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## MANHOLE CONSTRUCTION

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### Abstract

A manhole assembly comprising a plurality of interconnected longitudinal manhole segments is provided. In an embodiment, the plurality of interconnected longitudinal manhole segments may comprise a first edge comprising a plurality of dowel pins, a second edge comprising a plurality of dowel holes, a curved wall extending between the first edge and the second edge, and a plurality of clip bosses extending periodically along the first edge and the second edge. In another embodiment, the plurality of interconnected longitudinal manhole segments may comprise a plurality of hinges extending periodically along the first edge and the second edge.

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## **Background/Summary**

CROSS-REFERENCE TO RELATED APPLICATIONS [0001] This application claims benefit of priority of U.S. Provisional Patent Application No. 63/553,344, filed on Feb. 14, 2024. The contents of the foregoing application are incorporated herein by reference in its entirety.

### **TECHNICAL FIELD**

[0002] This disclosure relates generally to systems, methods, and apparatuses for constructing a manhole, and more particularly, for constructing a manhole to create storage and freight efficiencies.

### **BACKGROUND**

[0003] Underground utilities require periodic inspections, repairs, and maintenance. Manholes provide access to these underground utilities, such as sewers and water, electricity, gas, and telephone lines. Depending on the depth of the underground utilities, manholes may extend from two feet below grade to over forty feet below grade. Many manholes must be large enough to allow a person to descend down the manhole to access the underground utility.

[0004] Most existing manhole designs are monolithic, meaning that existing manholes are designed, manufactured, and shipped in one piece. Monolithic manholes may provide increased durability because such manholes do not contain seals or seams that may cause maintenance issues. Such existing monolithic manholes may be made from precast concrete, plastic, or fiberglass to ensure durability of the manhole assembly. Existing monolithic manholes are easily installed on work sites because they do not need to be assembled prior to installation. However, because such existing manholes are formed in one piece, they are inefficient to store and transport. For example, such existing monolithic manholes may require large amounts of space in storage facilities and on trucks during transportation.

[0005] Therefore, solutions are needed to provide manhole structures that are more efficient in storage and transportation. Such solutions should provide a manhole structure that may be efficiently stacked during storage and transportation. Additionally, such solutions should be easily assembled on the work site prior to installation. Finally, such manholes should be durable to decrease maintenance time and costs.

### **SUMMARY**

[0006] The disclosed embodiments describe systems, methods, and devices for a manhole construction. These systems, methods, and devices may include a manhole assembly that may comprise a plurality of interconnected longitudinal manhole segments, wherein each of the plurality of longitudinal manhole segments may comprise, a first edge comprising a plurality of dowel pins, a second edge comprising a plurality of dowel holes, a curved wall extending between the first edge and the second edge, and a plurality of clip bosses extending periodically along the first edge and the second edge.

[0007] In some embodiments, an inner surface of the curved wall may comprise a plurality of vertical reinforcements and a plurality of horizontal reinforcements. In other embodiments, manhole assembly may further comprise a plurality of gaskets between the plurality of longitudinal manhole segments. In other embodiments, the plurality of clip bosses may extend parallel to an outer surface of the curved wall. In some embodiments, the plurality of interconnected longitudinal

manhole segments may comprise three longitudinal manhole segments. In some embodiments, the plurality of clip bosses of a first of the plurality of longitudinal manhole segments may be aligned with the plurality of clip bosses of a second of the plurality of longitudinal manhole segments. In other embodiments, the plurality of clip bosses of the first of the plurality of longitudinal manhole segments may be connected with the plurality of clip bosses of the second of the plurality of longitudinal manhole segments using at least one clip. In some embodiments, the at least one clip may comprise notches configured to engage with the plurality of clip bosses of the first of the plurality of longitudinal manhole segments and the plurality of clip bosses of the second of the plurality of longitudinal manhole segments. In some embodiments, a diameter of the manhole assembly may be 48 inches.

[0008] The disclosed embodiments may further include a manhole assembly comprising a plurality of interconnected longitudinal manhole segments. Each of the plurality of longitudinal manhole segments may comprise a first edge having a plurality of dowel pins, a second edge having a plurality of dowel holes, a curved wall extending between the first edge and the second edge, and a plurality of hinges extending periodically along the first edge and the second edge.

[0009] In some embodiments, an inner surface of the curved wall may comprise a plurality of vertical reinforcements and a plurality of horizontal reinforcements. In other embodiments, the plurality of interconnected longitudinal manhole segments may comprise three longitudinal manhole segments. In some embodiments, the plurality of hinges of a first of the plurality of longitudinal manhole segments may be aligned with the plurality of hinges of a second of the plurality of longitudinal manhole segments. In some embodiments, the plurality of hinges of the first of the plurality of longitudinal manhole segments may be connected with the plurality of hinges of the second of the plurality of longitudinal manhole segments using at least one hinge pin. In other embodiments, the at least one hinge pin may be placed through the connected plurality of hinges. In some embodiments, a diameter of the manhole assembly may be 48 inches. In other embodiments, a diameter of the manhole assembly may be 36, 38, 40, 42, 44, 46, 50, 52, 54, 56, or any other suitable number of inches. In some embodiments, the plurality of longitudinal manhole segments may be connected by living hinges. In other embodiments, the living hinges may be integral to the plurality of longitudinal manhole segments. In some embodiments, a plurality of hinge pins may be installed adjacent to the plurality of living hinges.

