CLAIMS

What is claimed is:

1. A method of determining a load applied by a jack, comprising:

providing a jack having at least one strain gauge positioned such that a corresponding at least one strain experienced by the jack is related to a load applied by the jack in accordance with a load-strain relationship;

applying a load with the jack;

measuring the corresponding at least one strain from the at least one strain gauge; and

determining the load applied by the jack based on the load-strain relationship.

2. The method according to claim 1, wherein the jack comprises a piston, a cylinder for receiving the piston, and a fluid positioned between a top surface of the piston and a bottom surface of a top of the cylinder, wherein pressurizing the fluid creates a first force on the piston and a second force on the cylinder tending to separate the piston and the cylinder.

3. The method according to claim 2, wherein the at least one strain gauge is incorporated with the piston of the jack, wherein the at least one strain is at least one strain experienced by the piston.

4. The method according to claim 3, wherein one or more of the at least one strain gauge is attached to the piston.

5. The method according to claim 4, wherein the one or more of the at least one strain gauge is attached to a surface of the piston.

6. The method according to claim 3, wherein one or more of the at least one strain gauge is embedded in the piston.

7. The method according to claim 3, wherein one or more of the at least one strain gauge is positioned proximate the piston.

8. The method according to claim 7, wherein the piston comprises a hollow body, a top plate, and a bottom plate, wherein one of the at least one strain gauge is attached to a top plate and attached to a bottom plate of the piston.

9. The method according to claim 3, further comprising:

determining the load-strain relationship by applying one or more loads with the jack and measuring the corresponding one or more strains from the at least one strain gauge to determine the load-strain relationship.

10. The method according to claim 9, wherein determining the load-strain relationship comprises producing a load-strain curve from the one or more applied loads and the corresponding one or more strains, wherein the load-strain curve represents the load-strain relationship.

11. A method of determining a load applied by a jack to a pile, comprising:

positioning a jack with respect to a pile such that the jack can apply a load to the pile;

measuring at least one strain on the jack from at least one strain gauge incorporated with the jack;

determining the load applied by the jack to the pile based on a load-strain relationship.

12. The method according to claim 11, wherein the jack comprises a piston, a cylinder for receiving the piston, and a fluid positioned between a top surface of the piston and a bottom surface of a top of the cylinder, wherein pressurizing the fluid creates a first force on the piston and a second force on the cylinder tending to separate the piston and the cylinder

13. The method according to claim 12, wherein the at least one strain gauge is incorporated with the piston of the jack, wherein the at least one strain is at least one strain experienced by the piston.

14. The method according to claim 13, wherein one or more of the at least one strain gauge is attached to the piston.

15. The method according to claim 13, wherein the one or more of the at least one strain gauge is attached to a surface of the piston.

16. The method according to claim 13, wherein one or more of the at least one strain gauge is embedded in the piston.

17. The method according to claim 13, wherein one or more of the at least one strain gauge is positioned within the piston.

18. The method according to claim 17, wherein the piston comprises a hollow body, a top plate, and a bottom plate, wherein one or more of the at least one strain gauge is attached to a top plate and attached to a bottom plate of the piston.

19. The method according to claim 13, further comprising:

determining the load-strain relationship by applying one or more loads with the jack and measuring the corresponding one or more strains from the at least one strain gauge to determine the load-strain relationship.

20. The method according to claim 19, wherein determining the load-strain relationship comprises producing a load-strain curve from the one or more applied loads and the corresponding one or more strains, wherein the load-strain curve represents the load-strain relationship.

21. A method of measuring a load-bearing capacity of a pile, comprising:

positioning a jack with respect to a pile such that the jack can apply a load to the pile;

measuring at least one strain on the jack from at least one strain gauge incorporated with the jack;

determining the load applied by the jack based on a load-strain relationship; and

determining a load-bearing capacity of the pile using the determined load.

22. A system for determining a load applied by a jack, comprising:

a jack, wherein the jack is configured to apply a load, wherein the jack incorporates at least one strain gauge, wherein the at least one strain gauge is positioned with respect to the jack such that a corresponding at least one strain measured from the at least one strain gauge can be used to determine the load applied by the jack via a strain-load relationship.

23. The system according to claim 22, wherein the jack comprises a piston, a cylinder for receiving the piston, and a fluid positioned between a top surface of the piston and a bottom surface of a top of the cylinder, wherein pressurizing the fluid creates a first force on the piston and a second force on the cylinder tending to separate the piston and the cylinder.

24. The system according to claim 23, wherein the at least one strain gauge is incorporated with the piston of the jack, wherein the at least one strain is at least one strain experienced by the piston.

25. The system according to claim 24, wherein one or more of the at least one strain gauge is attached to the piston.

26. The system according to claim 25, wherein the one or more of the at least one strain gauge is attached to a surface of the piston.

