PLUMBING SPECIFICATIONS

DOMESTIC WATER PIPING - COPPER TUBE AND FITTINGS

A. HARD COPPER TUBE: ASTM B 88, TYPE L (ASTM B 88M, TYPE B) WATER TUBE, DRAWN TEMPER.
   1. CAST-COPPER SOLDER-JOINT FITTINGS: ASME B16.18, PRESSURE FITTINGS.
   2. WROUGHT-COPPER SOLDER-JOINT FITTINGS: ASME B16.22, WROUGHT-COPPER PRESSURE FITTINGS.
   3. BRONZE FLANGES: ASME B16.24, CLASS 150, WITH SOLDER-JOINT ENDS.
   4. COPPER UNIONS: MSS SP-123, CAST-COPPER-ALLOY, HEXAGONAL-STOCK BODY, WITH BALL-AND-SOCKET, METAL-TO-METAL SEATING SURFACES, AND SOLDER-JOINT OR THREADED ENDS.

B. SOFT COPPER TUBE: ASTM B 88, TYPE K (ASTM B 88M, TYPE A) AND ASTM B 88, TYPE L (ASTM B 88M, TYPE B) WATER TUBE, ANNEALED TEMPER.
COPPER SOLDER-JOINT FITTINGS: ASME B16.22, WROUGHT-COPPER PRESSURE FITTINGS.
COPPER PRESSURE-SEAL-JOINT FITTINGS:
MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING:
   1. NIBCO INC.
   2. VIEGA; PLUMBING AND HEATING SYSTEMS.
NPS 2 (DN 50) AND SMALLER: WROUGHT-COPPER FITTING WITH EPDM-RUBBER O-RING SEAL IN EACH END.
NPS 3 AND NPS 4 (DN 80 AND DN 100): CAST-BRONZE OR WROUGHT-COPPER FITTING WITH EPDM-RUBBER O-RING SEAL IN EACH END.

C. DIELECTRIC FITTINGS
GENERAL REQUIREMENTS: ASSEMBLY OF COPPER ALLOY AND FERROUS MATERIALS WITH SEPARATING NONCONDUCTIVE INSULATING MATERIAL. INCLUDE END CONNECTIONS COMPATIBLE WITH PIPES TO BE JOINED.

D. DRAWING PLANS, SCHEMATICS, AND DIAGRAMS INDICATE GENERAL LOCATION AND ARRANGEMENT OF DOMESTIC WATER PIPING. INDICATED LOCATIONS AND ARRANGEMENTS ARE USED TO SIZE PIPE AND CALCULATE FRICTION LOSS, EXPANSION, AND OTHER DESIGN CONSIDERATIONS. INSTALL PIPING AS INDICATED UNLESS DEVIATIONS TO LAYOUT ARE APPROVED ON COORDINATION DRAWINGS.
E. INSTALL COPPER TUBING UNDER BUILDING SLAB ACCORDING TO CDA'S "COPPER TUBE HANDBOOK."
F. INSTALL SHUTOFF VALVE IMMEDIATELY UPSTREAM OF EACH DIELECTRIC FITTING.
G. INSTALL DOMESTIC WATER PIPING LEVEL WITH 0.125 PERCENT SLOPE DOWNWARD TOWARD DRAIN AND PLUMB.
H. INSTALL PIPING CONCEALED FROM VIEW AND PROTECTED FROM PHYSICAL CONTACT BY BUILDING OCCUPANTS UNLESS OTHERWISE INDICATED AND EXCEPT IN EQUIPMENT ROOMS AND SERVICE AREAS.
I. INSTALL PIPING INDICATED TO BE EXPOSED AND PIPING IN EQUIPMENT ROOMS AND SERVICE AREAS AT RIGHT ANGLES OR PARALLEL TO BUILDING WALLS. DIAGONAL RUNS ARE PROHIBITED UNLESS SPECIFICALLY INDICATED OTHERWISE.
J. INSTALL PIPING ABOVE ACCESSIBLE CEILINGS TO ALLOW SUFFICIENT SPACE FOR CEILING PANEL REMOVAL, AND COORDINATE WITH OTHER SERVICES OCCUPYING THAT SPACE.
K. INSTALL PIPING ADJACENT TO EQUIPMENT AND SPECIALTIES TO ALLOW SERVICE AND MAINTENANCE.
L. INSTALL PIPING TO PERMIT VALVE SERVICING.
M. INSTALL NIPPLES, UNIONS, SPECIAL FITTINGS, AND VALVES WITH PRESSURE RATINGS THE SAME AS OR HIGHER THAN SYSTEM PRESSURE RATING USED IN APPLICATIONS BELOW UNLESS OTHERWISE INDICATED.
N. INSTALL PIPING FREE OF SAGS AND BENDS.
O. INSTALL FITTINGS FOR CHANGES IN DIRECTION AND BRANCH CONNECTIONS.
P. INSTALL UNIONS IN COPPER TUBING AT FINAL CONNECTION TO EACH PIECE OF EQUIPMENT, MACHINE, AND SPECIALTY.
Q. INSTALL SLEEVES FOR PIPING PENETRATIONS OF WALLS, CEILINGS, AND FLOORS.
R. INSTALL ESCUTCHEONS FOR PIPING PENETRATIONS OF WALLS, CEILINGS, AND FLOORS.

S. INSTALL SHUTOFF VALVE CLOSE TO WATER MAIN ON EACH BRANCH AND RISER SERVING PLUMBING FIXTURES OR EQUIPMENT, ON EACH WATER SUPPLY TO EQUIPMENT, AND ON EACH WATER SUPPLY TO PLUMBING FIXTURES THAT DO NOT HAVE SUPPLY STOPS. USE BALL VALVES FOR PIPING NPS 2 (DN 50) AND SMALLER. USE GATE VALVES FOR PIPING NPS 2-1/2 (DN 65) AND LARGER.

T. HANGER AND SUPPORT INSTALLATION: SUPPORT VERTICAL PIPING AND TUBING AT BASE AND AT EACH FLOOR.
U. ROD DIAMETER MAY BE REDUCED ONE SIZE FOR DOUBLE-ROD HANGERS, TO A MINIMUM OF 3/8 INCH (10 MM).
V. INSTALL HANGERS FOR COPPER TUBING WITH THE FOLLOWING MAXIMUM HORIZONTAL SPACING AND MINIMUM ROD DIAMETERS:
   1. NPS 3/4 (DN 20) AND SMALLER: 60 INCHES (1500 MM) WITH 3/8-INCH (10-MM) ROD.
   2. NPS 1 AND NPS 1-1/4 (DN 25 AND DN 32): 72 INCHES (1800 MM) WITH 3/8-INCH (10-MM) ROD.
   3. NPS 1-1/2 AND NPS 2 (DN 40 AND DN 50): 96 INCHES (2400 MM) WITH 3/8-INCH (10-MM) ROD.
   4. NPS 2-1/2 (DN 65): 108 INCHES (2700 MM) WITH 1/2-INCH (13-MM) ROD.
   5. NPS 3 TO NPS 5 (DN 80 TO DN 125): 10 FEET (3 M) WITH 1/2-INCH (13-MM) ROD.
   6. NPS 6 (DN 150): 10 FEET (3 M) WITH 5/8-INCH (16-MM) ROD.
   7. NPS 8 (DN 200): 10 FEET (3 M) WITH 3/4-INCH (19-MM) ROD.
W. INSTALL SUPPORTS FOR VERTICAL COPPER TUBING EVERY 10 FEET (3 M).

