CLAIMS

1. A residential fire sprinkler for connection to a piping system having a fluid supply so as to locate the sprinkler centrally over a coverage area in at least one of a first fluid distribution test and a second fluid distribution test, the coverage area in the first fluid distribution test including at least 324 square feet or greater sub-divided into four quadrants, the coverage area being defined as a product of coverage width and length, where a length of one quadrant is about one-half the coverage length and a width of the one quadrant is about one-half coverage width where each square foot of the quadrant is covered by a first set of collection pans of one-square foot area with the top of each collection being about eight feet below a generally flat ceiling of the coverage area, the coverage area including in the second fluid distribution test non-porous walls, a second set of fluid collection pans of one square foot area being placed against the non-porous walls, the tops of the second set of collection pans being six feet, ten inches below the generally flat ceiling, the sprinkler comprising:

a body for connection to the piping system defining a passageway between an inlet and an outlet along a longitudinal axis with the outlet closer to an area to be protected than the inlet, the passage including a rated K-factor of at least 6, the body including a portion having ¾-inch or greater NPT threads formed thereon;

a closure positioned proximate the outlet opening so as to occlude the passageway;

a heat responsive trigger that retains the closure to occlude the passageway;

at least one frame arm being coupled to the body; and

a deflector coupled to the at least one frame arm and spaced from the outlet opening so that when the trigger is actuated, the deflector provides adequate fluid distribution for the protection of a dwelling unit, the deflector including:

a first surface that faces the outlet and a second surface spaced apart from the first surface;

a plurality of tines that extends away from the longitudinal axis, the plurality of tines being disposed generally about the longitudinal axis; and

a plurality of slots formed through the first and second surfaces, the plurality of slots comprising 22 slots, each slot including two generally parallel walls between a first end and a second end to define an opening extending along a slot axis generally perpendicular the longitudinal axis, the slot axis intersecting the longitudinal axis, the plurality of slots further including two close-ended slots, the two walls of each close-ended slot converging towards each other at the first end and the second end to define a polygonal perimeter,

the deflector being spaced from the body such that when the sprinkler is connected for the first fluid distribution test and the fluid supply feeds 10 pounds per square inch gauge (psig) of fluid

to the inlet and is allowed to flow from the outlet upon actuation of the trigger for a duration of about twenty minutes over the coverage area for distribution by the deflector and a portion of the at least one frame arm, an amount of fluid is collected in any of the first set of collection pans at a density of about 0.02 gallons per minute per square foot and no more than four collection pans for each quadrant receive less than 0.015 gallons per square foot, and when the sprinkler is connected for the second fluid distribution test the fluid supply feeds 10 pounds per square inch gauge (psig) of fluid to the inlet and is allowed to flow from the outlet upon actuation of the trigger for a duration of about ten minutes over the coverage area for distribution by the deflector and a portion of the at least one frame arm to impinge the non-porous walls within 28 inches of the ceiling, an amount of fluid in the second set of collection pans that is at least five percent of a flow rate of at least 17 gallons per minute.

2. The residential fire sprinkler of claim 1, wherein the deflector further comprises:

a nub located proximate the second end of each of the two slots, the nub projecting towards the outlet.

3. The residential fire sprinkler of claim 1, wherein the sprinkler is connected to the piping system and the fluid supply is of less than 8 pounds per square inch gauge fed to the inlet for distribution over the coverage area, the coverage area further being a generally square coverage area in accordance UL 1626 (October 2003).

4. The residential fire sprinkler of claim 1, wherein the sprinkler body is configured for a minimum design pressure of less than 14 pounds per square inch gauge so as to provide a suitable density in accordance with the 2002 Edition of National Fire Protection Association Standards 13, 13D and 13R to a design protection area of about 400 square feet with a maximum distance of a generally linear side of the design protection area being no greater than 20 feet.

5. The residential fire sprinkler of claim 1, wherein the sprinkler body is configured for a minimum design pressure of less than 10 pounds per square inch gauge so as to provide a suitable density in accordance with the 2002 Edition of National Fire Protection Association Standards 13, 13D and 13R to a design protection area of about 324 square feet with a maximum distance of a generally linear side of the design protection area being no greater than 18 feet.

6. A residential fire sprinkler for connecting to a piping network to protect a residential dwelling unit having a plurality of compartments as defined in accordance with the 2002 Edition of National Fire Protection Association Standards 13, 13D and 13R, the residential fire sprinkler comprising:

a body defining a passageway between an inlet and an outlet along a longitudinal axis with the outlet closer to an area to be protected than the inlet, the passageway having a rated K factor that is at a minimum 6;

a closure positioned proximate the outlet opening so as to occlude the passageway in a unactuated position;

a heat responsive trigger that retains the closure to occlude the passageway; and

a deflector assembly that distributes fluid fed to the inlet at less than 10 pounds per square inch gauge over a residential coverage area of at least 324 square feet and a density of at least 0.05 gallons per minute per square feet when the heat responsive trigger is actuated to permit flow through the outlet, the deflector assembly including a plate centrally aligned with the longitudinal axis, the plate including a plurality of slots arrayed about the longitudinal axis, the plurality of slots comprising 22 slots, each slot defining a slot axis that intersects and is perpendicular to the longitudinal axis, the body and deflector assembly providing for the residential sprinkler to meet a vertical fluid distribution test requirement and a horizontal distribution test requirement under UL 1626 (October 2003), the body includes a pair of frame arms spaced apart along a first axis perpendicular to the longitudinal axis, and wherein further the plate includes a pair of through holes disposed along a second axis perpendicular to the longitudinal axis and aligned 90 degrees relative to the first axis,

wherein the vertical fluid distribution test requirement includes the residential sprinkler installed in a test arrangement having four walls, a floor and a nominal eight foot (8 ft.) high flat ceiling to define a test coverage area equal to the residential coverage area with the residential sprinkler installed beneath the ceiling coupled to a one-inch internal diameter test pipe, the residential sprinkler being centered over the test coverage area at one-half the width or the length of the test coverage area, the test arrangement further including a first plurality of test pans, each having a top defining a one square foot (1 sq. ft.) collection area, being located on the floor against the four walls such that the tops of the plurality of test pans are located six feet, ten inches (6 ft. - 10 in.) below the ceiling, the vertical fluid distribution test requirement providing that when water is delivered to the residential sprinkler via the test pipe at a test flow rate for a duration often minutes, the four walls are wetted within 28 inches of the ceiling and wherein when further the test coverage area is square, each of the four walls is wetted with at least five percent of the sprinkler flow, and wherein when the test coverage area is rectangular, for each of the four walls is wetted with a proportional amount of water collected in the first plurality of pans that is generally equal to twenty percent (20%) of a total

discharge from the residential sprinkler times the wall length and divided by the perimeter length of the coverage area, and

