WHAT IS CLAIMED IS:

1. A plumbing assembly, comprising:

a plumbing fitting having a body, the body of the plumbing fitting comprising:

a main body portion comprising a first end and a second end opposite the first end, a main bore extending through the main body from the first end to the second end, a first flare nut around the first end of the main body portion, and a second flare nut around the second end of the main body portion, wherein the first end circumscribes a first port and the second end circumscribes a second port, wherein the first flare nut is configured to connect a first conduit to the first end of the main body, and wherein the second flare nut is configured to connect a second conduit to the second end of the main body; and

a peripheral body portion extending from the main body portion, the peripheral body portion including a distal end, a third flare nut circumscribing the distal end of the peripheral body portion, and a sampling bore extending through the peripheral body such that the sampling bore is in fluid communication with the main bore;

a sampling valve threadably coupled to the peripheral body portion of the plumbing fitting and extending at least partially into the sampling bore without extending into the main bore, such that the main bore is unimpeded by the sampling valve and use of the sampling valve imparts substantially no pressure drop in a fluid passing through the main bore of the plumbing fitting, wherein the sampling valve comprises an outlet tube that includes a sampling port.

2. A plumbing fitting, comprising:

a body, comprising:

a main body portion comprising a first end and a second end opposite the first end, a main bore extending through the main body from the first end to the second end, a first flare nut around the first end of the main body

portion, and a second flare nut around the second end of the main body portion, wherein the first end circumscribes a first port and the second end circumscribes a second port, wherein the first flare nut is configured to connect a first conduit to the first end of the main body, and wherein the second flare nut is configured to connect a second conduit to the second end of the main body; and

a peripheral body portion extending from the main body portion, the peripheral body portion including a distal end, a third flare nut circumscribing the distal end of the peripheral body portion, and a sampling bore extending through the peripheral body such that the sampling bore is in fluid communication with the main bore, wherein the peripheral body portion is configured to threadably receive a sampling valve, such that the main bore is unimpeded by the sampling valve and use of the sampling valve imparts substantially no pressure drop in a fluid passing through the main bore during operation of the plumbing fitting, wherein the sampling valve comprises an outlet tube that includes a sampling port.

3. A plumbing system, comprising:

a plumbing fitting having a body, the body comprising:

a main body portion comprising a first end and a second end opposite the first end, a main bore extending through the main body from the first end to the second end, a first flare nut around the first end of the main body portion, and a second flare nut around the second end of the main body portion, wherein the first end circumscribes a first port and the second end circumscribes a second port, wherein the first flare nut is configured to connect a first conduit to the first end of the main body, and wherein the second flare nut is configured to connect a second conduit to the second end of the main body; and

a peripheral body portion extending from the main body portion, the peripheral body portion including a distal end, a third flare nut circumscribing the distal end of the peripheral body portion,

and a sampling bore extending through the peripheral body such that the sampling bore is in fluid communication with the main bore;

a sampling valve threadably coupled to the peripheral body portion of the plumbing fitting and extending at least partially into the sampling bore without extending into the main bore, such that the main bore is unimpeded by the sampling valve and use of the sampling valve imparts substantially no pressure drop in a fluid passing through the main bore during operation of the plumbing fitting, wherein the sampling valve comprises an outlet tube that includes a sampling port; and

a shut-off valve coupled to the plumbing fitting upstream from plumbing fitting via a conduit, wherein closure of the shut-off valve permits the sampling valve to be removed from the plumbing fitting, and replaced by another implement.

4. The plumbing system according to claim 3, wherein the other implement comprises another sampling valve or a pressure gage, static mixer, thermometer, velocimeter, densimeter and plug, each of which is threaded to threadably engage the threaded port of the sampling bore when the sampling valve is removed therefrom.

5. The plumbing assembly, the plumbing fitting, or the plumbing system according to any of claims 1, 2, or 3, wherein the sampling valve is a high pressure valve (HPV) or a compact diaphragm valve (CDV).