27. The system according to claim 24, wherein one or more of the at least one strain gauge is embedded in the piston.

28. The system according to claim 24, wherein one or more of the at least one strain gauge is positioned within the piston.

29. The system according to claim 28, wherein the piston comprises a hollow body, a top plate, and a bottom plate, wherein one or more of the at least one strain gauge is attached to a top plate and attached to a bottom plate of the piston.

30. The system according to claim 23, further comprising:

a means for determining the load-strain relationship by applying one or more loads with the jack and measuring the corresponding one or more strains from the at least one strain gauge to determine the load-strain relationship.

31. The system according to claim 30, wherein determining the load-strain relationship comprises producing a load-strain curve from the one or more applied loads and the corresponding one or more strains, wherein the load-strain curve represents the load-strain relationship.

32. A jack, comprising:

a piston, wherein the jack is configured to apply a load, wherein the jack incorporates at least one strain gauge, wherein the at least one strain gauge is positioned with respect to the jack such that a corresponding at least one strain measured from the at least one strain gauge can be used to determine the load applied by the jack via a strain-load relationship.

33. The jack according to claim 32, further comprising:

a cylinder for receiving the piston, and a fluid positioned between a top surface of the piston and a bottom surface of a top of the cylinder, wherein pressurizing the fluid creates a first force on the piston and a second force on the cylinder tending to separate the piston and the cylinder

34. The jack according to claim 32, wherein the at least one strain gauge is incorporated with the piston of the jack, wherein the at least one strain is at least one strain experienced by the piston.

35. The jack according to claim 34, wherein one or more of the at least one strain gauge is attached to the piston.

36. The jack according to claim 35, wherein the one or more of the at least one strain gauge is attached to a surface of the piston.

37. The jack according to claim 35, wherein one or more of the at least one strain gauge is embedded in the piston.

38. The jack according to claim 35, wherein one or more of the at least one strain gauge is positioned within the piston.

39. The jack according to claim 38, wherein the piston comprises a hollow body, a top plate, and a bottom plate, wherein one or more of the at least one strain gauge is attached to a top plate and attached to a bottom plate of the piston.

40. The jack according to claim 34, further comprising:

a means for determining the load-strain relationship by applying one or more loads with the jack and measuring the corresponding one or more strains from the at least one strain gauge to determine the load-strain relationship.

41. The jack according to claim 40, wherein determining the load-strain relationship comprises producing a load-strain curve from the one or more applied loads and the corresponding one or more strains, wherein the load-strain curve represents the load-strain relationship.

CLAIMS

1. A method of determining a load applied by a jack, comprising:

providing a jack having at least one strain gauge positioned such that a corresponding at least one strain experienced by the jack is related to a load applied by the jack in accordance with a load-strain relationship;

applying a load with the jack;

measuring the corresponding at least one strain from the at least one strain gauge; and

determining the load applied by the jack based on the load-strain relationship,

wherein the jack comprises a piston, a cylinder for receiving the piston, and a fluid positioned between a top surface of the piston and a bottom surface of a top of the cylinder, wherein pressurizing the fluid creates a first force on the piston and a second force on the cylinder tending to separate the piston and the cylinder,

wherein the at least one strain gauge is incorporated with the piston of the jack, wherein the at least one strain is at least one strain experienced by the piston, wherein the at least one strain gauge comprises one or more vibratory wire strain gauge.

2. The method according to claim 1, wherein the piston comprises a hollow body, a top plate, and a bottom plate, wherein one of the one or more vibratory wire strain gauge is attached to the top plate and attached to the bottom plate of the piston.

3. The method according to claim 1, further comprising:

determining the load-strain relationship by applying one or more loads with the jack and measuring a corresponding one or more strains from the at least one strain gauge to determine the load-strain relationship.

4. The method according to claim 3, wherein determining the load-strain relationship comprises producing a load-strain curve from the one or more loads and

the corresponding one or more strains, wherein the load-strain curve represents the load-strain relationship.

5. A method of determining a load applied by a jack to a pile, comprising:

positioning a jack with respect to a pile such that the jack can apply a load to the pile;

measuring at least one strain on the jack from at least one strain gauge incorporated with the jack; and

determining the load applied by the jack to the pile based on a load-strain relationship,

wherein the jack comprises a piston, a cylinder for receiving the piston, and a fluid positioned between a top surface of the piston and a bottom surface of a top of the cylinder, wherein pressurizing the fluid creates a first force on the piston and a second force on the cylinder tending to separate the piston and the cylinder,
wherein the at least one strain gauge is incorporated with the piston of the jack, wherein the at least one strain is at least one strain experienced by the piston, wherein the at least one strain gauge comprises one or more vibratory wire strain gauge.