wherein the horizontal test distribution requirement, the residential sprinkler is installed in the test arrangement such that the residential sprinkler is coupled to the test pipe via a T-fitting having an outlet equivalent to the inlet of the body, the residential sprinkler being centered over the test coverage area at one-half the width and the length of the test coverage area so as to divide the test coverage area into quadrants, each quadrant having a length that is one-half the length of the test coverage area and a width that is one-half the width of the test coverage area, the test arrangement further including a second plurality of test pans, each having a top defining a one square foot (1 sq. ft.) collection area, being located on the floor so as to cover each square foot of each quadrant with the tops of the pans about eight feet (8 ft.) below the ceiling, the horizontal fluid distribution test requirement providing that when water is delivered to the residential sprinkler at a test flow rate for a duration of twenty minutes, fluid is collected in the second plurality of test pans at a density of about 0.02 gallons per minute per square foot (gpm/sq. ft.) with no more than four pans for each quadrant in the second plurality of pans collecting water at a density of at least 0.015 gallons per minute per square foot (gpm/sq. ft.).

7. The sprinkler of claim 5, wherein the vertical fluid distribution test requirement, the amount of fluid collected in the first plurality of collection pans is at least five percent of a flow rate of at least 17 gallons per minute.

8. The sprinkler of claim 7, wherein the vertical fluid distribution test requirement, is in accordance with section 27 of UL 1626 (October 2003).

9. A residential fire sprinkler that connects to a piping network to protect a residential dwelling unit having a plurality of compartments as defined in accordance with the 2002 Edition of National Fire Protection Association Standards 13, 13D and 13R, the residential fire sprinkler comprising:

a body defining a passageway between an inlet and an outlet along a longitudinal axis, the passageway having a rated K-factor that is at a minimum 6, the outlet being closer to an area to be protected;

a closure positioned proximate the outlet opening so as to occlude the passageway in a unactuated position;

a heat responsive trigger that retains the closure to occlude the passageway; and

a deflector assembly coupled to the body so that the sprinkler provides a suitable density, in accordance with the 2002 Edition of National Fire Protection Association Standards 13, 13D and 13R, for a residential protection design area having a maximum area of about 400 square feet with a maximum distance of a generally linear side of the residential design protection area being no greater than 20 feet, the body being configured for a minimum design pressure of less than 14 pounds per square inch gauge, the deflector assembly including a plate centrally aligned with the longitudinal axis, the plate including a plurality of slots arrayed about the longitudinal axis, the plurality of slots comprising 22 slots, each slot defining a slot axis that intersects and is perpendicular to the longitudinal axis, the body and deflector assembly providing for the residential sprinkler to meet a vertical fluid distribution test requirement and a horizontal distribution test requirement under UL 1626 (October 2003), the body includes a pair of frame arms spaced apart along a first axis perpendicular to the longitudinal axis, and the plate includes a pair of through holes disposed along a second axis perpendicular to the longitudinal axis and aligned 90 degrees relative to the first axis,

wherein the vertical fluid distribution test requirement includes the residential sprinkler installed in a test arrangement having four walls, a floor and a nominal eight foot (8 ft.) high flat ceiling to define a test coverage area equal to the residential coverage area with the residential sprinkler installed beneath the ceiling coupled to a one-inch internal diameter test pipe, the residential sprinkler being centered over the test coverage area at one-half the width or the length of the test coverage area, the test arrangement further including a first plurality of test pans, each having a top defining a one square foot (1 sq. ft.) collection area, being located on the floor against the four walls such that the tops of the plurality of test pans are located six feet, ten inches (6 ft. - 10 in.) below the ceiling, the vertical fluid distribution test requirement providing that when water is delivered to the residential sprinkler via the test pipe at a test flow rate for a duration often minutes, the four walls are wetted within 28 inches of the ceiling and wherein when further the test coverage area is square, each of the four walls is wetted with at least five percent of the sprinkler flow, and wherein when the test coverage area is rectangular, for each of the four walls is wetted with a proportional amount of water collected in the first plurality of pans that is generally equal to twenty percent (20%) of a total discharge from the residential sprinkler times the wall length and divided by the perimeter length of the coverage area, and

wherein the horizontal test distribution requirement, the residential sprinkler is installed in the test arrangement such that the residential sprinkler is coupled to the test pipe via a T-fitting having an outlet equivalent to the inlet of the body, the residential sprinkler being centered over the test coverage area at one-half the width and the length of the test coverage area so as to divide the test coverage area into quadrants, each quadrant having a length that is one-half the length of the test

coverage area and a width that is one-half the width of the test coverage area, the test arrangement further including a second plurality of test pans, each having a top defining a one square foot (1 sq. ft.) collection area, being located on the floor so as to cover each square foot of each quadrant with the tops of the pans about eight feet (8 ft.) below the ceiling, the horizontal fluid distribution test requirement providing that when water is delivered to the residential sprinkler at a test flow rate for a duration of twenty minutes, fluid is collected in the second plurality of test pans at a density of about 0.02 gallons per minute per square foot (gpm/sq. ft.) with no more than four pans for each quadrant in the second plurality of pans collecting water at a density of at least 0.015 gallons per minute per square foot (gpm/sq. ft.).

10. The residential fire sprinkler of claim 9, wherein the body is configured for the minimum design pressure being less than 10 pounds per square inch gauge, the residential design protection area being about 324 square feet with the distance of the generally linear side of the design protection area being no greater than 18 feet.

11. The residential fire sprinkler of claim 10, wherein the body is configured for the minimum design pressure having a minimum design flow rate from about 17 gallons per minute to about 33 gallons per minute for the minimum design pressure.

12. The residential fire sprinkler of claim 11, wherein the body is configured such that the minimum design flow rate is about 19 gallons per minute or less.

13. The residential fire sprinkler of claim 12, wherein the residential sprinkler is configured to be installed in a fire protection system having at least two identical residential fire sprinklers for the residential design protection area.