6. The plumbing assembly, the plumbing fitting, or the plumbing system according to any of claims 1, 2, or 3, wherein the sampling valve is manual or pneumatic.

7. The plumbing assembly, the plumbing fitting, or the plumbing system according to any of claims 1, 2, or 3, wherein the sampling bore has a first portion having an inner diameter, ID_{sb1}, and a second portion having an inner diameter, ID_{sb2}, wherein $ID_{sb1} < ID_{sb2}$.

8. The plumbing assembly according to claim 7, wherein $ID_{sb1} < 80\% ID_{sb2}$, such as $< 75\% ID_{sb2}$, or $< 70\% ID_{sb2}$.

9. The plumbing assembly according to claim 8, wherein $ID_{sb1} > 50\% ID_{sb2}$, such as $> 55\% ID_{sb2}$, or $> 60\% ID_{sb2}$.

10. The plumbing assembly according to claim 7, wherein $ID_{sb1} < 80\% ID_{sb2}$ and $> 50\% ID_{sb2}$, such as $< 80\% ID_{sb2}$ and $> 55\% ID_{sb2}$, or $< 80\% ID_{sb2}$ and $> 60\% ID_{sb2}$.

11. The plumbing assembly according to claim 7, wherein $ID_{sb1} < 75\% ID_{sb2}$ and $> 50\% ID_{sb2}$, such as $< 75\% ID_{sb2}$ and $> 55\% ID_{sb2}$, or $< 75\% ID_{sb2}$ and $> 60\% ID_{sb2}$.

12. The plumbing assembly according to claim 7, wherein $ID_{sb1} < 70\% ID_{sb2}$ and $> 50\% ID_{sb2}$, such as $< 70\% ID_{sb2}$ and $> 55\% ID_{sb2}$, or $< 70\% ID_{sb2}$ and $> 60\% ID_{sb2}$.

13. The plumbing assembly, the plumbing fitting, or the plumbing system according to any of claims 1, 2, or 3, wherein the sampling bore has a first portion having an inner diameter, ID_{sb1}, and the main bore has an inner diameter, ID_{mb}, and wherein $ID_{sb1} < ID_{mb}$.

14. The plumbing assembly, the plumbing fitting, or the plumbing system according to claim 10, wherein $ID_{sb1} \leq 40.0\% ID_{mb}$, such as $\leq 37.5\% ID_{mb}$, $\leq 35.0\% ID_{mb}$, or $\leq 30\% ID_{mb}$.

15. The plumbing assembly, the plumbing fitting, or the plumbing system according to claim 11, wherein $ID_{sb1} \geq 15.0\% ID_{mb}$, such as $\geq 20.0\% ID_{mb}$, or $\geq 25.0\% ID_{mb}$.

16. The plumbing assembly, the plumbing fitting, or the plumbing system according to claim 13, wherein $ID_{sb1} \leq 40.0\% ID_{mb}$ and $\geq 15.0\% ID_{mb}$, such as $\leq 40.0\% ID_{mb}$ and $\geq 20.0\% ID_{mb}$, or $\leq 40.0\% ID_{mb}$ and $\geq 25.0\% ID_{mb}$.

17. The plumbing assembly, the plumbing fitting, or the plumbing system according to claim 13, wherein $ID_{sb1} \leq 37.5\%$ ID_{mb} and $\geq 15.0\%$ ID_{mb}, such as $\leq$ 37.5% ID_{mb} and $\geq 20.0\%$ ID_{mb}, or $\leq 37.5\%$ ID_{mb} and $\geq 25.0\%$ ID_{mb}.

18. The plumbing assembly, the plumbing fitting, or the plumbing system according to claim 13, wherein $ID_{sb1} \leq 35.0\%$ ID_{mb} and $\geq 15.0\%$ ID_{mb}, such as $\leq$ 35.0% ID_{mb} and $\geq 20.0\%$ ID_{mb}, or $\leq 35.0\%$ ID_{mb} and $\geq 25.0\%$ ID_{mb}.