[0010] The disclosed embodiments may further include a manhole assembly comprising a plurality of interconnected ring segments. The plurality of interconnected ring segments may comprise, a large end having a first plurality of external tabs spaced between a first plurality of external rims, and a small end having a plurality of internal tabs spaced between a plurality of internal rims. The manhole assembly may further comprise a manhole base having a second plurality of external tabs spaced between a second plurality of external rims, and a manhole cover having a third plurality of external tabs spaced between a third plurality of external rims.

[0011] In some embodiments, a diameter of the small end may be less than a diameter of the large end. In other embodiments, the first plurality of external tabs, the second plurality of external tabs, and the third plurality of external tabs may extend in a lengthwise direction from an exterior surface the ring segment, an exterior surface of the manhole base, and an exterior surface of the manhole cover. In some embodiments, the plurality of internal tabs may extend in a lengthwise direction from an interior surface of a wall of the ring segment. In some embodiments, the manhole assembly may comprise at least one internal joint between a small end of a first of the plurality of interconnected ring segments and a small end of a second of the plurality of ring segments. In other embodiments, the manhole assembly may comprise at least one external joint between a large end of a first of the plurality of ring segments and a large end of a second of the plurality of ring segments. In some embodiments, the first plurality of external tabs, the second plurality of external tabs, the third plurality of external tabs, and the plurality of internal tabs may comprise angled ends. In other embodiments, the first plurality of external rims, the second plurality of external

rims, and the third plurality of external rims may have a boss shaped to receive a screw. In other embodiments, the plurality of internal rims may have a boss shaped to receive a screw. In some embodiments, the manhole assembly may further comprise a gasket between each of the plurality of interconnected ring segments.

[0012] The disclosed embodiments may further comprise a manhole assembly comprising a plurality of interconnected ring segments. The plurality of interconnected ring segments may comprise a large end having a first external flange, and a small end having an internal flange. The manhole assembly may further comprise a manhole base having a second external flange, and a manhole cover having a third external flange.

[0013] In some embodiments, the internal flange may extend inwardly from the small end of the plurality of ring segments. In other embodiments the first external flange, the second external flange, and the third external flange may extend outwardly from the large end of the plurality of ring segments, the manhole base, and the manhole cover. In some embodiments, the plurality of interconnected ring segments may further comprise a weld element molded into the first external flange and the internal flange. In other embodiments, the manhole base may further comprise a weld element molded into the second external flange. In some embodiments, the manhole cover may further comprise a weld element molded into the third external flange. In other embodiments, the internal flange, the first external flange, the second external flange, and the third external flange may further comprise a groove configured to hold a weld element.

[0014] The disclosed embodiments may further comprise a manhole assembly, comprising a plurality of interconnected ring segments. The plurality of interconnected ring segments may comprise a large end having a first plurality of external clip bosses, and a small end having a plurality of internal clip bosses. The manhole assembly may further comprise a manhole base having a second plurality of clip bosses, and a manhole cover having a third plurality of external clip bosses.

[0015] In some embodiments, the first plurality of external clip bosses, the second plurality of clip bosses, and the third plurality of clip bosses may extend parallel to an outer surface of the large end, an outer surface of the manhole base, and an outer surface of the manhole cover. In other embodiments, the plurality of internal clip bosses may extend parallel to an inner surface of the small end. In some embodiments, the manhole assembly may further comprise at least one external joint between a large end of a first of the plurality of interconnected ring segments and a large end of a second of the plurality of interconnected ring segments. In other embodiments, the manhole assembly may further comprise at least one internal joint between a small end of a first of the plurality of interconnected ring segments and a small end of a second of the plurality of interconnected ring segments. In other embodiments, the manhole assembly may comprise at least one clip connecting the external joint. In other embodiments, the manhole assembly may further comprise at least one clip connecting the internal joint. In some embodiments, the manhole assembly may further comprise a gasket between each of the plurality of interconnected ring segments.

[0016] Additional features and advantages of the disclosed embodiments will be set forth in part in the description that follows, and in part will be obvious from the description, or may be learned by practice of the disclosed embodiments. The features and advantages of the disclosed embodiments will be realized and attained by the elements and combinations particularly pointed out in the appended claims.

[0017] It is to be understood that both the foregoing general description and the following detailed description are examples and explanatory only and are not restrictive of the disclosed embodiments as claimed.

[0018] The accompanying drawings constitute a part of this specification. The drawings illustrate several embodiments of the present disclosure and, together with the description, serve to explain the principles of the disclosed embodiments as set forth in the accompanying claims.

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## Description

### BRIEF DESCRIPTION OF THE DRAWINGS

[0019] FIG. 1 is a longitudinal manhole segment, consistent with various embodiments of the present disclosure.

[0020] FIG. 2A is an enlarged view of a portion of the inner side of the longitudinal manhole segment of FIG. 1, consistent with various embodiments of the present disclosure.

[0021] FIG. 2B is an enlarged view of a portion of the inner side of the longitudinal manhole segment of FIG. 1, consistent with various embodiments of the present disclosure.

