thread contamination with particulates especially sand, soil, cement and granules of polymer concrete. As these installations are in soil or sidewalks, particulates are almost always contaminating the threads and the addition of anti-seize compounds give the particulates a grease-like compound to adhere to and carry them into the bolt/nut thread interface. Thus, most of the failures are due to contamination of the threads and the current solutions do not address this problem.

Therefore a need exists for an improved fastening system for attaching a lid or cover to an underground or buried vault, pit, chamber or box which addresses the drawbacks of previous fastening systems and which allow for gaining entry into the chamber of the box without damaging the lid or cover.

SUMMARY OF THE INVENTION

According to a first aspect of the present invention, there is provided a fastening system for attaching a cover to an underground vault comprising: a bolt having threads; and a composite fiber reinforced polymer nut having an unthreaded thread engagement portion extending through at least a portion of the nut, wherein the thread engagement portion is configured to receive the bolt which causes threads to form at the thread engagement portion and to fail in shear before the nut and bolt seize.

According to a second aspect of the present invention, there is provided a fastening system for attaching a lid to an underground box comprising: a threaded bolt; and a fiber reinforced composite nut having an unthreaded thread engagement portion extending through at least a portion of the nut, wherein the thread engagement portion is configured to receive the bolt which causes threads to form at the thread engagement portion, and wherein particulates trapped between the bolt and the thread engagement portion of the nut are pressed into the nut or crushed and driven out of the bottom of the nut.

Embodiments of the present invention provide a fastening system for a cover or lid for an underground or buried vault, pit, chamber or box which addresses the problems of prior fastening systems and can easily and inexpensively provide for entry into the chamber of the box without damaging the lid.

Embodiments of the present invention provide a fastening system, comprising a nut and bolt arrangement that may reduce the chance of failure, and when failure occurs the failure mode is changed such that the vault can still be entered into without damage to the cover or the box, and the failed component can be easily and cheaply replaced. The fastening system according to embodiments of the present invention provides for two types of nut retention designs deployed within underground boxes and covers wherein one is a fixed nut attachment to the box where the nut remains stationary, and the second is a floating nut design where the nut is allowed to move within a track or cage in the box to compensate for some degree of misalignment.

The failure mode of the fastening system according to embodiments of the present invention has been moved to the threads contained by the nut such that the bolt, nut retainer and nut attachment points remain intact. In this embodiment the nut strips out without damaging anything else. By careful selection of materials for the nut, bolt and retainer from which the fastener is made, the desired mode of failure is realized and the

WHAT IS CLAIMED IS:

1. A fastening system for attaching a cover to an underground vault comprising:

a bolt having threads; and

a composite fiber reinforced polymer nut having an unthreaded thread engagement portion extending through at least a portion of the nut, wherein the thread engagement portion is configured to receive the bolt which causes threads to form at the thread engagement portion and to fail in shear before the nut and bolt seize.

2. The fastening system of claim 1, further comprising a nut retainer sized to allow the nut to float within the nut retainer.

3. The fastening system of claim 1 or 2, wherein the nut further includes an unthreaded bolt alignment portion positioned above the thread engagement portion.

4. The fastening system of any one of the preceding claims, wherein the nut has a bolt shroud section positioned below the thread engagement portion.

5. The fastening system of any one of the preceding claims, wherein the nut further includes a lead-in chamfer and a lead-out chamfer adjacent the thread engagement portion.

6. The fastening system of any one of the preceding claims, wherein the nut includes at least one lobe extending radially outwardly from a portion of the nut.

7. The fastening system of claim 6, wherein there are two lobes each having a hole for receipt of a fastener.

8. The fastening system of claim 2, wherein the nut retainer has a cavity for receipt of at least a portion of the nut and sized for preventing the nut from fully rotating in the nut retainer.

9. The fastening system of claim 2, wherein the nut retainer has mounting holes.

10. The fastening system of any one of the preceding claims, wherein the composite fiber reinforced polymer nut is glass filled nylon.

11. The fastening system of any one of claims 1 to 9, wherein the composite fiber reinforced polymer nut is an engineering plastic with fiber or particulate filler.

12. The fastening system of claim 11, wherein the fiber is at least one of aramid fiber, carbon fiber, glass fiber or metal strand.

13. The fastening system of claim 11, wherein the particulate filler is at least one of carbide, ceramic or mineral.

14. A fastening system for attaching a lid to an underground box comprising:

a threaded bolt; and

a fiber reinforced composite nut having an unthreaded thread engagement portion extending through at least a portion of the nut, wherein the thread engagement portion is configured to receive the bolt which causes threads to form at the thread engagement portion, and wherein particulates trapped between the bolt and the thread engagement portion of the nut are pressed into the nut or crushed and driven out of the bottom of the nut.

15. The fastening system of claim 14, wherein the nut further includes an unthreaded bolt alignment portion positioned above the thread engagement portion and a bolt shroud portion positioned below the thread engagement portion.

16. The fastening system of claim 14 or 15, further comprising a nut retainer and wherein the nut includes at least one lobe extending radially outwardly in a portion of the nut so that the nut floats within the nut retainer.

17. The fastening system of any one of claims 14 to 16, wherein the fiber reinforced composite nut comprises glass-filled nylon.

18. The fastening system of any one of claims 14 to 16, wherein the fiber reinforced composite nut comprises an engineering plastic with fiber or particulate filler.

19. The fastening system of claim 18, wherein the fiber is at least one of aramid fiber, carbon fiber, glass fiber or metal strand.

20. The fastening system of claim 18, wherein the particulate filler is at least one of carbide, ceramic or mineral.