide and spaced max 24 in. OC.  
**B. Gypsum Board** — Nom 5/8 in. thick, 4 ft wide with square or tapered edges. The gypsum wallboard type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual U300 or U400 Series Design in the Fire Resistance Directory. Max diam of opening is 5-1/2 in.  
The hourly F and T Ratings of the freestop system is equal to the hourly fire rating of the wall assembly in which it is installed.  
**2. Through Penetrant** — One metallic tubing or conduit installed concentrically or eccentrically within the freestop system. Tube or conduit to be rigidly supported on both sides of wall assembly. The annular space between the tube or conduit and periphery of the steel sleeve shall be min 0 in. (point contact) to max 1 in. The following types and sizes of metallic tube or conduit may be used:  
**A. Conduit** — Nom 4 in. diam (or smaller) steel electrical metallic tubing or conduit.  
**3. Fill, Void or Cavity Material** — Putty — Min 5/8 in. thickness of fill material applied within the annulus, flush with both surfaces of wall. At point contact location between penetrant and wall, a 1/4 in. crown of fill material shall be applied at the conduit/wall interface on both sides of the assembly, lagging 1/4 in. on the conduit and 1/4 in. beyond the periphery of the opening.  
HILTI INC — CS918 Putty Stick  
\*Beating the UL Classification Mark

Reproduced by HILTI, Inc. Courtesy of Underwriters Laboratories, Inc. February 08, 2006

**System No. W-L-1175**  
**F Ratings — 1 and 2 Hr (See Item 1)**  
**T Rating — 0 Hr**  
**L Rating at Ambient — Less Than 1 CFM/Sq Ft**  
**L Rating at 400 F — Less Than 1 CFM/Sq Ft**

1. Wall Assembly — The 1 or 2 hr fire-rated wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:  
**A. Studs** — Wall framing shall consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 2-1/2 in. wide and spaced max 24 in. OC.  
**B. Gypsum Board** — Nom 5/8 in. thick, 4 ft wide with square or tapered edges. The gypsum wallboard type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual U300 or U400 Series Design in the Fire Resistance Directory. Max diam of opening is 5-1/2 in.  
The hourly F and T Ratings of the freestop system is equal to the hourly fire rating of the wall assembly in which it is installed.  
**2. Through Penetrant** — One metallic tubing or conduit installed concentrically or eccentrically within the freestop system. Tube or conduit to be rigidly supported on both sides of wall assembly. The annular space between the tube or conduit and periphery of the steel sleeve shall be min 0 in. (point contact) to max 1 in. The following types and sizes of metallic tube or conduit may be used:  
**A. Conduit** — Nom 4 in. diam (or smaller) steel electrical metallic tubing or conduit.  
**3. Fill, Void or Cavity Material** — Putty — Min 5/8 in. thickness of fill material applied within the annulus, flush with both surfaces of wall. At point contact location between penetrant and wall, a 1/4 in. crown of fill material shall be applied at the conduit/wall interface on both sides of the assembly, lagging 1/4 in. on the conduit and 1/4 in. beyond the periphery of the opening.  
HILTI INC — CS918 Putty Stick  
\*Beating the UL Classification Mark

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**System No. W-L-1095**  
**F Ratings — 1 & 2 Hr (See Item 1)**  
**T Ratings — 1 & 2 Hr (See Item 3)**  
**L Rating at Ambient — Less Than 1 CFM/Sq Ft**  
**L Rating at 400 F — 4 CFM/Sq Ft**

1. Wall Assembly — The 1 or 2 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner described in the individual U300 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:  
**A. Studs** — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 2-1/2 in. wide and spaced max 24 in. OC.  
**B. Gypsum Board** — 5/8 in. thick, 4 ft wide with square or tapered edges. The gypsum wallboard type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual U300 or U400 Series Design in the UL Fire Resistance Directory. Max size of opening 2-5/8 in. by 18 in. The hourly F Rating of the freestop system is equal to the hourly fire rating of the wall assembly in which it is installed.  
**2. Electric Metallic Tubing (EMT)** — One or more nom 1 in. diam steel electric tubing. The annular space shall be min 1/2 in. to a max 1 in. Conduit to be rigidly supported on both sides of wall assembly.  
**3. Fill, Void or Cavity Material** — Sealant — For 2 hr F Rating, min 1/4 in. thickness of fill material applied within the annulus, flush with both surfaces of wall. For 1 hr F Rating, min 5/8 in. thickness of fill material applied within the annulus, flush with both surfaces of wall.  
HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — FS-One Sealant  
\*Beating the UL Classification Mark