[0022] FIG. 2C is an enlarged view of a portion of the outer side of the longitudinal manhole segment of FIG. 1, consistent with various embodiments of the present disclosure.

[0023] FIG. 3 is a view of a manhole assembly comprising longitudinal manhole segments, consistent with various embodiments of the present disclosure.

[0024] FIG. 4A is an enlarged view of a joint between two interconnected longitudinal manhole segments of the manhole assembly of FIG. 3, consistent with various embodiments of the present disclosure.

[0025] FIG. 4B is a clip for securing two longitudinal manhole segments, consistent with various embodiments of the present disclosure.

[0026] FIG. 4C depicts an enlarged view of a joint between two longitudinal manhole segments of the manhole assembly of FIG. 3 connected with a clip, consistent with various embodiments of the present disclosure.

[0027] FIG. 5A is a manhole assembly with a hinge pin connection, consistent with various embodiments of the present disclosure.

[0028] FIG. 5B is an enlarged view of a hinge pin connection of the manhole assembly of FIG. 5A, consistent with various embodiments of the present disclosure.

[0029] FIG. 6A is a disassembled manhole assembly with living hinges, consistent with various embodiments of the present disclosure.

[0030] FIG. 6B is a disassembled manhole section with living hinges, consistent with various embodiments of the present disclosure.

[0031] FIG. 6C is a disassembled manhole section with living hinges, consistent with various embodiments of the present disclosure.

[0032] FIG. 6D is an assembled manhole section with living hinges, consistent with various embodiments of the present disclosure.

[0033] FIG. 6E is a partially assembled manhole assembly, consistent with various embodiments of the present disclosure.

[0034] FIG. 6F is an assembled manhole assembly, consistent with various embodiments of the present disclosure.

[0035] FIG. 6G is an enlarged view of a living hinge, consistent with various embodiments of the present disclosure.

[0036] FIG. 7 is a manhole assembly comprising a plurality of interconnected ring segments, consistent with various embodiments of the present disclosure.

[0037] FIG. 8 is a section cut of a plurality of interconnected ring segments, consistent with various embodiments of the present disclosure.

[0038] FIG. 9A is an enlarged view of a portion of a ring segment including an outer snap and shelf feature, consistent with various embodiments of the present disclosure.

[0039] FIG. 9B is an enlarged view of a portion of a large end of a ring segment including an outward facing snap tab, consistent with various embodiments of the present disclosure.

[0040] FIG. 9C is an enlarged view of a portion of a small end of a ring segment including an inward facing snap tab, consistent with various embodiments of the present disclosure.

[0041] FIG. **10A** is an enlarged view of a portion of a manhole assembly including the snap connection between a ring segment and a manhole cap, consistent with various embodiments of the present disclosure.

[0042] FIG. **10B** is an enlarged view of a portion of a manhole assembly including the snap connection between a ring segment and a manhole base, consistent with various embodiments of the present disclosure.

[0043] FIG. **11A** is a section cut of a manhole assembly with ring segments connected through electrofusion welding, consistent with various embodiments of the present disclosure.

[0044] FIG. **11B** is an enlarged view of a portion of the manhole assembly of FIG. **11A**, consistent with various embodiments of the present disclosure.

[0045] FIG. **12A** is a manhole assembly with ring segments connected through tank clips, consistent with various embodiments of the present disclosure.

[0046] FIG. **12B** is an enlarged view of a portion of the manhole assembly of FIG. **12A**, consistent with various embodiments of the present disclosure.

#### DETAILED DESCRIPTION

[0047] Examples of embodiments of the present disclosure are described with reference to the accompanying drawings. In the figures, which are not necessarily drawn to scale, wherever convenient, the same reference numbers are used throughout the drawings to refer to the same or like parts. While examples and features of disclosed principles are described herein, modifications, adaptations, and other implementations are possible without departing from the spirit and scope of the disclosed embodiments. Also, the words “comprising,” “having,” “containing,” and “including,” and other similar forms are intended to be equivalent in meaning and be open ended in that an item or items following any one of these words is not meant to be an exhaustive listing of such item or items or meant to be limited to only the listed item or items. It should also be noted that as used in the present disclosure and in the appended claims, the singular forms “a,” “an,” and “the” include plural references unless the context clearly dictates otherwise.

[0048] A need has been recognized to provide a manhole that may be efficiently stacked for storage and transportation. Existing monolithic manhole assemblies may be large and inefficient to store and transport. The disclosed embodiments improve these and other deficiencies in existing manhole assemblies. For example, solutions are provided to allow for compact and space efficient manhole segments. The disclosed embodiments comprise a plurality of longitudinal manhole segments that may be efficiently stacked during storage and transportation. Such longitudinal manhole segments may be easily assembled and installed on a worksite. Alternative disclosed embodiments also comprise stackable ring segments that may be efficiently stacked during storage and transportation. Such ring segments may also be easily assembled and installed on a worksite.

[0049] References will now be made in detail to the disclosed embodiments, examples of which are illustrated in the accompanying drawings.