19. The plumbing assembly, the plumbing fitting, or the plumbing system according to claim 13, wherein $ID_{sb1} \leq 30.0\%$ ID_{mb} and $\geq 15.0\%$ ID_{mb}, such as $\leq$ 30.0% ID_{mb} and $\geq 20.0\%$ ID_{mb}, or $\leq 30.0\%$ ID_{mb} and $\geq 25.0\%$ ID_{mb}.

20. The plumbing assembly, the plumbing fitting, or the plumbing system according to any of claims 1, 2, or 3, wherein the sampling valve comprises an inlet tube having a first portion and a threaded second portion adjacent to the first portion, wherein the first portion of the inlet tube extends into the second portion of the sampling bore and the third flare nut threadably engages the threaded second portion of the inlet tube to secure the sampling valve to the plumbing fitting.

21. The plumbing assembly, the plumbing fitting, or the plumbing system according to claim 20, wherein the peripheral body portion includes a flared face within the sampling bore between the first portion and second portion of the sampling bore, and the inlet tube of the sampling valve includes a distal end formed with a flared face that is configured to engage and seat against the flared face within the sampling bore.

22. The plumbing assembly, the plumbing fitting, or the plumbing system according to any of claims 1, 2, or 3, where each of the flare nuts have external textures to facilitate manual rotation.

23. The plumbing assembly, the plumbing fitting, or the plumbing system according to any of claims 1, 2, or 3, further comprising at least one of a pressure gage, a static mixer, a thermometer, a velocimeter, a densimeter, and a plug, each of

which is threaded to threadably engage the third flare nut when the sampling valve is removed therefrom.

24. The plumbing assembly, the plumbing fitting, or the plumbing system according to any of claims 1, 2, or 3, wherein the sampling valve further comprises a fourth flare nut that circumscribes a distal end of the outlet tube.

25. The plumbing assembly, the plumbing fitting, or the plumbing system according to any of claims 1, 2, or 3, wherein the outlet bore and the sampling port have an inner diameter, ID_O, and the inlet tube includes an inlet bore having a diameter, ID_I, wherein $ID_O \leq ID_I$.

26. The plumbing assembly according to claim 25, wherein $ID_O \leq 70\%$ ID_I, such as $\leq 65\%$ ID_I, $\leq 60\%$ ID_I, or $\leq 50\%$ ID_I.

27. The plumbing assembly according to claim 26, wherein $ID_O \geq 20\%$ ID_I, such as $\geq 25\%$ ID_I, or $\geq 30\%$ ID_I.

28. The plumbing assembly according to claim 25, wherein $ID_O \leq 70\%$ ID_I and $\geq 20\%$ ID_I, such as $\leq 70\%$ ID_I and $\geq 25\%$ ID_I, or $\leq 70\%$ ID_I and $\geq 30\%$ ID_I.

29. The plumbing assembly according to claim 25, wherein $ID_O \leq 65\%$ ID_I and $\geq 20\%$ ID_I, such as $\leq 65\%$ ID_I and $\geq 25\%$ ID_I, or $\leq 65\%$ ID_I and $\geq 30\%$ ID_I.

30. The plumbing assembly according to claim 25, wherein $ID_O \leq 60\%$ ID_I and $\geq 20\%$ ID_I, such as $\leq 60\%$ ID_I and $\geq 25\%$ ID_I, or $\leq 60\%$ ID_I and $\geq 30\%$ ID_I.

31. The plumbing assembly according to claim 25, wherein $ID_O \leq 50\%$ ID_I and $\geq 20\%$ ID_I, such as $\leq 50\%$ ID_I and $\geq 25\%$ ID_I, or $\leq 50\%$ ID_I and $\geq 30\%$ ID_I.

32. The plumbing assembly, the plumbing fitting, or the plumbing system according to any of claims 1, 2, or 3, wherein the sampling valve is rotatably connected to the peripheral body portion of the body of the plumbing fitting, such that

the sampling valve can be rotated about a sampling axis extending through the sampling bore.