14. A residential fire sprinkler that connects to a piping network to protect a residential dwelling unit having a plurality of compartments as defined in accordance with the 2002 Edition of National Fire Protection Association Standards 13, 13D and 13R, the residential fire sprinkler comprising:

a body defining a passageway between an inlet and an outlet along a longitudinal axis, the passageway having a rated K-factor that is at a minimum 6, the outlet being closer to an area to be protected;

a closure positioned proximate the outlet opening so as to occlude the passageway in a unactuated position;

a heat responsive trigger that retains the closure to occlude the passageway; and

means for distributing fluid over a coverage area of a residential dwelling unit and providing a suitable density, in accordance with the 2002 Edition of National Fire Protection Association Standards 13, 13D and 13R, for a residential protection design area having a maximum area of about 400 square feet with a maximum distance of a generally linear side of the residential design protection area being no greater than 20 feet, the body being configured for a minimum design pressure of less than 14 pounds per square inch gauge where a design protection area is about 400 square feet with a maximum distance of a generally linear side of the design protection area being no greater than 20 feet, the means including an annular plate centrally aligned with the longitudinal axis, the plate including a plurality of slots arrayed about the longitudinal axis, the plurality of slots comprising 22 slots, each slot defining a slot axis that intersects and is perpendicular to the longitudinal axis, the body and means providing for the residential sprinkler to meet a vertical fluid distribution test requirement and a horizontal distribution test requirement under UL 1626 (October 2003), the body includes a pair of frame arms spaced apart along a first axis perpendicular to the longitudinal axis, and the plate includes a pair of through holes disposed along a second axis perpendicular to the longitudinal axis and aligned 90 degrees relative to the first axis,

wherein the vertical fluid distribution test requirement includes the residential sprinkler installed in a test arrangement having four walls, a floor and a nominal eight foot (8 ft.) high flat ceiling to define a test coverage area equal to the residential coverage area with the residential sprinkler installed beneath the ceiling coupled to a one-inch internal diameter test pipe, the residential sprinkler being centered over the test coverage area at one-half the width or the length of the test coverage area, the test arrangement further including a first plurality of test pans, each having a top defining a one square foot (1 sq. ft.) collection area, being located on the floor against the four walls such that the tops of the plurality of test pans are located six feet, ten inches (6 ft. - 10 in.) below the ceiling, the vertical fluid distribution test requirement providing that when water is delivered to the residential sprinkler via the test pipe at a test flow rate for a duration often minutes, the four walls are wetted within 28 inches of the ceiling and wherein when further the test coverage area is square, each of the four walls is wetted with at least five percent of the sprinkler flow, and wherein when the test coverage area is rectangular, for each of the four walls is wetted with a proportional amount of water collected in the first plurality of pans that is generally equal to twenty percent (20%) of a total discharge from the residential sprinkler times the wall length and divided by the perimeter length of the coverage area, and

wherein the horizontal test distribution requirement, the residential sprinkler is installed in the test arrangement such that the residential sprinkler is coupled to the test pipe via a T-fitting having an

outlet equivalent to the inlet of the body, the residential sprinkler being centered over the test coverage area at one-half the width and the length of the test coverage area so as to divide the test coverage area into quadrants, each quadrant having a length that is one-half the length of the test coverage area and a width that is one-half the width of the test coverage area, the test arrangement further including a second plurality of test pans, each having a top defining a one square foot (1 sq. ft.) collection area, being located on the floor so as to cover each square foot of each quadrant with the tops of the pans about eight feet (8 ft.) below the ceiling, the horizontal fluid distribution test requirement providing that when water is delivered to the residential sprinkler at a test flow rate for a duration of twenty minutes, fluid is collected in the second plurality of test pans at a density of about 0.02 gallons per minute per square foot (gpm/sq. ft.) with no more than four pans for each quadrant in the second plurality of pans collecting water at a density of at least 0.05 gallons per minute per square foot (gpm/sq. ft.).

15. The residential fire sprinkler of claim 14, wherein body is configured for the minimum design pressure being less than 10 pounds per square inch gauge, the residential design protection area being about 324 square feet with the distance of the generally linear side of the design protection area being no greater than 18 feet.

16. The residential fire sprinkler of claim 15, wherein the body is configured for the minimum design pressure having a minimum design flow rate of from about 17 gallons per minute to about 33 gallons per minute for the minimum design pressure.

17. The residential fire sprinkler of claim 16, wherein body is configured such that the minimum design flow rate is about 19 gallons per minute.

18. The residential fire sprinkler of claim 17, wherein the residential sprinkler is configured to be installed in a fire protection system having at least two identical residential fire sprinklers for the residential design protection area.

19. The residential fire sprinkler of claim 18, wherein the plate includes a plurality of tines that extends away from the longitudinal axis, the plurality of tines being disposed generally about the longitudinal axis, and two close-ended slots formed on the plate, each close-ended slot including two generally parallel walls between a first end and a second end to define an opening extending along a slot axis generally perpendicular to a plane defined by the longitudinal axis and the at least one frame

arm, the two walls of the slot converging towards each other at the first end and the second end to define a polygonal perimeter.

20. A method of establishing a coverage area of protectability for a fire sprinkler in a residential dwelling unit having a plurality of compartments as defined in the 2002 National Fire Protection Association Standard 13, the fire sprinkler having a body with an inlet and an outlet along a longitudinal axis, the fire sprinkler including a deflector assembly having a plate centrally aligned with the longitudinal axis, the plate including a plurality of slots arrayed about the longitudinal axis, the plurality of slots comprising 22 slots, each slot defining a slot axis that intersects and is perpendicular to the longitudinal axis, the body includes a pair of frame arms spaced apart along a first axis perpendicular to the longitudinal axis, and the plate includes a pair of through holes disposed along a second axis perpendicular to the longitudinal axis and aligned 90 degrees relative to the first axis, the method comprising:

supplying fluid to the inlet of a sprinkler at less than 14 pounds per square inch gauge and greater than or equal to 7 pounds per square inch gauge;

flowing fluid from the outlet at a flow rate of less than 32 gallons per minute and greater than 17 gallons per minute; and

distributing fluid from the deflector assembly over a coverage area in accordance with requirements of UL 1626 Standard (October 2003), the requirements including a vertical fluid distribution test requirement and a horizontal distribution test requirement,

wherein the vertical fluid distribution test requirement includes the sprinkler installed in a test arrangement having four walls, a floor and a nominal eight foot (8 ft.) high flat ceiling to define a test coverage area equal to the residential coverage area with the sprinkler installed beneath the ceiling coupled to a one-inch internal diameter test pipe, the sprinkler being centered over the test coverage area at one-half the width or the length of the test coverage area, the test arrangement further including a first plurality of test pans, each having a top defining a one square foot (1 sq. ft.) collection area, being located on the floor against the four walls such that the tops of the plurality of test pans are located six feet, ten inches (6 ft. - 10 in.) below the ceiling, the vertical fluid distribution test requirement providing that when water is delivered to the sprinkler via the test pipe at the flow rate for a duration of ten minutes, the four walls are wetted within 28 inches of the ceiling and wherein when further the test coverage area is square, each of the four walls is wetted with at least five percent of the sprinkler flow, and wherein when the test coverage area is rectangular, for each of the four walls is wetted with a proportional amount of water collected in the first plurality of pans that

is generally equal to twenty percent (20%) of a total discharge from the sprinkler times the wall length and divided by the perimeter length of the coverage area, and

wherein the horizontal test distribution requirement, the sprinkler is installed in the test arrangement such that the sprinkler is coupled to the test pipe via a T-fitting having an outlet equivalent to the inlet of the body, the sprinkler being centered over the test coverage area at one-half the width and the length of the test coverage area so as to divide the test coverage area into quadrants, each quadrant having a length that is one-half the length of the test coverage area and a width that is one-half the width of the test coverage area, the test arrangement further including a second plurality of test pans, each having a top defining a one square foot (1 sq. ft.) collection area, being located on the floor so as to cover each square foot of each quadrant with the tops of the pans about eight feet (8 ft.) below the ceiling, the horizontal fluid distribution test requirement providing that when water is delivered to the sprinkler at the flow rate for a duration of twenty minutes, fluid is collected in the second plurality of test pans at a density of about 0.02 gallons per minute per square foot (gpm/sq. ft.) with no more than four pans for each quadrant in the second plurality of pans collecting water at a density of at least 0.015 gallons per minute per square foot (gpm/sq. ft.).