[0050] FIG. **1** depicts a longitudinal manhole segment **100**. Longitudinal manhole segment **100** may comprise a rounded wall that may be used as a portion of a larger manhole assembly. A plurality of longitudinal manhole segments **100** may be compactly and securely stacked for storage and during transportation. Longitudinal manhole segment **100** may be made of molded polypropylene or polyethylene components. Longitudinal manhole segment **100** may alternatively comprise a material other than polypropylene or polyethylene; for instance, other polymers, fiberglass reinforced polyester resin, or concrete. As depicted in FIG. **1**, longitudinal manhole segment **100** may comprise a plurality of horizontal reinforcements **105** and a plurality of vertical reinforcements **110**. The plurality of horizontal reinforcements **105** and the plurality of vertical reinforcements **110** may comprise extrusions from the inner face of the longitudinal manhole segment **100**. The plurality of horizontal reinforcements **105** and the plurality of vertical reinforcements **110** may provide increased strength and structural support to longitudinal manhole segment **100**. Longitudinal manhole segment **100** may further comprise a first edge **115** and a

second edge **120**. First edge **115** and second edge **120** may comprise dowel pins and dowel holes to facilitate alignment of multiple longitudinal manhole segments **100** as disclosed below with respect to FIG. 2A and FIG. 2B.

[0051] FIG. 2A depicts an enlarged view of first edge **115** of longitudinal manhole segment **100** and FIG. 2B depicts an enlarged view of second edge **120** of longitudinal manhole segment **100**. As depicted in FIG. 2A, first edge **115** of longitudinal manhole segment **100** may comprise a plurality of dowel pins **205**. Dowel pins **205** may comprise solid, cylindrical rods extending from first edge **115**. Dowel pins **205** may facilitate alignment of multiple longitudinal manhole sections **100**. As depicted in FIG. 2B, second edge **120** may comprise a plurality of dowel holes **215**. Dowel holes **215** may comprise openings in second edge **120** which may accept the dowel pins **205** of a second longitudinal manhole segment **100**. Interconnecting the dowel pins **205** of first edge **115** of a first longitudinal manhole segment with the dowel holes **215** of the second edge **120** of a second longitudinal manhole segment may facilitate alignment and connection of each of the longitudinal manhole segments.

[0052] FIG. 2C depicts clip bosses **225** on first edge **115** of longitudinal manhole segment **100**. Clip bosses **225** may extend parallel to the outer surface of longitudinal manhole segment **100** and may extend periodically along the entire length of the first edge **115** and the second edge **120** of longitudinal manhole segment **100**. Clip bosses **225** may be used to connect two longitudinal manhole segments, as disclosed herein with respect to FIG. 4A and FIG. 4B.

[0053] FIG. 3 depicts a manhole assembly **300** comprising a plurality of longitudinal manhole segments **100**. As depicted in FIG. 3, manhole assembly **300** may comprise three interconnected longitudinal manhole segments **100**. In other embodiments, manhole assembly **300** may comprise more or fewer interconnected longitudinal manhole segments **100**. The height of manhole assembly **300** may vary based on the application of the manhole assembly **300**. In some embodiments, installers of the manhole assembly **300** may cut manhole assembly **300** to a specific height before installation on a work site. A diameter of a typical manhole assembly **300** may be 48 inches. However, in other embodiments, manhole assembly **300** may comprise a diameter greater or less than 48 inches. As depicted in FIG. 3, each longitudinal section **100** may be connected at a joint **305**. Clip **310** may then be installed over the edges of the interconnected longitudinal manhole sections **100** at joints **305**, as disclosed below with reference to FIG. 4A and FIG. 4B. In some embodiments, manhole assembly **300** may further comprise a gasket (not shown) between each joint **305**. Gaskets may be made of a rubber or elastomer material and may impede the flow of water out of manhole assembly **300** through joint **305**, making manhole assembly **300** watertight. In other embodiments, where resistance to water passage through the joints **305** is not needed, manhole assembly **300** may be assembled without the use of gaskets between each joint **305**.

[0054] FIG. 4A depicts an enlarged view of joint **305** between two interconnected longitudinal manhole segments **100**. Each longitudinal manhole segment **100** may comprise a plurality of clip bosses **225**. Clip bosses **225** may extend parallel to the outer surface of longitudinal manhole segment **100**. Clip bosses **225** may extend periodically along the entire length of the first edge and the second edge of a longitudinal manhole segment **100**.

[0055] FIG. 4B depicts clip **310**. Clip **310** may comprise notches **405** which may extend parallel to the surface of clip **310**. Notches **405** may comprise a hook, which may be connected to clip bosses **225** of longitudinal manhole segments **100**. As depicted in FIG. 4C, starting at one end of manhole assembly **300**, clip **310** may be installed by aligning the notches **405** of clip **310** with the spaces between two sets of aligned clip bosses **225**. Clip **310** may then be driven towards the opposite end of manhole assembly **300**, pulling the clip bosses **225** together. The notches **405** of clip **310** may engage with clip bosses **225** of two aligned longitudinal manhole segments **100** to connect two longitudinal manhole segments **100** together. In some embodiments, as depicted in FIG. 4B, a single clip **310** may extend across a plurality of clip bosses **225**. In other embodiments, a single clip **310** may correspond to a single clip boss **225**. The length of clip **310** may vary, with the longer

clips **310** requiring fewer parts for assembly of manhole assembly **300**. Assembly of manhole assembly **300** may be complete when each of the clip bosses **225** of two aligned longitudinal manhole segments **100** are connected by a clip **310**.