X. FIELD QUALITY CONTROL PERFORM TESTS AND INSPECTIONS.
PIPING INSPECTIONS:
   1. DO NOT ENCLOSE, COVER, OR PUT PIPING INTO OPERATION UNTIL IT HAS BEEN INSPECTED AND APPROVED BY AUTHORITIES HAVING JURISDICTION.
   2. DURING INSTALLATION, NOTIFY AUTHORITIES HAVING JURISDICTION AT LEAST ONE DAY BEFORE INSPECTION MUST BE MADE. PERFORM TESTS SPECIFIED BELOW IN PRESENCE OF AUTHORITIES HAVING JURISDICTION:
   3. ROUGHING-IN INSPECTION: ARRANGE FOR INSPECTION OF PIPING BEFORE CONCEALING OR CLOSING-IN AFTER ROUGHING-IN AND BEFORE SETTING FIXTURES.
   4. FINAL INSPECTION: ARRANGE FINAL INSPECTION FOR AUTHORITIES HAVING JURISDICTION TO OBSERVE TESTS SPECIFIED BELOW AND TO ENSURE COMPLIANCE WITH REQUIREMENTS.
   5. REINSPECTION: IF AUTHORITIES HAVING JURISDICTION FIND THAT PIPING WILL NOT PASS TESTS OR INSPECTIONS, MAKE REQUIRED CORRECTIONS AND ARRANGE FOR REINSPECTION.
   6. REPORTS: PREPARE INSPECTION REPORTS AND HAVE THEM SIGNED BY AUTHORITIES HAVING JURISDICTION.
Y. PIPING TESTS:
   1. FILL DOMESTIC WATER PIPING. CHECK COMPONENTS TO DETERMINE THAT THEY ARE NOT AIR BOUND AND THAT PIPING IS FULL OF WATER.
   2. TEST FOR LEAKS AND DEFECTS IN NEW PIPING AND PARTS OF EXISTING PIPING THAT HAVE BEEN ALTERED, EXTENDED, OR REPAIRED. IF TESTING IS PERFORMED IN SEGMENTS, SUBMIT A SEPARATE REPORT FOR EACH TEST, COMPLETE WITH DIAGRAM OF PORTION OF PIPING TESTED.
   3. LEAVE NEW, ALTERED, EXTENDED, OR REPLACED DOMESTIC WATER PIPING UNCOVERED AND UNCONCEALED UNTIL IT HAS BEEN TESTED AND APPROVED. EXPOSE WORK THAT WAS COVERED OR CONCEALED BEFORE IT WAS TESTED.
   4. CAP AND SUBJECT PIPING TO STATIC WATER PRESSURE OF 50 PSIG (345 KPA) ABOVE OPERATING PRESSURE, WITHOUT EXCEEDING PRESSURE RATING OF PIPING SYSTEM MATERIALS. ISOLATE TEST SOURCE AND ALLOW TO STAND FOR FOUR HOURS. LEAKS AND LOSS IN TEST PRESSURE CONSTITUTE DEFECTS THAT MUST BE REPAIRED.
   5. REPAIR LEAKS AND DEFECTS WITH NEW MATERIALS AND RETEST PIPING OR PORTION THEREOF UNTIL SATISFACTORY RESULTS ARE OBTAINED.
   6. PREPARE REPORTS FOR TESTS AND FOR CORRECTIVE ACTION REQUIRED.
Z. DOMESTIC WATER PIPING WILL BE CONSIDERED DEFECTIVE IF IT DOES NOT PASS TESTS AND INSPECTIONS.
AA. PREPARE TEST AND INSPECTION REPORTS.

AB. CLEAN AND DISINFECT POTABLE AND NON-POTABLE DOMESTIC WATER PIPING AS FOLLOWS:
AC. PURGE NEW PIPING AND PARTS OF EXISTING PIPING THAT HAVE BEEN ALTERED, EXTENDED, OR REPAIRED BEFORE USING.
AD. USE PURGING AND DISINFECTING PROCEDURES PRESCRIBED BY AUTHORITIES HAVING JURISDICTION; IF METHODS ARE NOT PRESCRIBED, USE PROCEDURES DESCRIBED IN EITHER AWWA C651 OR AWWA C652 OR FOLLOW PROCEDURES DESCRIBED BELOW:
   1. FLUSH PIPING SYSTEM WITH CLEAN, POTABLE WATER UNTIL DIRTY WATER DOES NOT APPEAR AT OUTLETS.
   2. FLUSH SYSTEM WITH CLEAN, POTABLE WATER UNTIL NO CHLORINE IS IN WATER COMING FROM SYSTEM AFTER THE STANDING TIME.
   3. SUBMIT WATER SAMPLES IN STERILE BOTTLES TO AUTHORITIES HAVING JURISDICTION. REPEAT PROCEDURES IF BIOLOGICAL EXAMINATION SHOWS CONTAMINATION.

AE. UNDER-BUILDING-SLAB, DOMESTIC WATER PIPING, NPS 2 (DN 50) AND SMALLER, SHALL BE THE FOLLOWING:
   1. SOFT COPPER TUBE, ASTM B 88, TYPE L (ASTM B 88M, TYPE B); WROUGHT-COPPER SOLDER-JOINT FITTINGS; AND BRAZED JOINTS.
AF. ABOVEGROUND DOMESTIC WATER PIPING, NPS 2 (DN 50) AND SMALLER, SHALL BE THE FOLLOWING:
   1. HARD COPPER TUBE, ASTM B 88, TYPE L (ASTM B 88M, TYPE B); WROUGHT-COPPER SOLDER-JOINT FITTINGS; AND SOLDERED JOINTS.
   2. COOPER PRESS FITTINGS: AT THE CONTRACTOR'S OPTION ON THE DOMESTIC HOT AND COLD WATER PIPING, COOLING COIL CONDENSATE DRAINS IN COPPER LINES 1/2" DIAMETER UP THROUGH 2-1/2" DIAMETER MECHANICAL PRESS (PRO-PRESS) JOINTS AND FIITINGS INCLUDING THE SMART CONNECTION FEATURE OPTION TO ENSURE THAT UNPRESSED FITTING WILL EASILY AND RELIABLY DETECTED DURING PRESSURE TESTING AS MANUFACTURER BY VIEGA, NIBCO AND APOLLO PRESS WILL BE ACCEPTABLE PROVIDED THE FITTING MANUFACTURER'S RECOMMENDED CRIMPING TOOL WITH PROPERLY SIZED REPLACEABLE JAWS ARE UTILIZED RIGID TOOL COMPANY. INSTALLATION WILL BE IN ACCORDANCE WITH MANUFACTURER'S APPROVED PUBLISHED GUIDELINES.
AG. ABOVEGROUND DOMESTIC WATER PIPING, NPS 2-1/2 TO NPS 4 (DN 65 TO DN 100), SHALL BE OF THE FOLLOWING:
   1. HARD COPPER TUBE, ASTM B 88, TYPE L (ASTM B 88M, TYPE B); CAST-COPPER SOLDER-JOINT FITTINGS; AND SOLDERED JOINTS.
   2. GALVANIZED-STEEL PIPE; GROOVED-JOINT, GALVANIZED-STEEL-PIPE APPURTENANCES; AND GROOVED JOINTS.

AH. DRAWINGS INDICATE VALVE TYPES TO BE USED. WHERE SPECIFIC VALVE TYPES ARE NOT INDICATED, THE FOLLOWING REQUIREMENTS APPLY:
   1. SHUTOFF DUTY: USE BALL VALVES FOR PIPING NPS 2 (DN 50) AND SMALLER. USE GATE VALVES WITH FLANGED ENDS FOR PIPING NPS 2-1/2 (DN 65) AND LARGER.
   2. THROTTLING DUTY: USE BALL VALVES FOR PIPING NPS 2 (DN 50) AND SMALLER. USE BALL VALVES WITH FLANGED ENDS FOR PIPING NPS 2-1/2 (DN 65) AND LARGER.
   3. HOT-WATER CIRCULATION PIPING, BALANCING DUTY: CALIBRATED BALANCING VALVES.
   4. DRAIN DUTY: HOSE-END DRAIN VALVES.

AI. USE CHECK VALVES TO MAINTAIN CORRECT DIRECTION OF DOMESTIC WATER FLOW TO AND FROM EQUIPMENT.

AJ. IRON GROOVED-END VALVES MAY BE USED WITH GROOVED-END PIPING.

AK. WATER HAMMER ARRESTERS
   1. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLWING:
      A.. AMTROL, INC.
      B... JOSAM COMPANY.
      C.. MIFAB, INC.
      D.. PPP INC.
      E.. SIOUX CHIEF MANUFACTURING COMPANY, INC.
      F.. SMITH, JAY R. MFG. CO.; DIVISION OF SMITH INDUSTRIES, INC.
      G.. TYLER PIPE; WADE DIV.
      H.. WATTS DRAINAGE PRODUCTS INC.
   2. STANDARD: ASSE 101 OR PDI-WH201.
   3. TYPE: COPPER SUBE WITH PISTON.
   4. SIZE: ASSE 1010, SIZES AA AND A THROUGH F OR PDI-WH 201, SIZES A THROUGH F.

INSTALL WATER HAMMER ARRESTERS IN WATER PIPING ACCORDING TO PDI-WH 201.

INSTALL AIR VENTS AT HIGH PINTS OF WATER PIPING. INSTALL DRAIN PIPING AND DISCHARGE ONTO FLOOR DRAIN.

SANITARY WASTE AND STORM PIPING

A. HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS
PIPE AND FITTINGS: ASTM A 74, SERVICE CLASS(ES).
GASKETS: ASTM C 564, RUBBER.

B. HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS
PIPE AND FITTINGS: ASTM A 888 OR CISPI 301.
SOVENT STACK FITTINGS: ASME B16.45 OR ASSE 1043, HUBLESS, CAST-IRON AERATOR AND DEAERATOR DRAINAGE FITTINGS.
CISPI, HUBLESS-PIPING COUPLINGS:
MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING:
   1. ANACO-HUSKY, SD-4000.
   2. MIFAB, INC.
   3. MISSION RUBBER COMPANY; A DIVISION OF MCP INDUSTRIES, INC.
   4. CLAMP-ALL CORP.
   5. STANDARDS: ASTM C 1277 AND CISPI 310.
   6. DESCRIPTION: STAINLESS-STEEL CORRUGATED SHIELD WITH STAINLESS-STEEL BANDS AND TIGHTENING DEVICES; AND ASTM C 564, RUBBER SLEEVE WITH INTEGRAL, CENTER PIPE STOP.