21. The method of claim 20, wherein the distributing comprises:

providing an identical fire sprinkler located eight feet away from the body; and distributing fluid of the fire sprinkler without prevention of the operation of the identical sprinkler in accordance with Section 22 of the UL 1626 Standard (October 2003).

22. The method of claim 20, wherein the flowing comprises flowing fluid at a flow rate of about 19 gallons per minute at less than 8 pounds per square inch gauge of pressure and the distributing comprises distributing fluid over a coverage area of 18 feet by 18 feet.

23. The method of claim 20, wherein the flowing comprises flowing fluid at a flow rate of 22 gallons per minute at less than 11 pounds per square inch gauge of pressure and the distributing comprises distributing fluid over a coverage area of 20 feet by 20 feet.

24. A residential fire sprinkler for installation in a sprinkler system designed in accordance with the 2002 Edition of NFPA 13, 13D, and 13R, the sprinkler comprising:

a body having a passageway between an inlet and an outlet along a longitudinal axis, the passageway defining a K-factor that is at a minimum 6, the body including ¾-inch NPT threads;

a deflector assembly coupled to the body to distribute a fluid flow through the passageway over a coverage area in accordance with UL 1626 (October 2003), the deflector assembly being further coupled to a heat responsive trigger disposed between the passage and the deflector assembly the body being configured for a minimum design pressure of less than 10 pounds per square inch gauge at a minimum design flow rate of 19 gallons per minute, such that the deflector assembly distributes the fluid over the coverage area in accordance with UL 1626 (October 2003), the coverage area being at least 324 square feet, the deflector assembly including a plate centrally aligned with the longitudinal axis, the plate including a plurality of slots arrayed about the longitudinal axis, the plurality of slots comprising 22 slots, each slot defining a slot axis that intersects and is perpendicular to the longitudinal axis, the body and deflector assembly providing for the residential sprinkler to meet a vertical fluid distribution test requirement and a horizontal distribution test requirement under UL 1626 (October 2003), the body includes a pair of frame arms spaced apart along a first axis perpendicular to the longitudinal axis, and the plate includes a pair of through holes disposed along a second axis perpendicular to the longitudinal axis and aligned 90 degrees relative to the first axis,

wherein the vertical fluid distribution test requirement includes the residential sprinkler installed in a test arrangement having four walls, a floor and a nominal eight foot (8 ft.) high flat ceiling to define a test coverage area equal to the residential coverage area with the residential sprinkler installed beneath the ceiling coupled to a one-inch internal diameter test pipe, the residential sprinkler being centered over the test coverage area at one-half the width or the length of the test coverage area, the test arrangement further including a first plurality of test pans, each having a top defining a one square foot (1 sq. ft.) collection area, being located on the floor against the four walls such that the tops of the plurality of test pans are located six feet, ten inches (6 ft. - 10 in.) below the ceiling, the vertical fluid distribution test requirement providing that when water is delivered to the residential sprinkler via the test pipe at a test flow rate for a duration often minutes, the four walls are wetted within 28 inches of the ceiling and wherein when further the test coverage area is square, each of the four walls is wetted with at least five percent of the sprinkler flow, and wherein when the test coverage area is rectangular, for each of the four walls is wetted with a proportional amount of water collected in the first plurality of pans that is generally equal to twenty percent (20%) of a total discharge from the residential sprinkler times the wall length and divided by the perimeter length of the coverage area, and

wherein the horizontal test distribution requirement, the residential sprinkler is installed in the test arrangement such that the residential sprinkler is coupled to the test pipe via a T-fitting having an outlet equivalent to the inlet of the body, the residential sprinkler being centered over the test coverage area at one-half the width and the length of the test coverage area so as to divide the test

coverage area into quadrants, each quadrant having a length that is one-half the length of the test coverage area and a width that is one-half the width of the test coverage area, the test arrangement further including a second plurality of test pans, each having a top defining a one square foot (1 sq. ft.) collection area, being located on the floor so as to cover each square foot of each quadrant with the tops of the pans about eight feet (8 ft.) below the ceiling, the horizontal fluid distribution test requirement providing that when water is delivered to the residential sprinkler at a test flow rate for a duration of twenty minutes, fluid is collected in the second plurality of test pans at a density of about 0.02 gallons per minute per square foot (gpm/sq. ft.) with no more than four pans for each quadrant in the second plurality of pans collecting water at a density of at least 0.015 gallons per minute per square foot (gpm/sq. ft.).

25. The sprinkler of any one of claims 1, 6, 9, 14, and 24, wherein the inlet includes a bellmouth portion having a radius of curvature of less than about 0.1 inches.

26. The sprinkler of any one of claims 1, 6, 9, 14, and 24, wherein the passageway includes a conic passageway and a cylindrical passageway contiguous with the conic passageway, wherein further the conic passageway defines a first diameter of the passageway and the cylindrical passageway defines a second diameter of the passageway, the second diameter being about eighty-six percent (86%) of the first diameter.

27. The sprinkler of claim 26, wherein the conic passageway defines a length of about 0.8 inches.

28. The sprinkler of claim 26, wherein the first diameter is about 0.6 inches and the second diameter is about 0.5 inches.

29. The sprinkler of claim 26, wherein the passageway further comprises a flared planar surface portion contiguous with the cylindrical passageway, the flared surface portion defining a third diameter that is about 110 percent of the second diameter.

30. The sprinkler of claim 1, wherein the at least one frame arm comprises a pair of arms disposed along a first axis that is perpendicular to the longitudinal axis so as to define a plane with the longitudinal axis, the pair of arms being disposed in the plane, the deflector including a pair of through openings disposed along a second axis extending perpendicular to the longitudinal axis and aligned 90 degrees relative to the first axis.

31. The sprinkler of any one of claims 1, 6, 9, 14 and 24, wherein the plurality of slots comprising 22 slots consists of 22 slots.