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**System No. W-J-7112**  
**F Rating — 2 Hr**  
**FT Rating — 0 Hr**  
**FH Rating — 2 Hr**  
**FTH Rating — 0 Hr**

1. Wall Assembly — The 1 or 2 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner described in the individual U300 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:  
**A. Studs** — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 2-1/2 in. wide and spaced max 24 in. OC.  
**B. Gypsum Board** — 5/8 in. thick, 4 ft wide with square or tapered edges. The gypsum wallboard type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual U300 or U400 Series Design in the UL Fire Resistance Directory. Max size of opening 2-5/8 in. by 18 in. The hourly F Rating of the freestop system is equal to the hourly fire rating of the wall assembly in which it is installed.  
**2. Electric Metallic Tubing (EMT)** — One or more nom 1 in. diam steel electric tubing. The annular space shall be min 1/2 in. to a max 1 in. Conduit to be rigidly supported on both sides of wall assembly.  
**3. Fill, Void or Cavity Material** — Sealant — For 2 hr F Rating, min 1/4 in. thickness of fill material applied within the annulus, flush with both surfaces of wall. For 1 hr F Rating, min 5/8 in. thickness of fill material applied within the annulus, flush with both surfaces of wall.  
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**System No. W-L-1214**  
**F Rating — 1 Hr**  
**T Rating — 0 Hr**

1. Wall Assembly — The fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the Fire Resistance Directory and shall include the following construction features:  
**A. Studs** — Wall framing shall consist of either wood studs or channel shaped steel studs. Wood studs to consist of 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 2-1/2 in. wide, fabricated from min 25 MSG galvanized steel, spaced max 24 in. OC.  
**B. Wallboard, Gypsum** — One layer of nom 5/8 in. gypsum wallboard, as specified in the individual Wall and Partition Design. Max diam of opening is 2 in.  
**2. Through Penetrants** — Flexible Steel Conduit — Nom 1 in. diam (or smaller) flexible steel conduit. Max one conduit to be installed either concentrically or eccentrically within the freestop system. The annular space between pipe and periphery of opening shall be min 0 in. (point contact) to max 3/4 in. Conduit to be rigidly supported on both sides of floor or wall assembly.  
See Flexible Metal Conduit (DMZ) category in the Electrical Construction Materials Directory for names of manufacturers.  
**3. Fill, Void or Cavity Material** — Sealant — Min 5/8 in. thickness of fill material applied within annulus flush with both surfaces of wall. At point contact location between conduit and wall, a min 1/2 in. bead of fill material shall be applied at the conduit/wallboard interface on both sides of wall.  
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**System No. W-L-1214**  
**F Rating — 1 Hr**  
**T Rating — 0 Hr**

1. Wall Assembly — The fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the Fire Resistance Directory and shall include the following construction features:  
**A. Studs** — Wall framing shall consist of either wood studs or channel shaped steel studs. Wood studs to consist of 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 2-1/2 in. wide, fabricated from min 25 MSG galvanized steel, spaced max 24 in. OC.  
**B. Wallboard, Gypsum** — One layer of nom 5/8 in. gypsum wallboard, as specified in the individual Wall and Partition Design. Max diam of opening is 2 in.  
**2. Through Penetrants** — Flexible Steel Conduit — Nom 1 in. diam (or smaller) flexible steel conduit. Max one conduit to be installed either concentrically or eccentrically within the freestop system. The annular space between pipe and periphery of opening shall be min 0 in. (point contact) to max 3/4 in. Conduit to be rigidly supported on both sides of floor or wall assembly.  
See Flexible Metal Conduit (DMZ) category in the Electrical Construction Materials Directory for names of manufacturers.  
**3. Fill, Void or Cavity Material** — Sealant — Min 5/8 in. thickness of fill material applied within annulus flush with both surfaces of wall. At point contact location between conduit and wall, a min 1/2 in. bead of fill material shall be applied at the conduit/wallboard interface on both sides of wall.  
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**System No. W-L-1148**  
**F Rating — 1 and 2 Hr (See Item 1)**  
**T Rating — 0 Hr**  
**FH Rating — 1 and 2 Hr (See Item 1)**  
**FTH Rating — 0 Hr**