C. DRAWING PLANS, SCHEMATICS, AND DIAGRAMS INDICATE GENERAL LOCATION AND ARRANGEMENT OF PIPING SYSTEMS. INDICATED LOCATIONS AND ARRANGEMENTS WERE USED TO SIZE PIPE AND CALCULATE FRICTION LOSS, EXPANSION, PUMP SIZING, AND OTHER DESIGN CONSIDERATIONS. INSTALL PIPING AS INDICATED UNLESS DEVIATIONS TO LAYOUT ARE APPROVED ON COORDINATION DRAWINGS.
D. INSTALL PIPING IN CONCEALED LOCATIONS UNLESS OTHERWISE INDICATED AND EXCEPT IN EQUIPMENT ROOMS AND SERVICE AREAS.
E. INSTALL PIPING INDICATED TO BE EXPOSED AND PIPING IN EQUIPMENT ROOMS AND SERVICE AREAS AT RIGHT ANGLES OR PARALLEL TO BUILDING WALLS. DIAGONAL RUNS ARE PROHIBITED UNLESS SPECIFICALLY INDICATED OTHERWISE.
F. INSTALL PIPING ABOVE ACCESSIBLE CEILINGS TO ALLOW SUFFICIENT SPACE FOR CEILING PANEL REMOVAL.
G. INSTALL PIPING TO PERMIT VALVE SERVICING.
H. INSTALL PIPING AT INDICATED SLOPES.
I. INSTALL PIPING FREE OF SAGS AND BENDS.
J. INSTALL FITTINGS FOR CHANGES IN DIRECTION AND BRANCH CONNECTIONS.
K. INSTALL PIPING TO ALLOW APPLICATION OF INSULATION.
L. MAKE CHANGES IN DIRECTION FOR SOIL AND WASTE DRAINAGE AND VENT PIPING USING APPROPRIATE BRANCHES, BENDS, AND LONG-SWEEP BENDS. SANITARY TEES AND SHORT-SWEEP 1/4 BENDS MAY BE USED ON VERTICAL STACKS IF CHANGE IN DIRECTION OF FLOW IS FROM HORIZONTAL TO VERTICAL. USE LONG-TURN, DOUBLE Y-BRANCH AND 1/8-BEND FITTINGS IF TWO FIXTURES ARE INSTALLED BACK TO BACK OR SIDE BY SIDE WITH COMMON DRAIN PIPE. STRAIGHT TEES, ELBOWS, AND CROSSES MAY BE USED ON VENT LINES. DO NOT CHANGE DIRECTION OF FLOW MORE THAN 90 DEGREES. USE PROPER SIZE OF STANDARD INCREASERS AND REDUCERS IF PIPES OF DIFFERENT SIZES ARE CONNECTED. REDUCING SIZE OF DRAINAGE PIPING IN DIRECTION OF FLOW IS PROHIBITED.
M. LAY BURIED BUILDING DRAINAGE PIPING BEGINNING AT LOW POINT OF EACH SYSTEM. INSTALL TRUE TO GRADES AND ALIGNMENT INDICATED, WITH UNBROKEN CONTINUITY OF INVERT. PLACE HUB ENDS OF PIPING UPSTREAM. INSTALL REQUIRED GASKETS ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS FOR USE OF LUBRICANTS, CEMENTS, AND OTHER INSTALLATION REQUIREMENTS. MAINTAIN SWAB IN PIPING AND PULL PAST EACH JOINT AS COMPLETED.
N. INSTALL SOIL AND WASTE DRAINAGE AND VENT PIPING AT THE FOLLOWING MINIMUM SLOPES UNLESS OTHERWISE INDICATED:
   1. BUILDING SANITARY DRAIN: 2 PERCENT DOWNWARD IN DIRECTION OF FLOW FOR PIPING NPS 3 (DN 80) AND SMALLER; 1 PERCENT DOWNWARD IN DIRECTION OF FLOW FOR PIPING NPS 4 (DN 100) AND LARGER.
   2. HORIZONTAL SANITARY DRAINAGE PIPING: 1 PERCENT DOWNWARD IN DIRECTION OF FLOW.
   3. VENT PIPING: 1 PERCENT DOWN TOWARD VERTICAL FIXTURE VENT OR TOWARD VENT STACK.
O. INSTALL CAST-IRON SOIL PIPING ACCORDING TO CISPI'S "CAST IRON SOIL PIPE AND FITTINGS HANDBOOK," CHAPTER IV, "INSTALLATION OF CAST IRON SOIL PIPE AND FITTINGS."
   1. INSTALL ENCASEMENT ON UNDERGROUND PIPING ACCORDING TO ASTM A 674 OR AWWA C105/A 21.5.
P. DO NOT ENCLOSE, COVER, OR PUT PIPING INTO OPERATION UNTIL IT IS INSPECTED AND APPROVED BY AUTHORITIES HAVING JURISDICTION.
Q. INSTALL SLEEVES FOR PIPING PENETRATIONS OF WALLS, CEILINGS, AND FLOORS.
R. INSTALL ESCUTCHEONS FOR PIPING PENETRATIONS OF WALLS, CEILINGS, AND FLOORS.

S. HANGER AND SUPPORT INSTALLATION
COMPLY WITH REQUIREMENTS FOR PIPE HANGER AND SUPPORT DEVICES AND INSTALLATION.
   1. INSTALL CARBON-STEEL PIPE HANGERS FOR HORIZONTAL PIPING IN NONCORROSIVE ENVIRONMENTS.
   2. INSTALL STAINLESS-STEEL PIPE HANGERS FOR HORIZONTAL PIPING IN CORROSIVE ENVIRONMENTS.
   3. INSTALL CARBON-STEEL PIPE SUPPORT CLAMPS FOR VERTICAL PIPING IN NONCORROSIVE ENVIRONMENTS.
   4. INSTALL STAINLESS-STEEL PIPE SUPPORT CLAMPS FOR VERTICAL PIPING IN CORROSIVE ENVIRONMENTS.
   5. VERTICAL PIPING: MSS TYPE 8 OR TYPE 42, CLAMPS.
   6. INSTALL INDIVIDUAL, STRAIGHT, HORIZONTAL PIPING RUNS:
   7. 100 FEET (30 M) AND LESS: MSS TYPE 1, ADJUSTABLE, STEEL CLEVIS HANGERS.
   8. LONGER THAN 100 FEET (30 M): MSS TYPE 43, ADJUSTABLE ROLLER HANGERS.
   9. LONGER THAN 100 FEET (30 M) IF INDICATED: MSS TYPE 49, SPRING CUSHION ROLLS.
   10. MULTIPLE, STRAIGHT, HORIZONTAL PIPING RUNS 100 FEET (30 M) OR LONGER: MSS TYPE 44, PIPE ROLLS. SUPPORT PIPE ROLLS ON TRAPEZE.
   11. BASE OF VERTICAL PIPING: MSS TYPE 52, SPRING HANGERS.
T. SUPPORT HORIZONTAL PIPING AND TUBING WITHIN 12 INCHES (300 MM) OF EACH FITTING, VALVE, AND COUPLING.
U. SUPPORT VERTICAL PIPING AND TUBING AT BASE AND AT EACH FLOOR.
V. ROD DIAMETER MAY BE REDUCED ONE SIZE FOR DOUBLE-ROD HANGERS, WITH 3/8-INCH (10-MM) MINIMUM RODS.
W. INSTALL HANGERS FOR CAST-IRON SOIL PIPING WITH THE FOLLOWING MAXIMUM HORIZONTAL SPACING AND MINIMUM ROD DIAMETERS:
   1. NPS 1-1/2 AND NPS 2 (DN 40 AND DN 50): 60 INCHES (1500 MM) WITH 3/8-INCH (10-MM) ROD.
   2. NPS 3 (DN 80): 60 INCHES (1500 MM) WITH 1/2-INCH (13-MM) ROD.
   3. NPS 4 AND NPS 5 (DN 100 AND DN 125): 60 INCHES (1500 MM) WITH 5/8-INCH (16-MM) ROD.
   4. NPS 6 AND NPS 8 (DN 150 AND DN 200): 60 INCHES (1500 MM) WITH 3/4-INCH (19-MM) ROD.
   5. INSTALL SUPPORTS FOR VERTICAL CAST-IRON SOIL PIPING EVERY 15 FEET (4.5 M).