CLAIMS

1. A residential fire sprinkler for connection to a piping system having a fluid supply so as to locate the sprinkler centrally over a coverage area in at least one of a first fluid distribution test and a second fluid distribution test, the coverage area in the first fluid distribution test including at least 324 square feet or greater sub-divided into four quadrants, the coverage area being defined as a product of coverage width and length, where a length of one quadrant is about one-half the coverage length and a width of the one quadrant is about one-half coverage width where each square foot of the quadrant is covered by a first set of collection pans of one-square foot area with the top of each collection being about eight feet below a generally flat ceiling of the coverage area, the coverage area including in the second fluid distribution test non-porous walls, a second set of fluid collection pans of one square foot area being placed against the non-porous walls, the tops of the second set of collection pans being six feet, ten inches below the generally flat ceiling, the sprinkler comprising:

a body for connection to the piping system defining a passageway between an inlet and an outlet along a longitudinal axis with the outlet closer to an area to be protected than the inlet, the passage including a rated K-factor of at least 6, the body including a portion having 3/4-inch or greater NPT threads formed thereon;

a closure positioned proximate the outlet opening so as to occlude the passageway;

a heat responsive trigger that retains the closure to occlude the passageway;

at least one frame arm being coupled to the body; and

a deflector coupled to the at least one frame arm and spaced from the outlet opening so that when the trigger is actuated, the deflector provides adequate fluid distribution for the protection of a dwelling unit, the deflector including:

a first surface that faces the outlet and a second surface spaced apart from the first surface;

a plurality of tines that extends away from the longitudinal axis, the plurality of tines being disposed generally about the longitudinal axis; and

a plurality of slots formed through the first and second surfaces, the plurality of slots comprising 22 slots, each slot including two generally parallel walls between a first end and a second end to define an opening extending along a slot axis generally perpendicular to the longitudinal axis, the slot axis intersecting the longitudinal axis, the plurality of slots further including two close-ended slots, the two walls of each close-ended slot converging towards each other at the first end and the second end to define a polygonal perimeter,

the deflector being spaced from the body such that when the sprinkler is connected for the first fluid distribution test and the fluid supply feeds 10 pounds per square inch gauge (psig) of fluid to the inlet and is allowed to flow from the outlet upon actuation of the trigger for a duration of about twenty minutes over the coverage area for distribution by the deflector and a portion of the at least one frame arm, an amount of fluid is collected in any of the first set of collection pans at a density of about 0.02 gallons per minute per square foot and no more than four collection pans for each quadrant receive less than 0.015 gallons per square foot, and when the sprinkler is connected for the second fluid distribution test the fluid supply feeds 10 pounds per square inch gauge (psig) of fluid to the inlet and is allowed to flow from the outlet

upon actuation of the trigger for a duration of about ten minutes over the coverage area for distribution by the deflector and a portion of the at least one frame arm to impinge the non-porous walls within 28 inches of the ceiling, an amount of fluid in the second set of collection pans that is at least five percent of a flow rate of at least 17 gallons per minute.

2. The residential fire sprinkler of claim 1, wherein the deflector further comprises:

a nub located proximate the second end of each of the two slots, the nub projecting towards the outlet.

3. The residential fire sprinkler of claim 1, wherein the sprinkler is connected to the piping system and the fluid supply is of less than 8 pounds per square inch gauge fed to the inlet for distribution over the coverage area, the coverage area further being a generally square coverage area in accordance UL 1626 (October 2003).

4. The residential fire sprinkler of claim 1, wherein the sprinkler body is configured for a minimum design pressure of less than 14 pounds per square inch gauge so as to provide a suitable density in accordance with the 2002 Edition of National Fire Protection Association Standards 13, 13D and 13R to a design protection area of about 400 square feet with a maximum distance of a generally linear side of the design protection area being no greater than 20 feet.

5. The residential fire sprinkler of claim 1, wherein the sprinkler body is configured for a minimum design pressure of less than 10 pounds per square inch gauge so as to provide a suitable density in accordance with the 2002 Edition of National Fire Protection Association Standards 13, 13D and 13R to a design protection area of about 324 square feet with a maximum distance of a generally linear side of the design protection area being no greater than 18 feet.

6. A residential fire sprinkler for connecting to a piping network to protect a residential dwelling unit having a plurality of compartments as defined in accordance with the 2002 Edition of National Fire Protection Association Standards 13, 13D and 13R, the residential fire sprinkler comprising:

a body defining a passageway between an inlet and an outlet along a longitudinal axis with the outlet closer to an area to be protected than the inlet, the passageway having a rated K factor that is at a minimum 6;

a closure positioned proximate the outlet opening so as to occlude the passageway in a unactuated position;

a heat responsive trigger that retains the closure to occlude the passageway; and

a deflector assembly that distributes fluid fed to the inlet at less than 10 pounds per square inch gauge over a residential coverage area of at least 324 square feet and a density of at least 0.05 gallons per minute per square feet when the heat responsive trigger is actuated to permit flow through the outlet, the deflector assembly including a plate centrally aligned with the longitudinal axis, the plate including a plurality of slots arrayed about the longitudinal axis, the plurality of slots comprising 22 slots, each slot defining a slot axis that intersects and is perpendicular to the longitudinal axis, the body and deflector assembly providing for the residential sprinkler to meet a vertical fluid distribution test requirement and a horizontal distribution test requirement under UL 1626 (October 2003), the body includes a pair of frame arms spaced apart along a first axis perpendicular to the longitudinal axis, and wherein further the plate includes a pair of through holes disposed along a second axis perpendicular to the longitudinal axis and aligned 90 degrees relative to the first axis,

wherein the vertical fluid distribution test requirement includes the residential sprinkler installed in a test arrangement having four walls, a floor and a nominal eight foot (8 ft.) high flat ceiling to define a test coverage area equal to the residential coverage area with the residential sprinkler installed beneath the ceiling coupled to a one-inch internal diameter test pipe, the residential sprinkler being centered over the test coverage area at one-half the width or the length of the test coverage area, the test arrangement further including a first plurality of test pans, each having a top defining a one square foot (1 sq. ft.) collection area, being located on the floor against the four walls such that the tops of the plurality of test pans are located six feet, ten inches (6 ft. – 10 in.) below the ceiling, the vertical fluid distribution test requirement providing that when water is delivered to the residential sprinkler via the test pipe at a test flow rate for a duration of ten minutes, the four walls are wetted within 28 inches of the ceiling and wherein when further the test coverage area is square, each of the four walls is wetted with at least five percent of the sprinkler flow, and wherein when the test coverage area is rectangular, for each of the four walls is wetted with a proportional amount of water collected in the first plurality of pans that is generally equal to twenty percent (20%) of a total discharge from the residential sprinkler times the wall length and divided by the perimeter length of the coverage area, and