6. The method according to claim 5, wherein the piston comprises a hollow body, a top plate, and a bottom plate, wherein one of the one or more vibratory wire strain gauge is attached to the top plate and attached to the bottom plate of the piston.

7. The method according to claim 5, further comprising:

determining the load-strain relationship by applying one or more loads with the jack and measuring a corresponding one or more strains from the at least one strain gauge to determine the load-strain relationship.

8. The method according to claim 7, wherein determining the load-strain relationship comprises producing a load-strain curve from the one or more loads and

the corresponding one or more strains, wherein the load-strain curve represents the load-strain relationship.

9. A method of measuring a load-bearing capacity of a pile, comprising:

positioning a jack with respect to a pile such that the jack can apply a load to the pile;

measuring at least one strain on the jack from at least one strain gauge incorporated with the jack;

determining the load applied by the jack based on a load-strain relationship; and

determining a load-bearing capacity of the pile using the determined load, wherein the jack comprises a piston, a cylinder for receiving the piston, and a fluid positioned between a top surface of the piston and a bottom surface of a top of the cylinder, wherein pressurizing the fluid creates a first force on the piston and a second force on the cylinder tending to separate the piston and the cylinder,

wherein the at least one strain gauge is incorporated with the piston of the jack, wherein the at least one strain is at least one strain experienced by the piston, wherein the at least one strain gauge comprises one or more vibratory wire strain gauge.

10. The method according to claim 9, wherein the piston comprises a hollow body, a top plate, and a bottom plate, wherein one of the one or more vibratory wire strain gauge is attached to the top plate and attached to the bottom plate of the piston.

11. The method according to claim 9, further comprising:
determining the load-strain relationship by applying one or more loads with the jack and measuring a corresponding one or more strains from the at least one strain gauge to determine the load-strain relationship.

12. The method according to claim 11, wherein determining the load-strain relationship comprises producing a load-strain curve from the one or more loads and the corresponding one or more strains, wherein the load-strain curve represents the load-strain relationship.

13. A system for determining a load applied by a jack, comprising:

a jack, wherein the jack is configured to apply a load, wherein the jack incorporates at least one strain gauge, wherein the at least one strain gauge is positioned with respect to the jack such that a corresponding at least one strain measured from the at least one strain gauge can be used to determine the load applied by the jack via a strain-load relationship,

wherein the jack comprises a piston, a cylinder for receiving the piston, and a fluid positioned between a top surface of the piston and a bottom surface of a top of the cylinder, wherein pressurizing the fluid creates a first force on the piston and a second force on the cylinder tending to separate the piston and the cylinder,

wherein the at least one strain gauge is incorporated with the piston of the jack, wherein the at least one strain is at least one strain experienced by the piston, wherein the at least one strain gauge comprises one or more vibratory wire strain gauge.

14. The method according to claim 13, wherein the piston comprises a hollow body, a top plate, and a bottom plate, wherein one of the one or more vibratory wire strain gauge is attached to the top plate and attached to the bottom plate of the piston.

15. The system according to claim 13, further comprising:

a load-strain system, wherein the load-strain system applies one or more loads with the jack and measures a corresponding one or more strains from the at least one strain gauge, wherein the load-strain system determines the load-strain relationship from the one or more loads and the corresponding one or more strains.

16. The system according to claim 15, wherein the load-strain system produces a load-strain curve from the one or more loads and the corresponding one or more strains, wherein the load-strain curve represents the load-strain relationship.

17. A jack, comprising:

a piston, wherein the jack is configured to apply a load, wherein the jack incorporates at least one strain gauge, wherein the at least one strain gauge is positioned with respect to the jack such that a corresponding at least one strain measured from the at least one strain gauge can be used to determine the load applied by the jack via a strain-load relationship,

a cylinder for receiving the piston, and a fluid positioned between a top surface of the piston and a bottom surface of a top of the cylinder, wherein pressurizing the fluid creates a first force on the piston and a second force on the cylinder tending to separate the piston and the cylinder,

wherein the at least one strain gauge is incorporated with the piston of the jack, wherein the at least one strain is at least one strain experienced by the piston, wherein the at least one strain gauge comprises one or more vibratory wire strain gauge.

18. The method according to claim 17, wherein the piston comprises a hollow body, a top plate, and a bottom plate, wherein one of the one or more vibratory wire strain gauge is attached to the top plate and attached to the bottom plate of the piston.

19. The jack according to claim 17, further comprising:

a load-strain system, wherein the load-strain system applies one or more loads with the jack and measures a corresponding one or more strains from the at least one strain gauge, wherein the load-strain system determines the load-strain relationship from the one or more loads and the corresponding one or more strains.

20. The jack according to claim 19, wherein the load-strain system produces a load-strain curve from the one or more loads and the corresponding one or more strains, wherein the load-strain curve represents the load-strain relationship.