X. DURING INSTALLATION, NOTIFY AUTHORITIES HAVING JURISDICTION AT LEAST 24 HOURS BEFORE INSPECTION MUST BE MADE. PERFORM TESTS SPECIFIED BELOW IN PRESENCE OF AUTHORITIES HAVING JURISDICTION.
ROUGHING-IN INSPECTION: ARRANGE FOR INSPECTION OF PIPING BEFORE CONCEALING OR CLOSING-IN AFTER ROUGHING-IN AND BEFORE SETTING FIXTURES.
FINAL INSPECTION: ARRANGE FOR FINAL INSPECTION BY AUTHORITIES HAVING JURISDICTION TO OBSERVE TESTS SPECIFIED BELOW AND TO ENSURE COMPLIANCE WITH REQUIREMENTS.
Y. REINSPECTION: IF AUTHORITIES HAVING JURISDICTION FIND THAT PIPING WILL NOT PASS TEST OR INSPECTION, MAKE REQUIRED CORRECTIONS AND ARRANGE FOR REINSPECTION.
Z. REPORTS: PREPARE INSPECTION REPORTS AND HAVE THEM SIGNED BY AUTHORITIES HAVING JURISDICTION.
AA. TEST SANITARY DRAINAGE AND VENT PIPING ACCORDING TO PROCEDURES OF AUTHORITIES HAVING JURISDICTION OR, IN ABSENCE OF PUBLISHED PROCEDURES, AS FOLLOWS:
   1. TEST FOR LEAKS AND DEFECTS IN NEW PIPING AND PARTS OF EXISTING PIPING THAT HAVE BEEN ALTERED, EXTENDED, OR REPAIRED. IF TESTING IS PERFORMED IN SEGMENTS, SUBMIT SEPARATE REPORT FOR EACH TEST, COMPLETE WITH DIAGRAM OF PORTION OF PIPING TESTED.
   2. LEAVE UNCOVERED AND UNCONCEALED NEW, ALTERED, EXTENDED, OR REPLACED DRAINAGE AND VENT PIPING UNTIL IT HAS BEEN TESTED AND APPROVED. EXPOSE WORK THAT WAS COVERED OR CONCEALED BEFORE IT WAS TESTED.
   3. ROUGHING-IN PLUMBING TEST PROCEDURE: TEST DRAINAGE AND VENT PIPING EXCEPT OUTSIDE LEADERS ON COMPLETION OF ROUGHING-IN. CLOSE OPENINGS IN PIPING SYSTEM AND FILL WITH WATER TO POINT OF OVERFLOW, BUT NOT LESS THAN 10-FOOT HEAD OF WATER (30 KPA). FROM 15 MINUTES BEFORE INSPECTION STARTS TO COMPLETION OF INSPECTION, WATER LEVEL MUST NOT DROP. INSPECT JOINTS FOR LEAKS.
   4. FINISHED PLUMBING TEST PROCEDURE: AFTER PLUMBING FIXTURES HAVE BEEN SET AND TRAPS FILLED WITH WATER, TEST CONNECTIONS AND PROVE THEY ARE GASTIGHT AND WATERTIGHT. PLUG VENT-STACK OPENINGS ON ROOF AND BUILDING DRAINS WHERE THEY LEAVE BUILDING. INTRODUCE AIR INTO PIPING SYSTEM EQUAL TO PRESSURE OF 1-INCH WG (250 PA). USE U-TUBE OR MANOMETER INSERTED IN TRAP OF WATER CLOSET TO MEASURE THIS PRESSURE. AIR PRESSURE MUST REMAIN CONSTANT WITHOUT INTRODUCING ADDITIONAL AIR THROUGHOUT PERIOD OF INSPECTION. INSPECT PLUMBING FIXTURE CONNECTIONS FOR GAS AND WATER LEAKS.
   5. REPAIR LEAKS AND DEFECTS WITH NEW MATERIALS AND RETEST PIPING, OR PORTION THEREOF, UNTIL SATISFACTORY RESULTS ARE OBTAINED.

AB. CAP AND SUBJECT PIPING TO STATIC-WATER PRESSURE OF 50 PSIG (345 KPA) ABOVE OPERATING PRESSURE, WITHOUT EXCEEDING PRESSURE RATING OF PIPING SYSTEM MATERIALS. ISOLATE TEST SOURCE AND ALLOW TO STAND FOR FOUR HOURS. LEAKS AND LOSS IN TEST PRESSURE CONSTITUTE DEFECTS THAT MUST BE REPAIRED.
AC. REPAIR LEAKS AND DEFECTS WITH NEW MATERIALS AND RETEST PIPING, OR PORTION THEREOF, UNTIL SATISFACTORY RESULTS ARE OBTAINED.

AD. PREPARE REPORTS FOR TESTS AND REQUIRED CORRECTIVE ACTION.

AF. ABOVEGROUND, SOIL AND WASTE PIPING 6" AND SMALLER SHALL BE ANY OF THE FOLLOWING:
   1. SERVICE CLASS, CAST-IRON SOIL PIPE AND FITTINGS; GASKETS; AND GASKETED JOINTS.
   2. HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS HEAVY-DUTY HUBLESS-PIPING COUPLINGS; AND COUPLED JOINTS.

AG. ABOVEGROUND, SOIL AND WASTE PIPING 8" AND LARGER SHALL BE ANY OF THE FOLLOWING:
   1. SERVICE WEIGHT(SV) HUB AND SPIGOT CAST IRON SOIL PIPE FITTINGS

AH. ABOVEGROUND, VENT PIPING 6" AND SMALLER SHALL BE ANY OF THE FOLLOWING:
   1. HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS; CISPI HUBLESS-PIPING COUPLINGS; AND COUPLED JOINTS.

AI. ABOVEGROUND, VENT PIPING 8" AND LARGER SHALL BE ANY OF THE FOLLOWING:
   1. SERVICE CLASS, CAST-IRON SOIL PIPE AND FITTINGS; GASKETS; AND GASKETED JOINTS.

AJ. UNDERGROUND, SOIL, WASTE, AND VENT PIPING 15" AND SMALLER SHALL BE ANY OF THE FOLLOWING:
   1. SERVICE CLASS, CAST-IRON SOIL PIPE AND FITTINGS; GASKETS; AND GASKETED JOINTS
   2. SOLID WALL PVC PIPE, PVC SOCKET FITTINGS, AND SOLVENT-CEMENTED JOINTS

CLEANOUTS

A. EXPOSED METAL CLEANOUTS:
MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING:
   1. JOSAM COMPANY; JOSAM DIV.
   2. MIFAB, INC.
   3. SMITH, JAY R. MFG. CO.; DIVISION OF SMITH INDUSTRIES, INC.
   4. TYLER PIPE; WADE DIV.
   5. ZURN PLUMBING PRODUCTS GROUP; SPECIFICATION DRAINAGE OPERATION.
STANDARD: ASME A112.36.2M FOR CAST IRON FOR CLEANOUT TEST TEE.
SIZE: SAME AS CONNECTED DRAINAGE PIPING
BODY MATERIAL: HUB-AND-SPIGOT, CAST-IRON SOIL PIPE T-BRANCH AS REQUIRED TO MATCH CONNECTED PIPING.
CLOSURE: COUNTERSUNK PLUG.
CLOSURE PLUG SIZE: SAME AS OR NOT MORE THAN ONE SIZE SMALLER THAN CLEANOUT SIZE.
CLOSURE: STAINLESS-STEEL PLUG WITH SEAL.

B. METAL FLOOR CLEANOUTS:
MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING:
   1. JOSAM COMPANY; JOSAM DIV.
   2. SMITH, JAY R. MFG. CO.; DIVISION OF SMITH INDUSTRIES, INC.
   3. TYLER PIPE; WADE DIV.
   4. A. MIFAB, INC.
STANDARD: ASME A112.36.2M FOR THREADED, ADJUSTABLE HOUSING CLEANOUT.
SIZE: SAME AS CONNECTED BRANCH.
TYPE: ADJUSTABLE HOUSING THREADED, ADJUSTABLE HOUSING.
BODY OR FERRULE: CAST IRON.
CLAMPING DEVICE: NOT REQUIRED.
OUTLET CONNECTION: THREADED.
CLOSURE: BRASS PLUG WITH STRAIGHT THREADS AND GASKET.
ADJUSTABLE HOUSING MATERIAL: CAST IRON WITH SET-SCREWS OR OTHER DEVICE.
FRAME AND COVER MATERIAL AND FINISH: ROUGH BRONZE.
FRAME AND COVER SHAPE: ROUND.
TOP LOADING CLASSIFICATION: LIGHT DUTY.
RISER: ASTM A 74, SERVICE CLASS, CAST-IRON DRAINAGE PIPE FITTING AND RISER TO CLEANOUT.
STANDARD: ASME A112.3.1.
SIZE: SAME AS CONNECTED BRANCH.
HOUSING: STAINLESS STEEL.
CLOSURE: STAINLESS STEEL WITH SEAL.
RISER: STAINLESS-STEEL DRAINAGE PIPE FITTING TO CLEANOUT.

C. CAST-IRON WALL CLEANOUTS:
MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING:
   1. JOSAM COMPANY; JOSAM DIV.
   2. MIFAB, INC.
   3. SMITH, JAY R. MFG. CO.; DIVISION OF SMITH INDUSTRIES, INC.
   4. TYLER PIPE; WADE DIV.
   5. ZURN PLUMBING PRODUCTS GROUP; SPECIFICATION DRAINAGE OPERATION.
STANDARD: ASME A112.36.2M. INCLUDE WALL ACCESS.
SIZE: SAME AS CONNECTED DRAINAGE PIPING.
BODY: HUB-AND-SPIGOT, CAST-IRON SOIL PIPE T-BRANCH AS REQUIRED TO MATCH CONNECTED PIPING.
CLOSURE: COUNTERSUNK OR RAISED-HEAD, BRASS PLUG.
CLOSURE PLUG SIZE: SAME AS OR NOT MORE THAN ONE SIZE SMALLER THAN CLEANOUT SIZE.
WALL ACCESS: ROUND, STAINLESS-STEEL COVER PLATE WITH SCREW.
WALL ACCESS: ROUND, STAINLESS-STEEL WALL-INSTALLATION FRAME AND COVER.