wherein the horizontal test distribution requirement, the residential sprinkler is installed in the test arrangement such that the residential sprinkler is coupled to the test pipe via a T-fitting having an outlet equivalent to the inlet of the body, the residential sprinkler being centered over the test coverage area at one-half the width and the length of the test coverage area so as to divide the test coverage area into quadrants,

each quadrant having a length that is one-half the length of the test coverage area and a width that is one-half the width of the test coverage area, the test arrangement further including a second plurality of test pans, each having a top defining a one square foot (1 sq. ft.) collection area, being located on the floor so as to cover each square foot of each quadrant with the tops of the pans about eight feet (8 ft.) below the ceiling, the horizontal fluid distribution test requirement providing that when water is delivered to the residential sprinkler at a test flow rate for a duration of twenty minutes, fluid is collected in the second plurality of test pans at a density of about 0.02 gallons per minute per square foot (gpm/sq. ft.) with no more than four pans for each quadrant in the second plurality of pans collecting water at a density of at least 0.015 gallons per minute per square foot (gpm/sq. ft.).

7. The sprinkler of claim 6, wherein the vertical fluid distribution test requirement, the amount of fluid collected in the first plurality of collection pans is at least five percent of a flow rate of at least 17 gallons per minute.

8. The sprinkler of claim 7, wherein the vertical fluid distribution test requirement, is in accordance with section 27 of UL 1626 (October 2003).

9. A residential fire sprinkler that connects to a piping network to protect a residential dwelling unit having a plurality of compartments as defined in accordance with the 2002 Edition of National Fire Protection Association Standards 13, 13D and 13R, the residential fire sprinkler comprising:

a body defining a passageway between an inlet and an outlet along a longitudinal axis, the passageway having a rated K-factor that is at a minimum 6, the outlet being closer to an area to be protected;

a closure positioned proximate the outlet opening so as to occlude the passageway in a unactuated position;

a heat responsive trigger that retains the closure to occlude the passageway; and

a deflector assembly coupled to the body so that the sprinkler provides a suitable density, in accordance with the 2002 Edition of National Fire Protection Association Standards 13, 13D and 13R, for a residential protection design area having a maximum area of about 400 square feet with a maximum distance of a generally linear side of the residential design protection area being no greater than 20 feet, the body being configured for a minimum design pressure of less than 14 pounds per square inch gauge, the deflector assembly including a plate centrally aligned with the longitudinal axis, the plate including a plurality of slots arrayed about the longitudinal axis, the plurality of slots comprising 22 slots, each slot defining a slot axis that intersects and is perpendicular to the longitudinal axis, the body and deflector assembly providing for the residential sprinkler to meet a vertical fluid distribution test requirement and a horizontal distribution test requirement under UL 1626 (October 2003), the body includes a pair of frame arms spaced apart along a first axis perpendicular to the longitudinal axis, and the plate includes a pair of through holes disposed along a second axis perpendicular to the longitudinal axis and aligned 90 degrees relative to the first axis,

wherein the vertical fluid distribution test requirement includes the residential sprinkler installed in a test arrangement having four walls, a floor and a nominal eight foot (8 ft.) high flat ceiling to define a test coverage area equal to the

residential coverage area with the residential sprinkler installed beneath the ceiling coupled to a one-inch internal diameter test pipe, the residential sprinkler being centered over the test coverage area at one-half the width or the length of the test coverage area, the test arrangement further including a first plurality of test pans, each having a top defining a one square foot (1 sq. ft.) collection area, being located on the floor against the four walls such that the tops of the plurality of test pans are located six feet, ten inches (6 ft. – 10 in.) below the ceiling, the vertical fluid distribution test requirement providing that when water is delivered to the residential sprinkler via the test pipe at a test flow rate for a duration of ten minutes, the four walls are wetted within 28 inches of the ceiling and wherein when further the test coverage area is square, each of the four walls is wetted with at least five percent of the sprinkler flow, and wherein when the test coverage area is rectangular, for each of the four walls is wetted with a proportional amount of water collected in the first plurality of pans that is generally equal to twenty percent (20%) of a total discharge from the residential sprinkler times the wall length and divided by the perimeter length of the coverage area, and

wherein the horizontal test distribution requirement, the residential sprinkler is installed in the test arrangement such that the residential sprinkler is coupled to the test pipe via a T-fitting having an outlet equivalent to the inlet of the body, the residential sprinkler being centered over the test coverage area at one-half the width and the length of the test coverage area so as to divide the test coverage area into quadrants, each quadrant having a length that is one-half the length of the test coverage area and a width that is one-half the width of the test coverage area, the test arrangement further including a second plurality of test pans, each having a top defining a one square foot (1 sq. ft.) collection area, being located on the floor

so as to cover each square foot of each quadrant with the tops of the pans about eight feet (8 ft.) below the ceiling, the horizontal fluid distribution test requirement providing that when water is delivered to the residential sprinkler at a test flow rate for a duration of twenty minutes, fluid is collected in the second plurality of test pans at a density of about 0.02 gallons per minute per square foot (gpm/sq. ft.) with no more than four pans for each quadrant in the second plurality of pans collecting water at a density of at least 0.015 gallons per minute per square foot (gpm/sq. ft.).

10. The residential fire sprinkler of claim 9, wherein the body is configured for the minimum design pressure being less than 10 pounds per square inch gauge, the residential design protection area being about 324 square feet with the distance of the generally linear side of the design protection area being no greater than 18 feet.

11. The residential fire sprinkler of claim 10, wherein the body is configured for the minimum design pressure having a minimum design flow rate from about 17 gallons per minute to about 33 gallons per minute for the minimum design pressure.

12. The residential fire sprinkler of claim 11, wherein the body is configured such that the minimum design flow rate is about 19 gallons per minute or less.

13. The residential fire sprinkler of claim 12, wherein the residential sprinkler is configured to be installed in a fire protection system having at least two identical residential fire sprinklers for the residential design protection area.