1. Wall Assembly — The fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the Fire Resistance Directory and shall include the following construction features:  
**A. Studs** — Wall framing shall consist of either wood studs or channel shaped steel studs. Wood studs to consist of 2 by 4 in. (51 by 102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 2-1/2 in. (64 mm) wide, fabricated from min 25 MSG galvanized steel, spaced max 24 in. (610 mm) OC.  
**B. Gypsum Board** — 5/8 in. (16 mm) thick, 4 ft (1219 mm) wide with square or tapered edges. The gypsum wallboard type, number of layers and sheet orientation shall be as specified in the individual U300 or U400 Series Designs in the UL Fire Resistance Directory. Max diam of opening is 1 3/4 in. (38 mm).  
The hourly F Rating of the freestop system is equal to the hourly fire rating of the wall assembly in which it is installed.  
**2. Through Penetrants** — One metallic pipe, conduit or tubing to be installed either concentrically or eccentrically within the freestop system. Pipe, conduit or tubing to be rigidly supported on both sides of the assembly. The following types and sizes of metallic pipes, conduits or tubing may be used:  
**A. Steel Pipe** — Nom 8 in. (203 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.  
**B. Iron Pipe** — Nom 8 in. (203 mm) diam (or smaller) cast or ductile iron pipe.  
**C. Conduit** — Nom 4 in. (102 mm) diam (or smaller) steel electrical metallic tubing or steel conduit.  
**D. Pipe** — Nom 2 in. (51 mm) thick hollow cylindrical heavy duty (min 3.5 pcf or 96 kg/m<sup>3</sup>) fiberglass pipe covering with an all service jacket. Pipe covering material to be min 9/16 in. long and installed on penetrant to extend 2 in. (51 mm) beyond both sides of wall surface. Longitudinal joints sealed with metal fasteners or factory-applied self-sealing lap (SSL) tape. The annular space between the pipe covering and periphery of opening shall be min 0 in. (point contact) to max 3/8 in. (10 mm).  
**E. Fire, Void or Cavity Material** — Sealant — In 1 hr assemblies, min 5/8 in. (16 mm) thickness of fill material applied within annulus flush with both surfaces of wall. In 2 hr assemblies, min 1/4 in. (32 mm) thickness of fill material applied within annulus flush with both surfaces of wall. For both 1 and 2 hr assemblies, at point contact location between insulation and gypsum, a min 1/2 in. (13 mm) bead of fill material shall be applied on both sides of wall.  
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**System No. W-J-7112**  
**F Rating — 2 Hr**  
**FT Rating — 0 Hr**  
**FH Rating — 2 Hr**  
**FTH Rating — 0 Hr**

1. Wall Assembly — Min 6 in. (152 mm) thick reinforced lightweight or normal weight 100-150 pcf (1600-2400 kg/m<sup>3</sup>) concrete. Wall may also be constructed of any UL Classified Concrete Blocks. Max area of opening is 78.2 sq ft (7 m<sup>2</sup>) with a max width of 105-1/2 in. (2.7 m). See Concrete Blocks (CAZT) category in the Fire Resistance Directory for names of manufacturers.  
**2. Steel Duct** — Max 100 by 100 in. (2.5 by 2.5 m) steel duct to be installed within the framed opening. The duct shall be constructed and reinforced in accordance with SMACNA construction standards. Steel duct to be rigidly supported on both sides of wall assembly.  
**3. Balls and Blankets** — Nom 1-1/2 x 2 in. (38 or 51 mm) thick glass ball or blanket (min 3/4 pcf or 12 kg/m<sup>3</sup>) protected on the outside with a 3/8 in. (9.5 mm) thick longitudinal and transverse joints sealed with aluminum foil tape. During the installation of the fill material, the ball or blanket shall be compressed minimum 50% such that the annular space within the freestop system shall be min 1/2 in. (13 mm) to max 2 in. (51 mm).  
**4. Firestop System** — The freestop system shall consist of the following:  
**A. Packing Material** — Min 4 pcf (84 kg/m<sup>3</sup>) mineral wool ball insulation firmly packed into opening as a permanent form. Packing material to be recessed from both surfaces of wall to accommodate the required thickness of fill material.  
**B. Fire, Void or Cavity Material** — Sealant — Min 5/8 in. (16 mm) thickness of fill material applied within annulus, flush with both surfaces of wall.  
**C. Steel Rating Angles** — Min No. 16 gauge (0.059 in. or 1.5 mm) galv steel angles sized to lap steel duct a min of 1 in. (25 mm) and lap wall surfaces a min of 2 in. (51 mm). Angles attached to steel duct with min 1 in. (25 mm) long end screws spaced a max of 1 in. (25 mm) from each end of steel duct and spaced a max of 6 in. (152 mm) OC. When max duct dimension does not exceed 48 in. (1220 mm) and duct area does not exceed 1300 in<sup>2</sup> (837 cm<sup>2</sup>), angles may be min No. 16 gauge galv steel. Angles attached to steel duct on both sides of wall with min 1 in. (25 mm) long end screws located a max of 1 in. (25 mm) from each end of steel duct and spaced a max of 6 in. (152 mm) OC. When max 1-1/2 in. (38 mm) thick insulation is used, steel angles are optional for those sides of duct that do not exceed the dimension specified in Table below, dependent on packing material and annular space as specified.