D. INSTALL CLEANOUTS IN ABOVEGROUND PIPING AND BUILDING DRAIN PIPING ACCORDING TO THE FOLLOWING, UNLESS OTHERWISE INDICATED:
   1. SIZE SAME AS DRAINAGE PIPING UP TO NPS 4 (DN 100). USE NPS 4 (DN 100) FOR LARGER DRAINAGE PIPING UNLESS LARGER CLEANOUT IS INDICATED.
   2. LOCATE AT EACH CHANGE IN DIRECTION OF PIPING GREATER THAN 45 DEGREES.
   3. LOCATE AT MINIMUM INTERVALS OF 50 FEET (15 M) FOR PIPING NPS 4 (DN 100) AND SMALLER AND 100 FEET (30 M) FOR LARGER PIPING.
   4. LOCATE AT BASE OF EACH VERTICAL SOIL AND WASTE STACK.
E. FOR FLOOR CLEANOUTS FOR PIPING BELOW FLOORS, INSTALL CLEANOUT DECK PLATES WITH TOP FLUSH WITH FINISHED FLOOR.
F. FOR CLEANOUTS LOCATED IN CONCEALED PIPING, INSTALL CLEANOUT WALL ACCESS COVERS, OF TYPES INDICATED, WITH FRAME AND COVER FLUSH WITH FINISHED WALL.
G. INSTALL FLOOR DRAINS AT LOW POINTS OF SURFACE AREAS TO BE DRAINED. SET GRATES OF DRAINS FLUSH WITH FINISHED FLOOR, UNLESS OTHERWISE INDICATED.
H. INSTALL ROOF FLASHING ASSEMBLIES ON SANITARY STACK VENTS AND VENT STACKS THAT EXTEND THROUGH ROOF.
I. ASSEMBLE OPEN DRAIN FITTINGS AND INSTALL WITH TOP OF HUB 2 INCHES (51 MM) ABOVE FLOOR.
J. INSTALL DEEP-SEAL TRAPS ON FLOOR DRAINS AND OTHER WASTE OUTLETS, IF INDICATED.
K. INSTALL FLOOR-DRAIN, TRAP-SEAL PRIMER FITTINGS ON INLET TO FLOOR DRAINS THAT REQUIRE TRAP-SEAL PRIMER CONNECTION.
   1. EXCEPTION: FITTING MAY BE OMITTED IF TRAP HAS TRAP-SEAL PRIMER CONNECTION.
   2. SIZE: SAME AS FLOOR DRAIN INLET.
L. INSTALL AIR-GAP FITTINGS ON DRAINING-TYPE BACKFLOW PREVENTERS AND ON INDIRECT-WASTE PIPING DISCHARGE INTO SANITARY DRAINAGE SYSTEM.

PLUMBING FIXTURES

A. ASSEMBLE PLUMBING FIXTURES, TRIM, FITTINGS, AND OTHER COMPONENTS ACCORDING TO MANUFACTURERS' WRITTEN INSTRUCTIONS.
   1. INSTALL OFF-FLOOR SUPPORTS, AFFIXED TO BUILDING SUBSTRATE, FOR WALL-MOUNTING FIXTURES.
   2. USE CARRIER SUPPORTS WITH WASTE FITTING AND SEAL FOR BACK-OUTLET FIXTURES.
   3. USE CARRIER SUPPORTS WITHOUT WASTE FITTING FOR FIXTURES WITH TUBULAR WASTE PIPING.
B. USE CHAIR-TYPE CARRIER SUPPORTS WITH RECTANGULAR STEEL UPRIGHTS FOR ACCESSIBLE FIXTURES.
C. INSTALL BACK-OUTLET, WALL-MOUNTING FIXTURES ONTO WASTE FITTING SEALS AND ATTACH TO SUPPORTS.
D. INSTALL FLOOR-MOUNTING FIXTURES ON CLOSET FLANGES OR OTHER ATTACHMENTS TO PIPING OR BUILDING SUBSTRATE.
E. INSTALL WALL-MOUNTING FIXTURES WITH TUBULAR WASTE PIPING ATTACHED TO SUPPORTS.
F. INSTALL FLOOR-MOUNTING, BACK-OUTLET WATER CLOSETS ATTACHED TO BUILDING FLOOR SUBSTRATE AND WALL BRACKET AND ONTO WASTE FITTING SEALS.
G. INSTALL COUNTER-MOUNTING FIXTURES IN AND ATTACHED TO CASEWORK.
H. INSTALL FIXTURES LEVEL AND PLUMB ACCORDING TO ROUGHING-IN DRAWINGS.
I. INSTALL WATER-SUPPLY PIPING WITH STOP ON EACH SUPPLY TO EACH FIXTURE TO BE CONNECTED TO WATER DISTRIBUTION PIPING. ATTACH SUPPLIES TO SUPPORTS OR SUBSTRATE WITHIN PIPE SPACES BEHIND FIXTURES. INSTALL STOPS IN LOCATIONS WHERE THEY CAN BE EASILY REACHED FOR OPERATION.
J. EXCEPTION: USE BALL VALVES IF SUPPLY STOPS ARE NOT SPECIFIED WITH FIXTURE.
K. INSTALL TRAP AND TUBULAR WASTE PIPING ON DRAIN OUTLET OF EACH FIXTURE TO BE DIRECTLY CONNECTED TO SANITARY DRAINAGE SYSTEM.
L. INSTALL TUBULAR WASTE PIPING ON DRAIN OUTLET OF EACH FIXTURE TO BE INDIRECTLY CONNECTED TO DRAINAGE SYSTEM.
M. INSTALL FLUSHOMETER VALVES FOR ACCESSIBLE WATER CLOSETS AND URINALS WITH HANDLE MOUNTED ON WIDE SIDE OF COMPARTMENT. INSTALL OTHER ACTUATORS IN LOCATIONS THAT ARE EASY FOR PEOPLE WITH DISABILITIES TO REACH.
N. INSTALL TANKS FOR ACCESSIBLE, TANK-TYPE WATER CLOSETS WITH LEVER HANDLE MOUNTED ON WIDE SIDE OF COMPARTMENT.
O. INSTALL OPEN FRONT TOILET SEATS ON WATER CLOSETS.
P. INSTALL WATER-SUPPLY FLOW-CONTROL FITTINGS WITH SPECIFIED FLOW RATES IN FIXTURE SUPPLIES AT STOP VALVES.
Q. INSTALL FAUCET FLOW-CONTROL FITTINGS WITH SPECIFIED FLOW RATES AND PATTERNS IN FAUCET SPOUTS IF FAUCETS ARE NOT AVAILABLE WITH REQUIRED RATES AND PATTERNS. INCLUDE ADAPTERS IF REQUIRED.
R. INSTALL SHOWER FLOW-CONTROL FITTINGS WITH SPECIFIED MAXIMUM FLOW RATES IN SHOWER ARMS.
S. INSTALL TRAPS ON FIXTURE OUTLETS.
   1. EXCEPTION: OMIT TRAP ON FIXTURES WITH INTEGRAL TRAPS.
   2. EXCEPTION: OMIT TRAP ON INDIRECT WASTES, UNLESS OTHERWISE INDICATED.
U. INSTALL ESCUTCHEONS AT PIPING WALL CEILING PENETRATIONS IN EXPOSED, FINISHED LOCATIONS AND WITHIN CABINETS AND MILLWORK. USE DEEP-PATTERN ESCUTCHEONS IF REQUIRED TO CONCEAL PROTRUDING FITTINGS.
V. SEAL JOINTS BETWEEN FIXTURES AND WALLS, FLOORS, AND COUNTERTOPS USING SANITARY-TYPE, ONE-PART, MILDEW-RESISTANT SILICONE SEALANT. MATCH SEALANT COLOR TO FIXTURE COLOR.
W. VERIFY THAT INSTALLED PLUMBING FIXTURES ARE CATEGORIES AND TYPES SPECIFIED FOR LOCATIONS WHERE INSTALLED.
X. CHECK THAT PLUMBING FIXTURES ARE COMPLETE WITH TRIM, FAUCETS, FITTINGS, AND OTHER SPECIFIED COMPONENTS.
Y. INSPECT INSTALLED PLUMBING FIXTURES FOR DAMAGE. REPLACE DAMAGED FIXTURES AND COMPONENTS.
Z. TEST INSTALLED FIXTURES AFTER WATER SYSTEMS ARE PRESSURIZED FOR PROPER OPERATION. REPLACE MALFUNCTIONING FIXTURES AND COMPONENTS, THEN RETEST. REPEAT PROCEDURE UNTIL UNITS OPERATE PROPERLY.
AA. INSTALL FRESH BATTERIES IN SENSOR-OPERATED MECHANISMS.
AB. CLEAN FIXTURES, FAUCETS, AND OTHER FITTINGS WITH MANUFACTURERS' RECOMMENDED CLEANING METHODS AND MATERIALS. DO THE FOLLOWING:
   1. REMOVE FAUCET SPOUTS AND STRAINERS, REMOVE SEDIMENT AND DEBRIS, AND REINSTALL STRAINERS AND SPOUTS.
   2. REMOVE SEDIMENT AND DEBRIS FROM DRAINS.
AC. AFTER COMPLETING INSTALLATION OF EXPOSED, FACTORY-FINISHED FIXTURES, FAUCETS, AND FITTINGS, INSPECT EXPOSED FINISHES AND REPAIR DAMAGED FINISHES.