33. The plumbing assembly, the plumbing fitting, or the plumbing system according to any of claims 1, 2, or 3, wherein the fluid flowing through the main body portion of the body of the plumbing fitting includes a pressure, P, and a pressure drop, P_d, caused by sampling valve is $\leq$ 1.0% P, such as $\leq$ 0.75% P, or $\leq$ 0.5% P.

34. The plumbing assembly according to claim 33, wherein $P_d \geq$ 0.05% P, $\geq$ 0.1% P, or $\geq$ 0.25% P.

35. The plumbing assembly according to claim 33, wherein $P_d \leq$ 1.0% P and $\geq$ 0.05% P, such as $\leq$ 1.0% P and $\geq$ 0.1% P, or $\leq$ 1.0% P and $\geq$ 0.25% P.

36. The plumbing assembly according to claim 33, wherein $P_d \leq$ 0.75% P and $\geq$ 0.05% P, such as $\leq$ 0.75% P and $\geq$ 0.1% P, or $\leq$ 0.75% P and $\geq$ 0.25% P.

37. The plumbing assembly according to claim 33, wherein $P_d \leq$ 0.5% P and $\geq$ 0.05% P, such as $\leq$ 0.5% P and $\geq$ 0.1% P, or $\leq$ 0.5% P and $\geq$ 0.25% P.

WHAT IS CLAIMED IS:

1. A plumbing assembly, comprising:

a plumbing fitting having a body, the body of the plumbing fitting comprising:

a main body portion comprising a first end and a second end opposite the first end, a main bore extending through the main body from the first end to the second end, a first flare nut around the first end of the main body portion, and a second flare nut around the second end of the main body portion, wherein the first end circumscribes a first port and the second end circumscribes a second port, wherein the first flare nut is configured to connect a first conduit to the first end of the main body, and wherein the second flare nut is configured to connect a second conduit to the second end of the main body; and

a peripheral body portion extending from the main body portion, the peripheral body portion including a distal end, a third flare nut circumscribing the distal end of the peripheral body portion, and a sampling bore extending through the peripheral body such that the sampling bore is in fluid communication with the main bore;

a sampling valve threadably coupled to the peripheral body portion of the plumbing fitting and extending at least partially into the sampling bore without extending into the main bore, such that the main bore is unimpeded by the sampling valve and use of the sampling valve imparts substantially no pressure drop in a fluid passing through the main bore of the plumbing fitting, wherein the sampling valve comprises an outlet tube that includes a sampling port.

2. A plumbing fitting, comprising:

a body, comprising:

a main body portion comprising a first end and a second end opposite the first end, a main bore extending through the main body from the first end to the second end, a first flare nut around the first end of the main body

portion, and a second flare nut around the second end of the main body portion, wherein the first end circumscribes a first port and the second end circumscribes a second port, wherein the first flare nut is configured to connect a first conduit to the first end of the main body, and wherein the second flare nut is configured to connect a second conduit to the second end of the main body; and

a peripheral body portion extending from the main body portion, the peripheral body portion including a distal end, a third flare nut circumscribing the distal end of the peripheral body portion, and a sampling bore extending through the peripheral body such that the sampling bore is in fluid communication with the main bore, wherein the peripheral body portion is configured to threadably receive a sampling valve, such that the main bore is unimpeded by the sampling valve and use of the sampling valve imparts substantially no pressure drop in a fluid passing through the main bore during operation of the plumbing fitting, wherein the sampling valve comprises an outlet tube that includes a sampling port.