[0056] FIG. 5A and FIG. 5B depict an alternative embodiment of manhole assembly **300** in which longitudinal manhole segments **100** are connected by one or more hinge pins **510**. As depicted in FIG. 5A, manhole assembly **300** may comprise three interconnected longitudinal manhole segments **100**. In other embodiments, manhole assembly **300** may comprise more or fewer interconnected longitudinal manhole segments **100**. As depicted in FIG. 5A, each longitudinal manhole segment **100** may be connected at a joint **305**. One or more hinge pins **510** may then be installed over the edges of the interconnected longitudinal manhole segments **100** at joint **305**, as disclosed below with reference to FIG. 5B. In some embodiments, manhole assembly **300** may further comprise a gasket (not shown) between each joint **305**. Gaskets may be made of a rubber or elastomer material and may impede the flow of water out of manhole assembly **300** through joint **305**, making manhole assembly **300** watertight. In other embodiments, where resistance to water passage through the joints **305** is not needed, manhole assembly **300** may be assembled without the use of gaskets between each joint **305**.

[0057] FIG. 5B depicts an enlarged view of joint **305** between two longitudinal manhole segments **100** connected by a single hinge pin **510**. As depicted in FIG. 5B, the edge of each of the interconnected longitudinal manhole segments **100** may comprise a plurality of hinges **505**. The hinges **505** of each longitudinal manhole segment **100** may be spaced periodically along the length of the edge of longitudinal manhole segment **100** such that a continuous hinge is created when two longitudinal manhole segments **100** are interconnected. Once the hinges **505** of each of the interconnected longitudinal manhole segments **100** are aligned, a hinge pin **510** may be inserted through the center of hinges **505**. Hinge pin **510** may secure the connection between two longitudinal manhole segments **100**. In other embodiments, a plurality of shorter hinge pins **510** (not shown) may be inserted through the center of hinges **505**.

[0058] FIG. 6A depicts an alternative embodiment of manhole assembly **300**. In such an embodiment, as depicted in FIG. 6A, three longitudinal manhole segments **100** may be connected by living hinges **605**. In other embodiments, more or fewer longitudinal manhole segments **100** may be used to form manhole assembly **300**. As depicted in FIG. 6A, manhole assembly **300** may comprise two sets of living hinges **605** between the three longitudinal manhole segments **100**. Living hinges **605** may comprise a flexible hinge made from the same material as the longitudinal manhole segments **100** that are connected by the living hinges **605**. For example, living hinges **605** may be integral to the connected longitudinal manhole segments **100**. The two disconnected longitudinal manhole segments **100** may further comprise a free edge **610**. When disassembled, as depicted in FIG. 6A, manhole assembly **300** may be securely and efficiently stacked with other manhole assemblies during storage and transportation. Manhole assembly **300** may be assembled by joining free edges **610** through rotation of living hinges **605**. When free edges **610** are joined, one set of clips **310** (as depicted in FIG. 4B) or a hinge pin **510** (as depicted in FIG. 5B) may be used to secure free edges **610**. In such an embodiment, the living hinges **605** of manhole assembly **300** may be sufficient to maintain a connection between the longitudinal manhole segments **100**. In other embodiments, a set of clips **310** (as depicted in FIG. 4B) or a hinge pin **510** (as depicted in FIG. 5B) may be used to secure both free edges **610** and the edges connected by living hinges **605**. Securing all three connection points of the longitudinal manhole segments **100** may provide increased stability to manhole assembly **300**. In such an embodiment, the living hinges **605** provide a convenient way to keep the longitudinal manhole segments **100** together during shipping and aid in alignment during installation.

[0059] In other embodiments, not depicted, longitudinal manhole segments **100** may be joined at joints **305** to form manhole assembly **300** through use of extrusion welding. In such an embodiment, a welding machine may be used to heat and melt plastic filler material and the



connected longitudinal manhole segments **100** at joints **305**. The heated filler material may then be extruded onto the heated joints **305** to weld and bond each of the longitudinal manhole segments **100** together at joints **305**. Such an embodiment may provide a watertight connection between longitudinal manhole segments **100**.

[0060] FIG. **6B** and FIG. **6C** depict manhole section **600**, according to disclosed embodiments. Manhole section **600** may form a portion of a full manhole assembly, as disclosed herein. For example, as disclosed herein, two or more manhole sections **600** may be connected in an assembled configuration to form a manhole assembly. As depicted in FIG. **6B** and FIG. **6C**, manhole section **600** may comprise two longitudinal manhole segments **100** that may be connected by living hinge **605**. In other embodiments, more or fewer longitudinal manhole segments **100** connected by living hinges may be used to form manhole section **600**. Living hinge **605** may comprise a flexible hinge made from the same material as the longitudinal manhole segments **100** that are connected by living hinge **605**. For example, as depicted in FIG. **6G**, living hinge **605** may be integral to the connected longitudinal manhole segments **100** of manhole section **600**. In some embodiments, living hinge **605** may extend along the entire length of the connected longitudinal manhole segments **100**, which may create a watertight seal without the use of gaskets between longitudinal manhole segments **100**. When disassembled, as depicted in FIG. **6B** and FIG. **6C**, manhole sections **600** may be securely and efficiently stacked during storage and transportation. Further, manhole sections **600** may be shipped in multiple subsections that require smaller pallets for storage and transportation, which may increase storage and freight efficiencies.