PLUMBING PIPING INSULATION

A. INSULATION MATERIALS
PRODUCTS SHALL NOT CONTAIN ASBESTOS, LEAD, MERCURY, OR MERCURY COMPOUNDS.
PRODUCTS THAT COME IN CONTACT WITH STAINLESS STEEL SHALL HAVE A LEACHABLE CHLORIDE CONTENT OF LESS THAN 50 PPM WHEN TESTED ACCORDING TO ASTM C 871.

B. FOAM INSULATION MATERIALS SHALL NOT USE CFC OR HCFC BLOWING AGENTS IN THE MANUFACTURING PROCESS.

C. MINERAL-FIBER, PREFORMED PIPE INSULATION:
PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE THE FOLLOWING] [PROVIDE ONE OF THE FOLLOWING:
   1. CERTAIN TEED, CO.
   2. JOHNS MANVILLE; MICRO-LOK.
   3. KNAUF INSULATION; 1000-DEGREE PIPE INSULATION.
   4. MANSON INSULATION INC.; ALLEY-K.
   5. OWENS CORNING; FIBERGLAS PIPE INSULATION.
TYPE I, 850 DEG F (454 DEG C) MATERIALS: MINERAL OR GLASS FIBERS BONDED WITH A THERMOSETTING RESIN. COMPLY WITH ASTM C 547, TYPE I, GRADE A, WITH FACTORY-APPLIED ASJ-SSL. FACTORY-APPLIED JACKET REQUIREMENTS ARE SPECIFIED IN "FACTORY-APPLIED JACKETS" ARTICLE.

D. MINERAL-FIBER INSULATING CEMENT: COMPLY WITH ASTM C 195.
PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE THE FOLLOWING:
   1. RAMCO INSULATION, INC.; SUPER-STIK.

E. MINERAL-FIBER, HYDRAULIC-SETTING INSULATING AND FINISHING CEMENT: COMPLY WITH ASTM C 449.
PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE THE FOLLOWING:
   1. RAMCO INSULATION, INC.; RAMCOTE 1200 AND QUIK-COTE.

F. ADHESIVES
MATERIALS SHALL BE COMPATIBLE WITH INSULATION MATERIALS, JACKETS, AND SUBSTRATES AND FOR BONDING INSULATION TO ITSELF AND TO SURFACES TO BE INSULATED, UNLESS OTHERWISE INDICATED.
MINERAL-FIBER ADHESIVE: COMPLY WITH MIL-A-3316C, CLASS 2, GRADE A.
PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:
   1. CHILDERS BRAND, SPECIALTY CONSTRUCTION BRANDS, INC., A BUSINESS OF H. B. FULLER COMPANY; CP-127.
   2. EAGLE BRIDGES - MARATHON INDUSTRIES; 225.
   3. FOSTER BRAND, SPECIALTY CONSTRUCTION BRANDS, INC., A BUSINESS OF H. B. FULLER COMPANY; 85-60/85-70.
   4. MON-ECO INDUSTRIES, INC.; 22-25.
FOR INDOOR APPLICATIONS, USE ADHESIVE THAT HAS A VOC CONTENT OF 80 G/L OR LESS WHEN CALCULATED ACCORDING TO 40 CFR 59, SUBPART D (EPA METHOD 24).

G. ASJ ADHESIVE, AND FSK JACKET ADHESIVE: COMPLY WITH MIL-A-3316C, CLASS 2, GRADE A FOR BONDING INSULATION JACKET LAP SEAMS AND JOINTS.
PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:
   1. CHILDERS BRAND, SPECIALTY CONSTRUCTION BRANDS, INC., A BUSINESS OF H. B. FULLER COMPANY; CP-82.
   2. EAGLE BRIDGES - MARATHON INDUSTRIES; 225.
   3. FOSTER BRAND, SPECIALTY CONSTRUCTION BRANDS, INC., A BUSINESS OF H. B. FULLER COMPANY; 85-20.
   4. MON-ECO INDUSTRIES, INC.; 22-25.
FOR INDOOR APPLICATIONS, USE ADHESIVE THAT HAS A VOC CONTENT OF 50 G/L OR LESS WHEN CALCULATED ACCORDING TO 40 CFR 59, SUBPART D (EPA METHOD 24).

H. MASTICS: MATERIALS SHALL BE COMPATIBLE WITH INSULATION MATERIALS, JACKETS, AND SUBSTRATES; COMPLY WITH MIL-PRF-19565C, TYPE II. FOR INDOOR APPLICATIONS, USE MASTICS THAT HAVE A VOC CONTENT OF 50 G/L OR LESS WHEN CALCULATED ACCORDING TO 40 CFR 59, SUBPART D (EPA METHOD 24).

I. VAPOR-BARRIER MASTIC: SOLVENT BASED; SUITABLE FOR INDOOR USE ON BELOW-AMBIENT SERVICES.
PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:
   1. CHILDERS BRAND, SPECIALTY CONSTRUCTION BRANDS, INC., A BUSINESS OF H. B. FULLER COMPANY; CP-30.
   2. EAGLE BRIDGES - MARATHON INDUSTRIES; 501.
   3. FOSTER BRAND, SPECIALTY CONSTRUCTION BRANDS, INC., A BUSINESS OF H. B. FULLER COMPANY; 30-35.
   4. MON-ECO INDUSTRIES, INC.; 55-10.
WATER-VAPOR PERMEANCE: ASTM F 1249, 0.05 PERM (0.03 METRIC PERM) AT 35-MIL (0.9-MM) DRY FILM THICKNESS.
SERVICE TEMPERATURE RANGE: 0 TO 180 DEG F (MINUS 18 TO PLUS 82 DEG C).
SOLIDS CONTENT: ASTM D 1644, 44 PERCENT BY VOLUME AND 62 PERCENT BY WEIGHT.
COLOR: WHITE.

J. JOINT SEALANTS:
ASJ FLASHING SEALANTS, AND VINYL, PVDC, AND PVC JACKET FLASHING SEALANTS:
PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:
   1. CHILDERS BRAND, SPECIALTY CONSTRUCTION BRANDS, INC., A BUSINESS OF H. B. FULLER COMPANY; CP-76.
MATERIALS SHALL BE COMPATIBLE WITH INSULATION MATERIALS, JACKETS, AND SUBSTRATES.
FIRE- AND WATER-RESISTANT, FLEXIBLE, ELASTOMERIC SEALANT.
SERVICE TEMPERATURE RANGE: MINUS 40 TO PLUS 250 DEG F (MINUS 40 TO PLUS 121 DEG C).
COLOR: WHITE.
FOR INDOOR APPLICATIONS, USE SEALANTS THAT HAVE A VOC CONTENT OF 420 G/L OR LESS WHEN CALCULATED ACCORDING TO 40 CFR 59, SUBPART D (EPA METHOD 24).

K. FACTORY-APPLIED JACKETS: INSULATION SYSTEM SCHEDULES INDICATE FACTORY-APPLIED JACKETS ON VARIOUS APPLICATIONS. WHEN FACTORY-APPLIED JACKETS ARE INDICATED, COMPLY WITH THE FOLLOWING:
ASJ-SSL: ASJ WITH SELF-SEALING, PRESSURE-SENSITIVE, ACRYLIC-BASED ADHESIVE COVERED BY A REMOVABLE PROTECTIVE STRIP; COMPLYING WITH ASTM C 1136, TYPE I.

L. ASJ TAPE: WHITE VAPOR-RETARDER TAPE MATCHING FACTORY-APPLIED JACKET WITH ACRYLIC ADHESIVE, COMPLYING WITH ASTM C 1136. PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:
   1. ABI, IDEAL TAPE DIVISION; 428 AWF ASJ.
   2. AVERY DENNISON CORPORATION, SPECIALTY TAPES DIVISION; FASSON 0836.
   3. COMPAC CORPORATION; 104 AND 105.
   4. VENTURE TAPE; 1540 CW PLUS, 1542 CW PLUS, AND 1542 CW PLUS/SQ.
WIDTH: 3 INCHES (75 MM).
THICKNESS: 11.5 MILS (0.29 MM).
ADHESION: 90 OUNCES FORCE/INCH (1.0 N/MM) IN WIDTH.
ELONGATION: 2 PERCENT.
TENSILE STRENGTH: 40 LBF/INCH (7.2 N/MM) IN WIDTH.
ASJ TAPE DISKS AND SQUARES: PRECUT DISKS OR SQUARES OF ASJ TAPE.

M. PROTECTIVE SHIELDING PIPE COVERS:
MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING:
   1. INSUL-TECT PRODUCTS CO.; A SUBSIDIARY OF MVG MOLDED PRODUCTS.
   2. MCGUIRE MANUFACTURING.
   3. PLUMBEREX.
   4. TRUEBRO; A BRAND OF IPS CORPORATION.
DESCRIPTION: MANUFACTURED PLASTIC WRAPS FOR COVERING PLUMBING FIXTURE HOT- AND COLD-WATER SUPPLIES AND TRAP AND DRAIN PIPING. COMPLY WITH AMERICANS WITH DISABILITIES ACT (ADA) REQUIREMENTS.

