a repair sleeve **102** disposed on a pipe outer surface **14**, a first sealing enclosure **104**, and a second sealing enclosure **106**. Repair sleeve **102** forms a repair sleeve bore through which the pipe **12** extends. Repair sleeve **102** may be formed by wrapping the pipe **12** with a wrap to form at least one layer over the pipe outer surface **14**. The wrap is pliable and may be wrapped around the pipe **12** so that the repair sleeve **102** is formed to abut against the pipe out surface **14** and have an inner diameter approximately equal to the outer diameter of the pipe **12**. The wrap may be a reinforcing material that has a fiber structure. The wrap may be made using materials including glass, carbon, and aramid reinforced polymers, typically epoxies and polyurethanes. The wrap may be non-metallic in some embodiments. The repair sleeve **102** typically, but not exclusively, comprises a composite material. Repair sleeve **102** may include multiple layers of the wrap wrapped circumferentially around the pipe **12**.

[0028] Repair sleeve **102** extends axially along the pipe **12** and has a first termination section **107** and a second termination section **108** axially spaced from one another, as shown in Figure **3**. Repair sleeve **102** may have multiple layers and each layer may be formed by a different wrap layer. In some embodiments, the repair sleeve **102** may have one wrap layer, two wrap layers, or more than two wrap layers.

[0029] First sealing enclosure **104** and the second sealing enclosure **106** have a similar construction and are assembled at opposite ends of the repair sleeve **102**. In some embodiments, a repair sleeve may use a first termination enclosure to enclose a first termination section, and a second termination enclosure is not used to enclose a second termination section. In some embodiments, more than two termination enclosures may be used to enclose a repair sleeve, such as a repair sleeve that has multiple sections. For example, a pipe may have a main line and a branch line extending from the main line to form a T-joint, and a repair sleeve is applied to cover the T-joint with the repair sleeve having opposing termination sections on the main line and a branch termination section the branch line. The opposing termination sections and the branch termination section may each have a termination enclosure to provide a pressure connection at each of the three different termination sections. In some embodiments, a repair sleeve may cover a portion of the main line and a portion of multiple branch lines with more than three termination sections and a termination enclosure providing pressure connection for each of the termination sections. Figure **1** shows the pipe **12** with a pipe flange at each end. The pipe flanges may be used to connect to other pipe sections forming a longer pipe. The

through-hole defect **20** to either the first enclosure housing **104**, the second enclosure housing **106**, or both enclosure housings **104**, **106**. Leak flow path **234** is depicted in Figure **10** as extending from the through-hole defect **20** to the termination enclosures **104**, **106**. Pipe fluid flows from the through-hole defect to the enclosure cavities **152**, **182**, as depicted by arrows **236**, **244**. Termination enclosures **104**, **106** form a pressure containing connection at the termination sections **107**, **108** of the repair sleeve **102** to block pipe fluid in the leak flow path from flowing to an external atmosphere outside of the termination enclosures **104**, **106**. In other words, the first outer seal **140** and the first inner seal **142** seal with the pipe outer wall **14** and the outer surface of the repair sleeve **102**, respectively, to block pipe fluid from exiting from the first enclosure cavity **152**, and the second outer seal **170** and the second inner seal **172** seal with the pipe outer wall **14** and the outer surface of the repair sleeve **102**, respectively, to block pipe fluid from exiting from the second enclosure cavity **182**.

[0049] In operation, a pipe replacement method **1100** may be performed for repairing a pipe containing a pipe fluid. A pipe defect may be identified in a repair section of the pipe. The pipe defect may be a through-wall defect. In some embodiments, the pipe defect may be determined based on the condition of the pipe. For example, wall thickness of the pipe may be one factor in a determination that there might be a hole during the intended life of the repair of the pipe.

[0050] A wrap is wrapped around the repair section of the pipe to form a repair sleeve having a first termination section and a second termination section [block **1102**]. The repair sleeve may cover a pipe defect, such as a through-hole defect in the pipe wall. The repair sleeve may have an adhesive configured to bond the repair sleeve to the pipe outer surface. Wrapping the wrap around the pipe outer surface includes bonding the repair sleeve to the pipe outer surface with the adhesive.