14. A residential fire sprinkler that connects to a piping network to protect a residential dwelling unit having a plurality of compartments as defined in accordance with the 2002 Edition

of National Fire Protection Association Standards 13, 13D and 13R, the residential fire sprinkler comprising:

a body defining a passageway between an inlet and an outlet along a longitudinal axis, the passageway having a rated K-factor that is at a minimum 6, the outlet being closer to an area to be protected;

a closure positioned proximate the outlet opening so as to occlude the passageway in a unactuated position;

a heat responsive trigger that retains the closure to occlude the passageway; and

means for distributing fluid over a coverage area of a residential dwelling unit and providing a suitable density, in accordance with the 2002 Edition of National Fire Protection Association Standards 13, 13D and 13R, for a residential protection design area having a maximum area of about 400 square feet with a maximum distance of a generally linear side of the residential design protection area being no greater than 20 feet, the body being configured for a minimum design pressure of less than 14 pounds per square inch gauge where a design protection area is about 400 square feet with a maximum distance of a generally linear side of the design protection area being no greater than 20 feet, the means including an annular plate centrally aligned with the longitudinal axis, the plate including a plurality of slots arrayed about the longitudinal axis, the plurality of slots comprising 22 slots, each slot defining a slot axis that intersects and is perpendicular to the longitudinal axis, the body and means providing for the residential sprinkler to meet a vertical fluid distribution test requirement and a horizontal distribution test requirement under UL 1626 (October 2003), the body includes a pair of frame arms spaced apart along a first axis perpendicular to the longitudinal axis, and the plate includes

a pair of through holes disposed along a second axis perpendicular to the longitudinal axis and aligned 90 degrees relative to the first axis,

wherein the vertical fluid distribution test requirement includes the residential sprinkler installed in a test arrangement having four walls, a floor and a nominal eight foot (8 ft.) high flat ceiling to define a test coverage area equal to the residential coverage area with the residential sprinkler installed beneath the ceiling coupled to a one-inch internal diameter test pipe, the residential sprinkler being centered over the test coverage area at one-half the width or the length of the test coverage area, the test arrangement further including a first plurality of test pans, each having a top defining a one square foot (1 sq. ft.) collection area, being located on the floor against the four walls such that the tops of the plurality of test pans are located six feet, ten inches (6 ft. – 10 in.) below the ceiling, the vertical fluid distribution test requirement providing that when water is delivered to the residential sprinkler via the test pipe at a test flow rate for a duration of ten minutes, the four walls are wetted within 28 inches of the ceiling and wherein when further the test coverage area is square, each of the four walls is wetted with at least five percent of the sprinkler flow, and wherein when the test coverage area is rectangular, for each of the four walls is wetted with a proportional amount of water collected in the first plurality of pans that is generally equal to twenty percent (20%) of a total discharge from the residential sprinkler times the wall length and divided by the perimeter length of the coverage area, and

wherein the horizontal test distribution requirement, the residential sprinkler is installed in the test arrangement such that the residential sprinkler is coupled to the test pipe via a T-fitting having an outlet equivalent to the inlet of the body, the residential

sprinkler being centered over the test coverage area at one-half the width and the length of the test coverage area so as to divide the test coverage area into quadrants, each quadrant having a length that is one-half the length of the test coverage area and a width that is one-half the width of the test coverage area, the test arrangement further including a second plurality of test pans, each having a top defining a one square foot (1 sq. ft.) collection area, being located on the floor so as to cover each square foot of each quadrant with the tops of the pans about eight feet (8 ft.) below the ceiling, the horizontal fluid distribution test requirement providing that when water is delivered to the residential sprinkler at a test flow rate for a duration of twenty minutes, fluid is collected in the second plurality of test pans at a density of about 0.02 gallons per minute per square foot (gpm/sq. ft.) with no more than four pans for each quadrant in the second plurality of pans collecting water at a density of at least 0.015 gallons per minute per square foot (gpm/sq. ft.).

15. The residential fire sprinkler of claim 14, wherein body is configured for the minimum design pressure being less than 10 pounds per square inch gauge, the residential design protection area being about 324 square feet with the distance of the generally linear side of the design protection area being no greater than 18 feet.

16. The residential fire sprinkler of claim 15, wherein the body is configured for the minimum design pressure having a minimum design flow rate of from about 17 gallons per minute to about 33 gallons per minute for the minimum design pressure.

17. The residential fire sprinkler of claim 16, wherein body is configured such that the minimum design flow rate is about 19 gallons per minute.

18. The residential fire sprinkler of claim 17, wherein the residential sprinkler is configured to be installed in a fire protection system having at least two identical residential fire sprinklers for the residential design protection area.

19. The residential fire sprinkler of claim 18, wherein the plate includes a plurality of tines that extends away from the longitudinal axis, the plurality of tines being disposed generally about the longitudinal axis, and two close-ended slots formed on the plate, each close-ended slot including two generally parallel walls between a first end and a second end to define an opening extending along a slot axis generally perpendicular to a plane defined by the longitudinal axis and the at least one frame arm, the two walls of the slot converging towards each other at the first end and the second end to define a polygonal perimeter.

20. A method of establishing a coverage area of protectability for a fire sprinkler in a residential dwelling unit having a plurality of compartments as defined in the 2002 National Fire Protection Association Standard 13, the fire sprinkler having a body with an inlet and an outlet along a longitudinal axis, the fire sprinkler including a deflector assembly having a plate centrally aligned with the longitudinal axis, the plate including a plurality of slots arrayed about the longitudinal axis, the plurality of slots comprising 22 slots, each slot defining a slot axis that intersects and is perpendicular to the longitudinal axis, the body includes a pair of frame arms spaced apart along a first axis perpendicular to the longitudinal axis, and the plate includes a pair of through holes disposed along a second axis perpendicular to the longitudinal axis and aligned 90 degrees relative to the first axis, the method comprising:

supplying fluid to the inlet of a sprinkler at less than 14 pounds per square inch gauge and greater than or equal to 7 pounds per square inch gauge;

flowing fluid from the outlet at a flow rate of less than 33 gallons per minute and greater than 17 gallons per minute; and

distributing fluid from the deflector assembly over a coverage area in accordance with requirements of UL 1626 Standard (October 2003), the requirements including a vertical fluid distribution test requirement and a horizontal distribution test requirement,

wherein the vertical fluid distribution test requirement includes the sprinkler installed in a test arrangement having four walls, a floor and a nominal eight foot (8 ft.) high flat ceiling to define a test coverage area equal to the residential coverage area with the sprinkler installed beneath the ceiling coupled to a one-inch internal diameter test pipe, the sprinkler being centered over the test coverage area at one-half the width or the length of the test coverage area, the test arrangement further including a first plurality of test pans, each having a top defining a one square foot (1 sq. ft.) collection area, being located on the floor against the four walls such that the tops of the plurality of test pans are located six feet, ten inches (6 ft. – 10 in.) below the ceiling, the vertical fluid distribution test requirement providing that when water is delivered to the sprinkler via the test pipe at the flow rate for a duration of ten minutes, the four walls are wetted within 28 inches of the ceiling and wherein when further the test coverage area is square, each of the four walls is wetted with at least five percent of the sprinkler flow, and wherein when the test coverage area is rectangular, for each of the four walls is wetted with a proportional amount of water collected in the first plurality of pans that is generally equal to twenty percent (20%) of a total discharge from the sprinkler times the wall length and divided by the perimeter length of the coverage area, and

wherein the horizontal test distribution requirement, the sprinkler is installed in the test arrangement such that the sprinkler is coupled to the test pipe via a T-fitting having an outlet equivalent to the inlet of the body, the sprinkler being centered over the test coverage area at one-half the width and the length of the test coverage area so as to divide the test coverage area into quadrants, each quadrant having a length that is one-half the length of the test coverage area and a width that is one-half the width of the test coverage area, the test arrangement further including a second plurality of test pans, each having a top defining a one square foot (1 sq. ft.) collection area, being located on the floor so as to cover each square foot of each quadrant with the tops of the pans about eight feet (8 ft.) below the ceiling, the horizontal fluid distribution test requirement providing that when water is delivered to the sprinkler at the flow rate for a duration of twenty minutes, fluid is collected in the second plurality of test pans at a density of about 0.02 gallons per minute per square foot (gpm/sq. ft.) with no more than four pans for each quadrant in the second plurality of pans collecting water at a density of at least 0.015 gallons per minute per square foot (gpm/sq. ft.).