3. A plumbing system, comprising:

a plumbing fitting having a body, the body comprising:

a main body portion comprising a first end and a second end opposite the first end, a main bore extending through the main body from the first end to the second end, a first flare nut around the first end of the main body portion, and a second flare nut around the second end of the main body portion, wherein the first end circumscribes a first port and the second end circumscribes a second port, wherein the first flare nut is configured to connect a first conduit to the first end of the main body, and wherein the second flare nut is configured to connect a second conduit to the second end of the main body; and

a peripheral body portion extending from the main body portion, the peripheral body portion including a distal end, a third flare nut circumscribing the distal end of the peripheral body portion,

and a sampling bore extending through the peripheral body such that the sampling bore is in fluid communication with the main bore;

a sampling valve threadably coupled to the peripheral body portion of the plumbing fitting and extending at least partially into the sampling bore without extending into the main bore, such that the main bore is unimpeded by the sampling valve and use of the sampling valve imparts substantially no pressure drop in a fluid passing through the main bore during operation of the plumbing fitting, wherein the sampling valve comprises an outlet tube that includes a sampling port; and

a shut-off valve coupled to the plumbing fitting upstream from plumbing fitting via a conduit, wherein closure of the shut-off valve permits the sampling valve to be removed from the plumbing fitting, and replaced by another implement.

4. The plumbing system according to claim 3, wherein the other implement comprises another sampling valve or a pressure gage, static mixer, thermometer, velocimeter, densimeter and plug, each of which is threaded to threadably engage the threaded port of the sampling bore when the sampling valve is removed therefrom.

5. The plumbing assembly, the plumbing fitting, or the plumbing system according to any of claims 1, 2, or 3, wherein the sampling valve is a high pressure valve (HPV) or a compact diaphragm valve (CDV).

6. The plumbing assembly, the plumbing fitting, or the plumbing system according to any of claims 1, 2, or 3, wherein the sampling valve is manual or pneumatic.

7. The plumbing assembly, the plumbing fitting, or the plumbing system according to any of claims 1, 2, or 3, wherein the sampling bore has a first portion having an inner diameter, ID_{sb1}, and a second portion having an inner diameter, ID_{sb2}, wherein $ID_{sb1} < ID_{sb2}$.

8. The plumbing assembly according to claim 7, wherein $ID_{sb1} < 80\% ID_{sb2}$, such as $< 75\% ID_{sb2}$, or $< 70\% ID_{sb2}$.

9. The plumbing assembly according to claim 8, wherein $ID_{sb1} > 50\% ID_{sb2}$, such as $> 55\% ID_{sb2}$, or $> 60\% ID_{sb2}$.

10. The plumbing assembly, the plumbing fitting, or the plumbing system according to any of claims 1, 2, or 3, wherein the sampling bore has a first portion having an inner diameter, ID_{sb1}, and the main bore has an inner diameter, ID_{mb}, and wherein $ID_{sb1} < ID_{mb}$.

11. The plumbing assembly, the plumbing fitting, or the plumbing system according to claim 10, wherein $ID_{sb1} \leq 40.0\% ID_{mb}$, such as $\leq 37.5\% ID_{mb}$, $\leq 35.0\% ID_{mb}$, or $\leq 30\% ID_{mb}$.

12. The plumbing assembly, the plumbing fitting, or the plumbing system according to any of claims 1, 2, or 3, wherein the outlet bore and the sampling port have an inner diameter, ID_O, and the inlet tube includes an inlet bore having a diameter, ID_I, wherein $ID_O \leq ID_I$.

13. The plumbing assembly according to claim 12, wherein $ID_O \leq 70\% ID_I$, such as $\leq 65\% ID_I$, $\leq 60\% ID_I$, or $\leq 50\% ID_I$.

14. The plumbing assembly, the plumbing fitting, or the plumbing system according to any of claims 1, 2, or 3, wherein the sampling valve is rotatably connected to the peripheral body portion of the body of the plumbing fitting, such that the sampling valve can be rotated about a sampling axis extending through the sampling bore.

15. The plumbing assembly, the plumbing fitting, or the plumbing system according to any of claims 1, 2, or 3, wherein the fluid flowing through the main body portion of the body of the plumbing fitting includes a pressure, P, and a pressure drop, P_d, caused by sampling valve is $\leq$1.0% P, such as $\leq$0.75% P, or $\leq$0.5% P.