N. GENERAL INSTALLATION REQUIREMENTS:
INSTALL INSULATION MATERIALS, ACCESSORIES, AND FINISHES WITH SMOOTH, STRAIGHT, AND EVEN SURFACES; FREE OF VOIDS THROUGHOUT THE LENGTH OF PIPING INCLUDING FITTINGS, VALVES, AND SPECIALTIES.
O. INSTALL INSULATION MATERIALS, FORMS, VAPOR BARRIERS OR RETARDERS, JACKETS, AND THICKNESSES REQUIRED FOR EACH ITEM OF PIPE SYSTEM AS SPECIFIED IN INSULATION SYSTEM SCHEDULES.
P. INSTALL ACCESSORIES COMPATIBLE WITH INSULATION MATERIALS AND SUITABLE FOR THE SERVICE. INSTALL ACCESSORIES THAT DO NOT CORRODE, SOFTEN, OR OTHERWISE ATTACK INSULATION OR JACKET IN EITHER WET OR DRY STATE.
Q. INSTALL INSULATION WITH LONGITUDINAL SEAMS AT TOP AND BOTTOM OF HORIZONTAL RUNS.
R. INSTALL MULTIPLE LAYERS OF INSULATION WITH LONGITUDINAL AND END SEAMS STAGGERED.
S. DO NOT WELD BRACKETS, CLIPS, OR OTHER ATTACHMENT DEVICES TO PIPING, FITTINGS, AND SPECIALTIES.
T. KEEP INSULATION MATERIALS DRY DURING APPLICATION AND FINISHING.
U. INSTALL INSULATION WITH TIGHT LONGITUDINAL SEAMS AND END JOINTS. BOND SEAMS AND JOINTS WITH ADHESIVE RECOMMENDED BY INSULATION MATERIAL MANUFACTURER.
V. INSTALL INSULATION WITH LEAST NUMBER OF JOINTS PRACTICAL.
W. WHERE VAPOR BARRIER IS INDICATED, SEAL JOINTS, SEAMS, AND PENETRATIONS IN INSULATION AT HANGERS, SUPPORTS, ANCHORS, AND OTHER PROJECTIONS WITH VAPOR-BARRIER MASTIC.
   1. INSTALL INSULATION CONTINUOUSLY THROUGH HANGERS AND AROUND ANCHOR ATTACHMENTS.
   2. FOR INSULATION APPLICATION WHERE VAPOR BARRIERS ARE INDICATED, EXTEND INSULATION ON ANCHOR LEGS FROM POINT OF ATTACHMENT TO SUPPORTED ITEM TO POINT OF ATTACHMENT TO STRUCTURE. TAPER AND SEAL ENDS AT ATTACHMENT TO STRUCTURE WITH VAPOR-BARRIER MASTIC.
   3. INSTALL INSERT MATERIALS AND INSTALL INSULATION TO TIGHTLY JOIN THE INSERT. SEAL INSULATION TO INSULATION INSERTS WITH ADHESIVE OR SEALING COMPOUND RECOMMENDED BY INSULATION MATERIAL MANUFACTURER.
   4. COVER INSERTS WITH JACKET MATERIAL MATCHING ADJACENT PIPE INSULATION. INSTALL SHIELDS OVER JACKET, ARRANGED TO PROTECT JACKET FROM TEAR OR PUNCTURE BY HANGER, SUPPORT, AND SHIELD.
X. APPLY ADHESIVES, MASTICS, AND SEALANTS AT MANUFACTURER'S RECOMMENDED COVERAGE RATE AND WET AND DRY FILM THICKNESSES.
Y. INSTALL INSULATION WITH FACTORY-APPLIED JACKETS AS FOLLOWS:
   1. DRAW JACKET TIGHT AND SMOOTH.
   2. COVER CIRCUMFERENTIAL JOINTS WITH 3-INCH- (75-MM-) WIDE STRIPS, OF SAME MATERIAL AS INSULATION JACKET. SECURE STRIPS WITH ADHESIVE AND OUTWARD CLINCHING STAPLES ALONG BOTH EDGES OF STRIP, SPACED 4 INCHES (100 MM) O.C.
   3. OVERLAP JACKET LONGITUDINAL SEAMS AT LEAST 1-1/2 INCHES (38 MM). INSTALL INSULATION WITH LONGITUDINAL SEAMS AT BOTTOM OF PIPE. CLEAN AND DRY SURFACE TO RECEIVE SELF-SEALING LAP. STAPLE LAPS WITH OUTWARD CLINCHING STAPLES ALONG EDGE AT 4 INCHES (100 MM) O.C.
   4. FOR BELOW-AMBIENT SERVICES, APPLY VAPOR-BARRIER MASTIC OVER STAPLES.
   5. COVER JOINTS AND SEAMS WITH TAPE, ACCORDING TO INSULATION MATERIAL MANUFACTURER'S WRITTEN INSTRUCTIONS, TO MAINTAIN VAPOR SEAL.
   6. WHERE VAPOR BARRIERS ARE INDICATED, APPLY VAPOR-BARRIER MASTIC ON SEAMS AND JOINTS AND AT ENDS ADJACENT TO PIPE FLANGES AND FITTINGS.

A. CUT INSULATION IN A MANNER TO AVOID COMPRESSING INSULATION MORE THAN 75 PERCENT OF ITS NOMINAL THICKNESS.
B. FINISH INSTALLATION WITH SYSTEMS AT OPERATING CONDITIONS. REPAIR JOINT SEPARATIONS AND CRACKING DUE TO THERMAL MOVEMENT.
C. REPAIR DAMAGED INSULATION FACINGS BY APPLYING SAME FACING MATERIAL OVER DAMAGED AREAS. EXTEND PATCHES AT LEAST 4 INCHES (100 MM) BEYOND DAMAGED AREAS. ADHERE, STAPLE, AND SEAL PATCHES SIMILAR TO BUTT JOINTS.
D. FOR ABOVE-AMBIENT SERVICES, DO NOT INSTALL INSULATION TO THE FOLLOWING:
   1. VIBRATION-CONTROL DEVICES.
   2. TESTING AGENCY LABELS AND STAMPS.
   3. NAMEPLATES AND DATA PLATES.
   4. CLEANOUTS.
E. INSTALLATION OF MINERAL-FIBER INSULATION:
INSULATION INSTALLATION ON STRAIGHT PIPES AND TUBES:
   1. SECURE EACH LAYER OF PREFORMED PIPE INSULATION TO PIPE WITH WIRE OR BANDS AND TIGHTEN BANDS WITHOUT DEFORMING INSULATION MATERIALS.
   2. WHERE VAPOR BARRIERS ARE INDICATED, SEAL LONGITUDINAL SEAMS, END JOINTS, AND PROTRUSIONS WITH VAPOR-BARRIER MASTIC AND JOINT SEALANT.
   3. FOR INSULATION WITH FACTORY-APPLIED JACKETS ON ABOVE-AMBIENT SURFACES, SECURE LAPS WITH OUTWARD CLINCHED STAPLES AT 6 INCHES (150 MM) O.C.
   4. FOR INSULATION WITH FACTORY-APPLIED JACKETS ON BELOW-AMBIENT SURFACES, DO NOT STAPLE LONGITUDINAL TABS. INSTEAD, SECURE TABS WITH ADDITIONAL ADHESIVE AS RECOMMENDED BY INSULATION MATERIAL MANUFACTURER AND SEAL WITH VAPOR-BARRIER MASTIC AND FLASHING SEALANT.
F. INSULATION INSTALLATION ON PIPE FLANGES:
   1. INSTALL PREFORMED PIPE INSULATION TO OUTER DIAMETER OF PIPE FLANGE.
   2. MAKE WIDTH OF INSULATION SECTION SAME AS OVERALL WIDTH OF FLANGE AND BOLTS, PLUS TWICE THE THICKNESS OF PIPE INSULATION.
   3. FILL VOIDS BETWEEN INNER CIRCUMFERENCE OF FLANGE INSULATION AND OUTER CIRCUMFERENCE OF ADJACENT STRAIGHT PIPE SEGMENTS WITH MINERAL-FIBER BLANKET INSULATION.
   4. INSTALL JACKET MATERIAL WITH MANUFACTURER'S RECOMMENDED ADHESIVE, OVERLAP SEAMS AT LEAST 1 INCH (25 MM), AND SEAL JOINTS WITH FLASHING SEALANT.
G. INSULATION INSTALLATION ON PIPE FITTINGS AND ELBOWS:
   1. INSTALL PREFORMED SECTIONS OF SAME MATERIAL AS STRAIGHT SEGMENTS OF PIPE INSULATION WHEN AVAILABLE.
   2. WHEN PREFORMED INSULATION ELBOWS AND FITTINGS ARE NOT AVAILABLE, INSTALL MITERED SECTIONS OF PIPE INSULATION, TO A THICKNESS EQUAL TO ADJOINING PIPE INSULATION. SECURE INSULATION MATERIALS WITH WIRE OR BANDS.
H. INSULATION INSTALLATION ON VALVES AND PIPE SPECIALTIES:
   1. INSTALL PREFORMED SECTIONS OF SAME MATERIAL AS STRAIGHT SEGMENTS OF PIPE INSULATION WHEN AVAILABLE.
   2. WHEN PREFORMED SECTIONS ARE NOT AVAILABLE, INSTALL MITERED SECTIONS OF PIPE INSULATION TO VALVE BODY.
   3. ARRANGE INSULATION TO PERMIT ACCESS TO PACKING AND TO ALLOW VALVE OPERATION WITHOUT DISTURBING INSULATION.
   4. INSTALL INSULATION TO FLANGES AS SPECIFIED FOR FLANGE INSULATION APPLICATION.