Max Duct Dimension	Duct Thickness	Annular Space	Packing Material	Angle (Min) Required
24 in. (610 mm)	24 ga or heavier	1/2 in. min to 1 in. max (13 to 25 mm)	Item 3A1	No

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**System No. W-L-1243**  
**F Rating — 1 and 2 Hr (See Item 1)**  
**T Rating — 0 Hr**  
**L Rating at Ambient — 5 CFM/Sq Ft**  
**L Rating at 400 F — Less Than 1 CFM/Sq Ft**

1. Wall Assembly — The 1 or 2 hr fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400 or U400 Series Wall and Partition Designs in the Fire Resistance Directory and shall include the following construction features:  
**A. Studs** — Wall framing shall consist of either wood studs or channel shaped steel studs. Wood studs to consist of 2 by 4 in. (51 by 102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 2-1/2 in. (64 mm) wide, fabricated from min 25 MSG galvanized steel, spaced max 24 in. (610 mm) OC.  
**B. Gypsum Board** — 5/8 in. (16 mm) thick, 4 ft (1219 mm) wide with square or tapered edges. The gypsum board type, number of layers and sheet orientation shall be as specified in the individual U300, U400 or U400 Series Designs in the UL Fire Resistance Directory. Max diam of opening is 3-1/2 in. (89 mm).  
The hourly F Rating of the freestop system is equal to the hourly fire rating of the wall assembly in which it is installed.  
**2. Through Penetrant** — One fire-rated metal pipe or conduit installed concentrically or eccentrically within the freestop system. The annular space between penetrant and periphery of opening shall be min 0 in. (point contact) to max 1 in. (25 mm). Penetrant to be rigidly supported on both sides of wall assembly. The following types and sizes of penetrants may be used:  
**A. Flexible Metal Conduit** — Nom 2 in. (51 mm) diam (or smaller) aluminum or steel flexible conduit installed either concentrically or eccentrically within the freestop system. The annular space between conduit and periphery of opening shall be min 0 in. (point contact) to max 1 in. (25 mm). Conduit to be rigidly supported on both sides of wall assembly.  
See Flexible Metal Conduit (DMZ) category in the Electrical Construction Materials Directory for names of manufacturers.  
**B. Through Penetrating Product** — Flexible Metal Pipe — The following types of steel flexible metal gas piping may be used:  
**1. Nom 2 in. (51 mm) diam (or smaller) steel flexible metal gas piping**  
OMEGA FLEX INC  
**2. Nom 1 in. (25 mm) diam (or smaller) steel flexible metal gas piping**  
GASTITE, DIV OF TITEXLEX  
**3. Min 5/8 in. (16 mm) thickness of fill material applied with annulus, flush with both surfaces of the wall. At point contact location between penetrant and gypsum board, a min 1/2 in. (13 mm) bead of fill material shall be applied at the penetrant/gypsum board interface on both sides of wall.**  
WARD MFG L L C  
**3. Fill, Void or Cavity Material** — Sealant — Min 5/8 in. thickness of fill material applied with annulus, flush with both surfaces of the wall. At point contact location between penetrant and gypsum board, a min 1/2 in. bead of fill material shall be applied at the penetrant/gypsum board interface on both sides of wall.  
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**System No. W-L-1243**  
**F Rating — 1 and 2 Hr (See Item 1)**  
**T Rating — 0 Hr**  
**L Rating at Ambient — 5 CFM/Sq Ft**  
**L Rating at 400 F — Less Than 1 CFM/Sq Ft**