[0061] Longitudinal manhole segments **100** of manhole section **600** may further comprise first free edge **615A** and second free edge **615B**. First free edge **615A** may comprise a plurality of dowel holes **620**. Dowel holes **620** may comprise openings or holes in first free edge **615A** which may accept dowel pins **625** of a second manhole section **600**. Second free edge **615B** may comprise a plurality of dowel pins **625**. Dowel pins **625** may comprise solid, cylindrical rods extending from second free edge **615B**. Dowel pins **625** may facilitate alignment of multiple manhole sections **600** when forming a manhole assembly. Interconnecting the dowel pins **625** of second free edge **615B** of a first manhole section **600** with the dowel holes **620** of the first free edge **615A** of a second manhole section **600** may facilitate alignment and connection of each of the manhole sections **600**.

[0062] In some embodiments, as depicted in FIG. **6B**, an inner surface of longitudinal manhole segments **100** may be substantially flat and smooth. In other embodiments, as depicted in FIG. **6C**, the inner surface of longitudinal manhole segments **100** may comprise a plurality of horizontal reinforcements **635** and a plurality of vertical reinforcements **630**. The plurality of horizontal reinforcements **635** and the plurality of vertical reinforcements **630** may comprise extrusions from the inner face of longitudinal manhole segment **100**. The plurality of horizontal reinforcements **635** and the plurality of vertical reinforcements **630** may provide increased strength and structural support to longitudinal manhole segments **100**. In some embodiments (not depicted), an inner surface of longitudinal manhole segments **100** may comprise a plurality of horizontal reinforcements **635** but no vertical reinforcements **630**. In other embodiments (not depicted), an inner surface of longitudinal manhole segments **100** may comprise a plurality of vertical reinforcements **630** but no horizontal reinforcements **635**.

[0063] FIG. **6D** depicts manhole section **600** in an assembled configuration. As depicted in FIG. **6D**, each of longitudinal manhole segments **100** may be rotated toward each other by living hinge **605** to form a semi-cylindrical configuration. In the assembled configuration, the joint formed between longitudinal manhole segments **100** by living hinge **605** may be watertight without the use of a gasket. As shown in FIG. **6D**, manhole section **600** may form half of a full manhole assembly. For example, as depicted in FIG. **6E** and FIG. **6F**, two manhole sections **600** may be connected to form manhole assembly **650**. In other embodiments, more or fewer manhole sections **600** may be connected to form manhole assembly **650**. The dowel pins **625** of second free edge **615B** of a first manhole section **600** may be interconnected with the dowel holes **620** of the first free edge **615A** of

a second manhole section **600** to facilitate alignment and connection of each of the manhole sections **600**. In some embodiments, manhole assembly **650** may further comprise a gasket (not shown) between the joints formed by the free edges of manhole sections **600**. Gaskets may be made of a rubber or elastomer material and may impede the flow of water out of manhole assembly **650**, making manhole assembly **650** watertight. In other embodiments, where resistance to water passage is not needed, manhole assembly **650** may be assembled without the use of gaskets.

[0064] FIG. 7 depicts an alternative embodiment of a manhole assembly **700** comprising a plurality of identical ring segments **705A-705F**. FIG. 8 depicts a section cut of manhole assembly **700** with manhole base **720** and manhole cover **725** removed. Each identical ring segment **705A-705F** may comprise a small end and a large end where a diameter of the small end is less than a diameter of the large end. In some embodiments, the diameter of the small end of ring segment **705A-705F** may be about six inches less than the diameter of the large end. Identical ring segments **705A-705F** may be compactly and securely stacked together during storage and transportation. As depicted in FIG. 7, the small end of ring segment **705C** may be interconnected with the small end of ring segment **705D** at an internal joint **715**. FIG. 8 depicts internal joints **715** of the interconnected ring segments **705A-705F**. The large end of ring segment **705C** may be interconnected with the large end of ring segment **705B** at external joint **710**. Ring segment **705A** may be interconnected with a manhole base **720** at an external joint **710** and ring segment **705F** may be interconnected with a manhole cover **725** at an external joint **710**. Although FIG. 7 depicts a manhole assembly **700** with six ring segments **705A-705F**, manhole assembly **700** may comprise one or more ring segments based on the necessary height of the manhole assembly **700** for a given application. In some embodiments, manhole assembly **700** may further comprise a gasket (not shown) between each internal joint **715** and each external joint **710**. Gaskets may be made of a rubber or elastomer material and may impede the flow of water out of manhole assembly **700** through internal joints **715** and external joints **710**, making manhole assembly **700** watertight. In other embodiments, where resistance to water passage through the internal joints **715** and external joints **710** is not needed, manhole assembly **700** may be assembled without the use of gaskets between each internal joints **715** and external joints **710**.

[0065] As depicted in FIG. 7, manhole base **720** may comprise extensions **730**. Extensions **730** may comprise circular protrusions from the side of manhole base **720**. In some embodiments, manhole base **720** may comprise four extensions **730**. In other embodiments, manhole base **720** may comprise more or fewer extensions **730**. Extensions **730** may be configured to receive a pipe that may connect a first manhole assembly to a second manhole assembly or that may connect a manhole assembly to any other form of drainage assembly.