INDOOR PIPING INSULATION SCHEDULE

A. DOMESTIC HOT AND RECIRCULATED HOT WATER:
NPS 2 (DN 25) AND SMALLER: INSULATION SHALL BE THE FOLLOWING:
   1. MINERAL-FIBER, PREFORMED PIPE INSULATION, TYPE I: 1 INCH (25 MM) THICK.
NPS 2-1/2 (DN 32) AND LARGER: INSULATION SHALL BE THE FOLLOWING:
   2. MINERAL-FIBER, PREFORMED PIPE INSULATION, TYPE I: 1-1/2 INCH (25 MM) THICK.

B. STORMWATER AND OVERFLOW:
ALL PIPE SIZES: INSULATION SHALL BE THE FOLLOWING:
MINERAL-FIBER, PREFORMED PIPE INSULATION, TYPE I: 1-1/2 INCH (25 MM) THICK.

C. ROOF DRAIN AND OVERFLOW DRAIN BODIES:
ALL PIPE SIZES: INSULATION SHALL BE THE FOLLOWING:
MINERAL-FIBER, PREFORMED PIPE INSULATION, TYPE I: 1-1/2 INCH (25 MM) THICK.

D. EXPOSED SANITARY DRAINS, DOMESTIC WATER, DOMESTIC HOT WATER, AND STOPS FOR PLUMBING FIXTURES FOR PEOPLE WITH DISABILITIES:
ALL PIPE SIZES: INSULATION SHALL THE FOLLOWING:
MINERAL-FIBER, PREFORMED PIPE INSULATION, TYPE I: 1/2 INCH (13 MM) THICK.

E. FLOOR DRAINS, TRAPS, AND SANITARY DRAIN PIPING WITHIN 10 FEET (3 M) OF DRAIN RECEIVING CONDENSATE AND EQUIPMENT DRAIN WATER BELOW 60 DEG F (16 DEG C):
ALL PIPE SIZES: INSULATION SHALL BE THE FOLLOWING:
MINERAL-FIBER, PREFORMED PIPE INSULATION, TYPE I: 1 INCH (25 MM).

FIRE PROTECTION

FIRE SUPPRESSION

A. COMPLY WITH REQUIREMENTS FOR INSTALLATION OF SPRINKLER PIPING IN NFPA 13.

B. STEEL PIPE AND FITTINGS: SCHEDULE 40 BLACK STEEL PIPE: ASTM A 53/A 53M. PIPE ENDS MAY BE FACTORY OR FIELD FORMED TO MATCH JOINING METHOD.

C. USE LISTED FITTINGS TO MAKE CHANGES IN DIRECTION, BRANCH TAKEOFFS FROM MAINS, AND REDUCTIONS IN PIPE SIZES.

D. INSTALL UNIONS ADJACENT TO EACH VALVE IN PIPES NPS 2 (DN 50) AND SMALLER.

E. INSTALL FLANGES, FLANGE ADAPTERS, OR COUPLINGS FOR GROOVED-END PIPING ON VALVES, APPARATUS, AND EQUIPMENT HAVING NPS 2-1/2 (DN 65) AND LARGER END CONNECTIONS.

F. INSTALL "INSPECTOR'S TEST CONNECTIONS" IN SPRINKLER SYSTEM PIPING, COMPLETE WITH SHUTOFF VALVE, AND SIZED AND LOCATED ACCORDING TO NFPA 13.

G. INSTALL SPRINKLER PIPING WITH DRAINS FOR COMPLETE SYSTEM DRAINAGE.

H. INSTALL SPRINKLER CONTROL VALVES, TEST ASSEMBLIES, AND DRAIN RISERS ADJACENT TO STANDPIPES WHEN SPRINKLER PIPING IS CONNECTED TO STANDPIPES.

I. INSTALL ALARM DEVICES IN PIPING SYSTEMS.

J. INSTALL HANGERS AND SUPPORTS FOR SPRINKLER SYSTEM PIPING ACCORDING TO NFPA 13. COMPLY WITH REQUIREMENTS FOR HANGER MATERIALS IN NFPA 13.

K. FILL SPRINKLER SYSTEM PIPING WITH WATER.

L. INSTALL SLEEVES FOR PIPING PENETRATIONS OF WALLS, CEILINGS, AND FLOORS.

M. INSTALL ESCUTCHEONS FOR PIPING PENETRATIONS OF WALLS, CEILINGS, AND FLOORS.

N. SPRINKLER INSTALLATION: INSTALL SPRINKLERS IN SUSPENDED CEILINGS IN CENTER OF ACOUSTICAL CEILING PANELS.

O. FIRE SPRINKLER CONTRACTOR SHALL VERIFY LOCATION OF EXISTING SPRINKLER HEADS AND SHALL BE RESPONSIBLE FOR THE NECESSARY MODIFICATIONS TO PIPING. SPRINKLER CONTRACTOR SHALL REVISE PIPING TO ACCOMMODATE CEILING MOUNTED SPRINKLER HEADS TO MATCH BUILDING STANDARD, AND SHALL ADD OR RELOCATE SPRINKLER HEADS AS REQUIRED. ALL WORK SHALL BE IN ACCORDANCE WITH NFPA, STATE AND LOCAL CODES. VERIFY CLEARANCES IN CEILING SPACE PRIOR TO INSTALLATION.

P. BEFORE SHUTTING OFF A SECTION OF THE FIRE SERVICE SYSTEM TO MAKE SPRINKLER SYSTEM CONNECTION, NOTIFY THE FIRE DEPARTMENT, PLAN THE WORK CAREFULLY, AND ASSEMBLE ALL MATERIALS TO ENABLE COMPLETION IN THE SHORTEST POSSIBLE TIME. WORK STARTED ON CONNECTIONS SHOULD BE RUSHED TO COMPLETION WITHOUT INTERRUPTION, AND PROTECTION RESTORED AS PROMPTLY AS POSSIBLE. DURING THE IMPAIRMENT, PROVIDE EMERGENCY HOSE LINES, ADDITIONAL FIRE PAILS AND EXTINGUISHERS, AND MAINTAIN WATCH SERVICE IN THE AREAS AFFECTED.

Q. WHEN CHANGES INVOLVE SHUTTING OFF WATER FROM ANY CONSIDERABLE NUMBER OF SPRINKLERS FOR MORE THAN A FEW HOURS, TEMPORARY WATER SUPPLY CONNECTIONS SHOULD BE MADE TO SPRINKLER SYSTEMS SO THAT REASONABLE PROTECTION CAN BE MAINTAINED. IN ADDING TO OLD SYSTEMS OR REVAMPING THEM, PROTECTION SHOULD BE RESTORED EACH NIGHT SO FAR AS POSSIBLE. THE FIRE DEPARTMENT SHALL BE NOTIFIED AS TO CONDITIONS.

R. IDENTIFICATION: INSTALL LABELING AND PIPE MARKERS ON EQUIPMENT AND PIPING ACCORDING TO REQUIREMENTS IN NFPA 13.

S. LEAK TEST: AFTER INSTALLATION, CHARGE SYSTEMS AND TEST FOR LEAKS. REPAIR LEAKS AND RETEST UNTIL NO LEAKS EXIST. TEST AND ADJUST CONTROLS AND SAFETIES. REPLACE DAMAGED AND MALFUNCTIONING CONTROLS AND EQUIPMENT. FLUSH, TEST, AND INSPECT SPRINKLER SYSTEMS ACCORDING TO NFPA 13, "SYSTEMS ACCEPTANCE" CHAPTER. COORDINATE WITH FIRE-ALARM TESTS. OPERATE AS REQUIRED. COORDINATE WITH FIRE-PUMP TESTS. OPERATE AS REQUIRED. SPRINKLER PIPING SYSTEM WILL BE CONSIDERED DEFECTIVE IF IT DOES NOT PASS TESTS AND INSPECTIONS. PREPARE TEST AND INSPECTION REPORTS.

T. USE SPRINKLER TYPES IN SUBPARAGRAPHS BELOW FOR THE FOLLOWING APPLICATIONS:
   1. ROOMS WITHOUT CEILINGS: UPRIGHT SPRINKLERS.
   2. ROOMS WITH SUSPENDED CEILINGS: PENDENT, RECESSED, FLUSH, AND CONCEALED SPRINKLERS AS REQUIRED BY OWNER, WITH FINISH SELECTED BY ARCHITECT AND OWNER.
   3. WALL MOUNTING: SIDEWALL SPRINKLERS.

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WOODLANDS, TEXAS

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