1. Wall Assembly — The 1 or 2 hr fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400 or U400 Series Wall and Partition Designs in the Fire Resistance Directory and shall include the following construction features:  
**A. Studs** — Wall framing shall consist of either wood studs or channel shaped steel studs. Wood studs to consist of 2 by 4 in. (51 by 102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 2-1/2 in. (64 mm) wide, fabricated from min 25 MSG galvanized steel, spaced max 24 in. (610 mm) OC.  
**B. Gypsum Board** — 5/8 in. (16 mm) thick, 4 ft (1219 mm) wide with square or tapered edges. The gypsum board type, number of layers and sheet orientation shall be as specified in the individual U300, U400 or U400 Series Designs in the UL Fire Resistance Directory. Max diam of opening is 3-1/2 in. (89 mm).  
The hourly F Rating of the freestop system is equal to the hourly fire rating of the wall assembly in which it is installed.  
**2. Through Penetrant** — One fire-rated metal pipe or conduit installed concentrically or eccentrically within the freestop system. The annular space between penetrant and periphery of opening shall be min 0 in. (point contact) to max 1 in. (25 mm). Penetrant to be rigidly supported on both sides of wall assembly. The following types and sizes of penetrants may be used:  
**A. Flexible Metal Conduit** — Nom 2 in. (51 mm) diam (or smaller) aluminum or steel flexible conduit installed either concentrically or eccentrically within the freestop system. The annular space between conduit and periphery of opening shall be min 0 in. (point contact) to max 1 in. (25 mm). Conduit to be rigidly supported on both sides of wall assembly.  
See Flexible Metal Conduit (DMZ) category in the Electrical Construction Materials Directory for names of manufacturers.  
**B. Through Penetrating Product** — Flexible Metal Pipe — The following types of steel flexible metal gas piping may be used:  
**1. Nom 2 in. (51 mm) diam (or smaller) steel flexible metal gas piping**  
OMEGA FLEX INC  
**2. Nom 1 in. (25 mm) diam (or smaller) steel flexible metal gas piping**  
GASTITE, DIV OF TITEXLEX  
**3. Min 5/8 in. (16 mm) thickness of fill material applied with annulus, flush with both surfaces of the wall. At point contact location between penetrant and gypsum board, a min 1/2 in. (13 mm) bead of fill material shall be applied at the penetrant/gypsum board interface on both sides of wall.**  
WARD MFG L L C  
**3. Fill, Void or Cavity Material** — Sealant — Min 5/8 in. thickness of fill material applied with annulus, flush with both surfaces of the wall. At point contact location between penetrant and gypsum board, a min 1/2 in. bead of fill material shall be applied at the penetrant/gypsum board interface on both sides of wall.  
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**System No. W-L-1164**  
**F Ratings — 1 and 2 Hr (See Items 1 and 4)**  
**T Rating — 0 Hr**