[0066] FIGS. 9A, 9B, and 9C depict the external and internal tabs of a ring segment. FIG. 9A depicts external tabs **900** on ring segment **705A**. FIG. 9B depicts external tabs **900** of ring segment **705B** interconnected with external tabs **900** of ring segment **705C** at external joint **710**. FIG. 9C depicts internal tabs **910** of ring segment **705C** interconnected with internal tabs **910** of ring segment **710D** at internal joint **715**.

[0067] As depicted in FIG. 9A, the large end of ring segment **705A** may comprise a plurality of external tabs **900** which may be spaced apart between external rims **905**. External tabs **900** may extend in the lengthwise direction from the exterior surface of the wall of ring segment **705A**. External tab **900** may comprise ends **920** which may be canted to enable easier engagement of the external tabs **900** between two mated ring segments. The ends **920** of a first ring segment may abut the ends of a second ring segment. Each external tab **900** may have a lip **915** which may be configured to latch onto an external rim of a mated like ring segment. The inner edge **925** of a plurality of lips **915** may be disposed around a circle. The outer edges **930** of external rims **905** may be disposed around a circle which may be congruent with the circle of the inner edge **925** of lips **915**. The inner edge **925** of lip **915** may be angled with respect to the diametrical plane of the ring segment **705A**, such that external tab **900** may be thrust elastically outward when lip **915** of

external tab **900** engages with the external rim of a mating ring segment. The outer edge **930** of external rim **905** may be similarly angled with respect to the diametrical plane of ring segment **705A**. One or more of external rims **905** may further comprise boss **935** which may be nominally in the center of external rim **905**. Boss **935** may be shaped to receive a screw to enable the end of ring segment **705A** to be fitted with a screw-attached lid. External tab **900** may comprise a corresponding notch **940** which may be shaped to accommodate boss **935** and screw.

[0068] External joint **710**, as depicted in FIG. **9B**, may be formed when the plurality of external tabs **900** of one ring segment are engaged with a plurality of external rims **905** of a second ring segment. For example, FIG. **9B** depicts ring segment **705B** interconnected with ring segment **705C** at external joint **710**. External tabs **900** of ring segment **705C** may engage with the external rims (not shown) of ring segment **705B** at external joint **710**. Similarly, external tabs **900** of ring segment **705B** may engage with the external rims (not shown) of ring segment **705C** at external joint **710**.

[0069] FIG. **9C** depicts internal joint **715** of the small ends of ring segments **705C** and **705D**. The small end of ring segments **705C** and **705D** may each comprise internal tabs **910**. Internal tabs **910** may extend in the lengthwise direction from the interior surface of the walls of ring segments **705C** and **705D**. Internal tabs **910** may comprise ends which may correspond to ends **920** as disclosed herein with respect to FIG. **9A**. The ends of internal tabs **910** may be canted to enable easier engagement of the internal tabs **910** between two mated ring segments, such as ring segments **705C** and **705D**. Each internal tab **910** may further comprise a lip which may correspond to lip **915** as disclosed herein with respect to FIG. **9A**. The inner edge of the lips of internal tabs **910** may be configured to latch onto an internal rim, such as internal rims **915**, of a mated like ring segment. The inner edge of the lips of internal tabs **910** may be disposed around a circle. The outer edges of internal rims **915** may be disposed around a circle which may be congruent with the circle of the inner edge of the lips of internal tabs **910**. The inner edge of the lips of internal rims **915** may be angled with respect to the diametrical plane of the ring segment **705C** and **705D**, such that internal tabs **910** may be thrust elastically outward when the lip of internal tabs **910** engage with the internal rim of the mating ring segment. The outer edge of internal rims **915** may be similarly angled with respect to the diametrical plane of ring segment **705C** and **705D**. Internal joint **715**, as depicted in FIG. **9C**, may be formed when the internal tabs **910** of ring segment **705C** engage with the internal rims **915** of ring segment **705D** and the plurality of internal tabs **910** of ring segment **705D** engage with the internal rims **915** of ring segment **705C**.

[0070] FIG. **10A** depicts manhole cover **725** connected to a ring segment **705F** and FIG. **10B** depicts manhole base **720** connected to a ring segment **705A**. Manhole cover **725** and manhole base **720** may comprise a plurality of external tabs **900**. External tabs **900** may be spaced apart between external rims (not shown), which may correspond to external rims **905**, as disclosed herein with reference to FIG. **9A**. As depicted in FIG. **10A**, external joint **710** may be formed when the plurality of external tabs **900** of ring segment **705F** engage with a plurality of external rims of manhole cover **725** and the plurality of external tabs **900** of manhole cover **725** engage with a plurality of external rims of ring segment **705F**. Similarly, as depicted in FIG. **10B**, external joint **710** may be formed when the plurality of external tabs **900** of ring segment **705A** engage with a plurality of external rims of manhole base **720** and the plurality of external tabs **900** of manhole base **720** engage with a plurality of external rims of ring segment **705A**.