21. The method of claim 20, wherein the distributing comprises: providing an identical fire sprinkler located eight feet away from the body; and distributing fluid of the fire sprinkler without prevention of the operation of the identical sprinkler in accordance with Section 22 of the UL 1626 Standard (October 2003).

22. The method of claim 20, wherein the flowing comprises flowing fluid at a flow rate of about 19 gallons per minute at less than 8 pounds per square inch gauge of pressure and the distributing comprises distributing fluid over a coverage area of 18 feet by 18 feet.

23. The method of claim 20, wherein the flowing comprises flowing fluid at a flow rate of 22 gallons per minute at less than 11 pounds per square inch gauge of pressure and the distributing comprises distributing fluid over a coverage area of 20 feet by 20 feet.

24. A residential fire sprinkler for installation in a sprinkler system designed in accordance with the 2002 Edition of NFPA 13, 13D, and 13R, the sprinkler comprising:

a body having a passageway between an inlet and an outlet along a longitudinal axis, the passageway defining a K-factor that is at a minimum 6, the body including 3/4-inch NPT threads;

a deflector assembly coupled to the body to distribute a fluid flow through the passageway over a coverage area in accordance with UL 1626 (Oct 2003), the deflector assembly being further coupled to a heat responsive trigger disposed between the passage and the deflector assembly the body being configured for a minimum design pressure of less than 10 pounds per square inch gauge at a minimum design flow rate of 19 gallons per minute, such that the deflector assembly distributes the fluid over the coverage area in accordance with UL 1626 (Oct 2003), the coverage area being at least 324 square feet, the deflector assembly including a plate centrally aligned with the longitudinal axis, the plate including a plurality of slots arrayed about the longitudinal axis, the plurality of slots comprising 22 slots, each slot defining a slot axis that intersects and is perpendicular to the longitudinal axis, the body and deflector assembly providing for the residential sprinkler to meet a vertical fluid distribution test requirement and a horizontal distribution test requirement under UL 1626 (October 2003), the body includes a pair of frame arms spaced apart along a first axis perpendicular to the longitudinal axis, and the plate includes a pair of through holes disposed along a second axis perpendicular to the longitudinal axis and aligned 90 degrees relative to the first axis,

wherein the vertical fluid distribution test requirement includes the residential sprinkler installed in a test arrangement having four walls, a floor and a nominal eight foot (8 ft.) high flat ceiling to define a test coverage area equal to the residential coverage area with the residential sprinkler installed beneath the ceiling coupled to a one-inch internal diameter test pipe, the residential sprinkler being centered over the test coverage area at one-half the width or the length of the test coverage area, the test arrangement further including a first plurality of test pans, each having a top defining a one square foot (1 sq. ft.) collection area, being located on the floor against the four walls such that the tops of the plurality of test pans are located six feet, ten inches (6 ft. – 10 in.) below the ceiling, the vertical fluid distribution test requirement providing that when water is delivered to the residential sprinkler via the test pipe at a test flow rate for a duration of ten minutes, the four walls are wetted within 28 inches of the ceiling and wherein when further the test coverage area is square, each of the four walls is wetted with at least five percent of the sprinkler flow, and wherein when the test coverage area is rectangular, for each of the four walls is wetted with a proportional amount of water collected in the first plurality of pans that is generally equal to twenty percent (20%) of a total discharge from the residential sprinkler times the wall length and divided by the perimeter length of the coverage area, and

wherein the horizontal test distribution requirement, the residential sprinkler is installed in the test arrangement such that the residential sprinkler is coupled to the test pipe via a T-fitting having an outlet equivalent to the inlet of the body, the residential sprinkler being centered over the test coverage area at one-half the width and the length of the test coverage area so as to divide the test coverage area into quadrants, each quadrant having a

length that is one-half the length of the test coverage area and a width that is one-half the width of the test coverage area, the test arrangement further including a second plurality of test pans, each having a top defining a one square foot (1 sq. ft.) collection area, being located on the floor so as to cover each square foot of each quadrant with the tops of the pans about eight feet (8 ft.) below the ceiling, the horizontal fluid distribution test requirement providing that when water is delivered to the residential sprinkler at a test flow rate for a duration of twenty minutes, fluid is collected in the second plurality of test pans at a density of about 0.02 gallons per minute per square foot (gpm/sq. ft.) with no more than four pans for each quadrant in the second plurality of pans collecting water at a density of at least 0.015 gallons per minute per square foot (gpm/sq. ft.).

25. The sprinkler of any one of claims 1, 6, 9, 14, and 24, wherein the inlet includes a bellmouth portion having a radius of curvature of less than about 0.1 inches.

26. The sprinkler of any one of claims 1, 6, 9, 14, and 24, wherein the passageway includes a conic passageway and a cylindrical passageway contiguous with the conic passageway, wherein further the conic passageway defines a first diameter of the passageway and the cylindrical passageway defines a second diameter of the passageway, the second diameter being about eighty-six percent (86%) of the first diameter.

27. The sprinkler of claim 26, wherein the conic passageway defines a length of about 0.8 inches.

28. The sprinkler of claim 26, wherein the first diameter is about 0.6 inches and the second diameter is about 0.5 inches.

29. The sprinkler of claim 26, wherein the passageway further comprises a flared planar surface portion contiguous with the cylindrical passageway, the flared surface portion defining a third diameter that is about 110 percent of the second diameter.

30. The sprinkler of claim 1, wherein the at least one frame arm comprises a pair of arms disposed along a first axis that is perpendicular to the longitudinal axis so as to define a plane with the longitudinal axis, the pair of arms being disposed in the plane, the deflector including a pair of through openings disposed along a second axis extending perpendicular to the longitudinal axis and aligned 90 degrees relative to the first axis.

31. The sprinkler of any one of claims 1, 6, 9, 14 and 24, wherein the plurality of slots comprising 22 slots consists of 22 slots.