1. Wall Assembly — The 1 or 2 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner described in the individual U300 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:  
**A. Studs** — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 2-1/2 in. wide and spaced max 24 in. OC. When steel studs are used and the diam of opening exceeds the width of stud cavity, the opening shall be framed on all sides using lengths of steel stud installed between the vertical studs and screw-attached to the steel studs at each end. The framed opening in the wall shall be 4 to 6 in. wider and 4 to 6 in. higher than the diam of the penetrating item such that, when the penetrating item is installed in the opening, a 2 to 3 in. clearance is present between the penetrating item and the framing on all four sides.  
**B. Gypsum Board** — The gypsum wallboard type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual U300 or U400 Series Design in the UL Fire Resistance Directory. Max diam of opening in steel stud walls is 14-1/2 in.  
The hourly F Rating of the freestop system is equal to the hourly fire rating of the wall assembly in which it is installed.  
**2. Steel Sleeve** — Nom 32 in. diam (or smaller) Schedule 40 (or heavier) steel pipe sleeve friction fit in nom 32 in. diam circular opening through gypsum board walls. Length of steel sleeve to be equal to thickness of wall.  
**3. Through Penetrant** — One metallic pipe, conduit or tubing installed either concentrically or eccentrically within the freestop system. The annular space between pipe, conduit or tubing and the steel sleeve shall be min 0 in. (point contact) to max 7/8 in. Pipe, conduit or tubing to be rigidly supported on both sides of wall assembly. The following types and sizes of metallic pipes, conduits or tubing may be used:  
**A. Steel Pipe** — Nom 30 in. diam (or smaller) Schedule 10 (or heavier) steel pipe.  
**B. Iron Pipe** — Nom 30 in. diam (or smaller) service weight (or heavier) cast iron pipe or Class 50 (or heavier) ductile iron pressure pipe.  
**C. Conduit** — Nom 4 in. diam (or smaller) steel electrical metallic tubing.  
**D. Copper Tubing** — Nom 8 in. diam (or smaller) Type L (or heavier) copper tubing.  
**E. Copper Pipe** — Nom 8 in. diam (or smaller) Regular (or heavier) copper pipe.  
**4. Fill, Void or Cavity Material** — Sealant — Min 5/8 in. and 1-1/4 in. thickness of fill material applied within annulus, flush with both surfaces of wall assembly for 1 or 2 hr rated walls, respectively. Min 1/2 in. diam bead of fill material shall be applied to the penetrant/gypsum board interface at the point contact location on both sides of wall.  
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**System No. W-L-1054**  
**F Ratings — 1 and 2 Hr (See Items 1 and 3)**  
**L Rating at Ambient — 4 CFM/Sq Ft**  
**L Rating at 400 F — 4 CFM/Sq Ft**

1. Wall Assembly — The 1 or 2 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:  
**A. Studs** — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 2-1/2 in. wide and spaced max 24 in. OC. When steel studs are used and the diam of opening exceeds the width of stud cavity, the opening shall be framed on all sides using lengths of steel stud installed between the vertical studs and screw-attached to the steel studs at each end. The framed opening in the wall shall be 4 to 6 in. wider and 4 to 6 in. higher than the diam of the penetrating item such that, when the penetrating item is installed in the opening, a 2 to 3 in. clearance is present between the penetrating item and the framing on all four sides.  
**B. Gypsum Board** — 5/8 in. thick, 4 ft wide with square or tapered edges. The gypsum board type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual U300 or U400 Series Design in the UL Fire Resistance Directory. Max diam of opening is 32-1/4 in. for steel stud walls. Max diam of opening is 14-1/2 in. for wood stud walls.  
The hourly F Rating of the freestop system is equal to the hourly fire rating of the wall assembly.  
**2. Through Penetrant** — One metallic pipe, conduit or tubing to be installed either concentrically or eccentrically within the freestop system. The annular space shall be min 0 in. to max 2-1/4 in. Pipe may be installed with continuous point contact. Pipe, conduit or tubing may be installed at an angle not greater than 45 degrees from perpendicular. Pipe, conduit or tubing to be rigidly supported on both sides of wall assembly. The following types and sizes of metallic pipes, conduits or tubing may be used:  
**A. Steel Pipe** — Nom 30 in. diam (or smaller) Schedule 10 (or heavier) steel pipe.  
**B. Iron Pipe** — Nom 30 in. diam (or smaller) cast or ductile iron pipe.  
**C. Conduit** — Nom 4 in. diam (or smaller) steel electrical metallic tubing or 6 in. diam steel conduit.  
**D. Copper Pipe** — Nom 8 in. diam (or smaller) Type L (or heavier) copper tubing.  
**E. Copper Pipe** — Nom 8 in. diam (or smaller) Regular (or heavier) copper pipe.  
**3. Fill, Void or Cavity Material** — Sealant — Min 5/8 in. thickness of fill material applied within the annulus, flush with both surfaces of wall. At the point or continuous contact locations between pipe and wall, a min 1/2 in. diam bead of fill material shall be applied at the pipe/wall interface on both sides of wall.  
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