[0051] In some embodiments, the first termination section of the repair sleeve may be abrasively cleaned to form a first outer diameter for the first termination section. The repair sleeve may be abrasively cleaned using hand tools or other abrasive techniques. The first termination section may be abrasively cleaned to configure an outer diameter for the first termination section to conform to an inner diameter of the first inner seal of the first termination enclosure so that the first inner seal forms a seal on the abrasively cleaned first termination section. In some embodiments, the second termination section may be abrasively cleaned to

CLAIMS

What is claimed is:

1. A pipe replacement system for repairing a pipe, comprising:

a wrap wrapped around a pipe outer surface to form a repair sleeve having a first termination section and a second termination section; and

a first termination enclosure comprising:

a first main body having a first outer extension and a first inner extension, the first outer extension and the first inner extension extending radially inward from the first main body and are spaced from each other;

the first outer extension having a first outer seal; and

the first inner extension having a first inner seal;

wherein the first termination enclosure encloses the first termination section to form a first pressure containing connection with the repair sleeve, such that:

the first outer seal is disposed around the pipe on a pipe outer surface, the first outer seal outwardly spaced from the first termination section to annularly seal on the pipe outer surface; and

the first inner seal is disposed around the repair sleeve on a repair sleeve outer surface, the first inner seal inwardly spaced from the first outer seal to annularly seal on the repair sleeve outer surface.

2. The pipe replacement system of claim 1, wherein the first termination enclosure further includes a first upper half and a first lower half configured to be connected to form the first termination enclosure.

3. The pipe replacement system of claim 2, wherein the first termination enclosure forms a first cavity containing the first termination section where the cavity is pressure sealed by the first outer seal and the first inner seal to seal a pipe leak having a leak flow path from under the first termination section to the first cavity.

4. The pipe replacement system of claim 1, wherein the first outer seal has a first seal diameter and the first inner seal has a second seal diameter where the first seal diameter is less than the second seal diameter and wherein the wrap is made of a composite material.

5. The pipe replacement system of claim 1, wherein the repair sleeve is configurable in a leak path configuration where the repair sleeve forms a leak flow path extending from a pipe defect

covered by the repair sleeve to the first termination enclosure and sealed from an external atmosphere by the first termination enclosure.

6. The pipe replacement system of claim 5, wherein the repair sleeve has an adhesive configured to bond the repair sleeve to the pipe outer surface, wherein the repair sleeve is configurable in a non-leak path configuration where the repair sleeve blocks pipe fluid flow from a pipe defect section covered by the repair sleeve from flowing to the first termination enclosure and to seal the pipe defect from the external atmosphere with the repair sleeve, and wherein the repair sleeve is configured to move from the non-leak path configuration to the leak path configuration.

7. The pipe replacement system of claim 1, further comprising:

a first ring restraint disposed around the pipe and spaced outwardly from the first termination enclosure, the first ring restraint including a first restraint upper half connected to a first restraint lower half to connect the first ring restraint to the pipe; and

a first restraint bolt connected between the first ring restraint and the first termination enclosure to secure the first termination enclosure in a first axial position on the pipe.

8. The pipe replacement system of claim 1, further comprising:

a second termination enclosure enclosing the second termination section to form a second pressure containing connection with the repair sleeve, the second termination enclosure including:

a second outer seal disposed around the pipe on the pipe outer surface, the second outer seal outwardly spaced from the second termination section to annularly seal on the pipe outer surface; and

a second inner seal disposed around the repair sleeve on the repair sleeve outer surface, the second inner seal inwardly spaced from the second outer seal to annularly seal on the repair sleeve outer surface.

9. The pipe replacement system of claim 8, wherein the first termination enclosure is axially spaced from the second termination enclosure.

10. A pipe replacement method for repairing a pipe, the method comprising:

wrapping a wrap around the pipe to form a repair sleeve having a first termination section and a second termination section;

enclosing a first termination enclosure over the first termination section to form a first pressure containing connection with the repair sleeve, wherein the first termination enclosure comprises:

a first main body having a first outer extension and a first inner extension, the first outer extension and the first inner extension extending radially inward from the first main body and are spaced from each other;

the first outer extension having a first outer seal; and

the first inner extension having a first inner seal;

such that the enclosing the first termination enclosure over the first termination section includes:

disposing the first outer seal around the pipe on a pipe outer surface, the first outer seal outwardly spaced from the first termination section to annularly seal on the pipe outer surface; and

disposing the first inner seal around the repair sleeve on a repair sleeve outer surface, the first inner seal inwardly spaced from the first outer seal to annularly seal on the repair sleeve outer surface.

11. The method of claim 10, wherein the wrap is wrapped around a pipe in an online condition where pipe has fluid pressure and the repair sleeve is formed on the pipe with the pipe in the online condition.

12. The method of claim 10, further comprising identifying a pipe defect in the pipe based on the condition of the pipe, and wherein the repair sleeve covers the pipe defect and a pipe repair section.

13. The method of claim 12, wherein the pipe defect is a through-wall defect in the pipe repair section.

14. The method of claim 10, wherein the repair sleeve has an adhesive configured to bond the repair sleeve to the pipe outer surface,

15. The method of claim 10, wherein wrapping the wrap around the pipe outer surface includes bonding the repair sleeve to the pipe outer surface with the adhesive.

16. The method of claim 10, further comprising:

abrasively cleaning the first termination section to form a first outer diameter for the first termination section, and wherein the first inner seal forms a seal on the abrasively cleaned first termination section.

17. The method of claim 10, wherein the repair sleeve is configurable in a leak path configuration where the repair sleeve forms a leak flow path from a pipe leak section covered by the repair sleeve to the first termination enclosure and the leak flow path is sealed from an external atmosphere by the first termination enclosure, and wherein the repair sleeve has an adhesive configured to bond the repair sleeve to the pipe outer surface and the repair sleeve is configurable in a non-leak path configuration where the repair sleeve is bonded to the pipe outer surface to block pipe fluid flow from a pipe defect section covered by the repair sleeve from flowing to the first termination enclosure and the second termination enclosure.

18. The method of claim 10, further comprising:

enclosing a second termination enclosure over the second termination section to form a second pressure containing connection with the repair sleeve, the second termination enclosure including:

disposing a second outer seal around the pipe on the pipe outer surface, the second outer seal outwardly spaced from the second termination section to annularly seal on the pipe outer surface; and

disposing a second inner seal around the repair sleeve on a repair sleeve outer surface, the second inner seal inwardly spaced from the second outer seal to annularly seal on the repair sleeve outer surface.

19. A pipe replacement method for repairing a pipe, the method comprising:

wrapping a fiber wrap around the repair section of the pipe to form a repair sleeve having a first termination section and a second termination section;

enclosing a first termination enclosure over the first termination section to form a first pressure containing connection with the repair sleeve, wherein the first termination enclosure comprises:

a first main body having a first outer extension and a first inner extension, the first outer extension and the first inner extension extending radially inward from the first main body and are spaced from each other;

the first outer extension having a first outer seal; and

the first inner extension having a first inner seal;

such that the enclosing the first termination enclosure over the first termination section includes:

disposing the first outer seal around the pipe on a pipe outer surface, the first outer seal outwardly spaced from the first termination section to annularly seal on the pipe outer surface; and

disposing the first inner seal around the repair sleeve on a repair sleeve outer surface, the first inner seal inwardly spaced from the first outer seal to annularly seal on the repair sleeve outer surface;

enclosing a second termination enclosure over the second termination section to form a second pressure containing connection with the repair sleeve, the second termination enclosure including:

disposing a second outer seal around the pipe on the pipe outer surface, the second outer seal outwardly spaced from the second termination section to annularly seal on the pipe outer surface; and

disposing a second inner seal around the repair sleeve on a repair sleeve outer surface, the second inner seal inwardly spaced from the second outer seal to annularly seal on the repair sleeve outer surface; and

wherein the repair sleeve is configurable in a leak path configuration where the repair sleeve forms a leak flow path extending from a pipe defect covered by the repair sleeve to the first termination enclosure and the second termination enclosure with the leak flow path sealed from an external atmosphere by the first termination enclosure and the second termination enclosure.

20. The method of claim 19, wherein the repair sleeve has an adhesive configured to bond the repair sleeve to the pipe outer surface, and wherein the repair sleeve is configurable in a non-leak path configuration where the repair sleeve blocks pipe fluid flow from a pipe defect section covered by the repair sleeve from flowing to the first termination enclosure and the second termination enclosure to seal the pipe defect from the external atmosphere with the repair sleeve, and wherein the repair sleeve is configured to move from the non-leak path configuration to the leak path configuration.