[0071] FIGS. **11A** and **11B** depict a manhole assembly **700** comprising a plurality of ring segments **705** that are assembled using electrofusion welding. As depicted in FIG. **11A**, manhole assembly **700** may comprise a plurality of connected ring segments **705**. Although FIG. **11A** depicts six interconnected ring segments **705**, manhole assembly **700** may comprise more or fewer ring segments **705**. The larger ends of ring segments **705** may be connected at external joint **1110** and the smaller ends of ring segments **705** may be connected at internal joint **1105**. Manhole assembly **700** may further comprise a manhole cover **725** and a manhole base **720**. As depicted in FIG. **11A**,

manhole base **720** may comprise a plurality of extensions **730**, as disclosed herein with respect to FIG. 7. Manhole base **720** may further comprise bench **1130**. In some embodiments, bench **1130** may be integral with manhole base **720**. In other embodiments, bench **1130** may be placed inside manhole base **720**. Bench **1130** may be configured to form a channel within manhole base **720** to direct a flow of water between various inlets and outlets of manhole base **720**.

[0072] FIG. **11B** depicts an enlarged view of external joint **1110** and internal joint **1105**. The small end of ring segment **705** may comprise an internal flange **1120** extending inwardly from the top of the small end of ring segment **705**. The large end of ring segment **705**, manhole cover **725**, and manhole base **720** may comprise an external flange **1115** extending outwardly from the large end of ring segment **705**, manhole cover **725**, and manhole base **720**. The small ends of two ring segments **705** may be joined at internal flanges **1120** to form internal joint **1105**. The large ends of two ring segments **705** or the large end of a ring segment **705** and manhole cover **725** or manhole base **720** may be joined at external flanges **1115** to form external joint **1110**.

[0073] Internal joint **1105** and external joint **1110** may be formed by electrofusion welding. For example, an electrically heated weld element may be captured within two connecting internal joints **1105** or two connecting external joints **1110**. The weld element may comprise a plastic with embedded metal materials that may be heated by electric resistance or electromagnetic induction. The weld element may be positioned on or just beneath the surface of internal flange **1120** and external flange **1115**. In some embodiments, the weld element may be molded into the material of internal flange **1120** and external flange **1115**. In other embodiments, the weld element may be placed partly or wholly within a groove formed on the surface of internal flange **1120** and external flange **1115**. In other embodiments, the weld element may be captured between two connecting internal flanges **1120** or two connecting external flanges **1115** as they are pressed together prior to welding. Such weld element may be heated by electrical or electromagnetic energy sufficient to cause localized melting and fusion of the weld element and the local plastic material of the two connecting internal flanges **1115** or two connecting external flanges **1120**. A plurality of ring segments **705** may be connected by applying heat to the internal flanges **1120** and external flanges **1115** to create welded internal joints **1105** and external joints **1110**. Welded internal joints **1105** and external joints **1110** may provide a watertight connection between a first ring segment and a second ring segment.

[0074] In other embodiments, not depicted, ring segments **705** may be joined at internal joints **1105** and external joints **1110** to form manhole assembly **700** through use of extrusion welding. In such an embodiment, a welding machine may be used to heat and melt plastic filler material and the connected ring segments **705** at internal joints **1105** and external joints **1110**. The heated filler material may then be extruded onto the heated internal joints **1105** and external joints **1110** to weld and bond each of the ring segments **705** together at internal joints **1105** and external joints **1110**. Such an embodiment may provide a watertight connection between ring segments **705**.

[0075] FIGS. **12A** and **12B** depict an alternative embodiment of manhole assembly **700**. As depicted in FIG. **12A**, manhole assembly **700** may comprise a plurality of connected ring segments **705** with a manhole cover **725** and a manhole base **720**. Although FIG. **12A** depicts six interconnected ring segments **705**, manhole assembly **700** may comprise more or fewer ring segments **705**. The larger ends of ring segments **705** may be connected at external joint **1210** and the smaller ends of ring segments **705** may be connected at internal joints **1205**. Manhole assembly **700** may further comprise a manhole cover **725** and a manhole base **720**. As depicted in FIG. **12A**, manhole base **720** may comprise a plurality of extensions **730**, as disclosed herein with respect to FIG. 7. In some embodiments, manhole assembly **700** may further comprise a gasket (not shown) between each internal joint **1205** and each external joint **1210**. Gaskets may be made of a rubber or elastomer material and may impede the flow of water out of manhole assembly **700** through internal joints **1205** and external joints **1210**, making manhole assembly **700** watertight. In other embodiments, where resistance to water passage through the internal joints **1205** and external joints

**1210** is not needed, manhole assembly **700** may be assembled without the use of gaskets between each internal joints **1205** and external joints **1210**.

[0076] FIG. **12B** depicts an enlarged view of external joint **1210**. The large end of each ring segment **705** may comprise a plurality of external clip bosses **1215**. Clip bosses **1215** may extend parallel to the outer surface of ring segment **705** and may extend periodically along the entire perimeter of the large end of ring segment **705**. When the large ends of two ring segments **705** are joined, the clip bosses **1215** of each ring segment **705** may be aligned. Clip **1220** may be placed around each of the pairs of aligned clip bosses **1215** to secure two ring segments **705** together. Clip **1220** may comprise notches that may engage with clip bosses **1215** of the ring segments **705** to connect the two ring segments **705** together. The internal joint **1205** of manhole assembly **700** may further comprise clip bosses **1215** that may extend parallel to the inner surface of ring segment **705** and may extend periodically along the entire perimeter of the small end of ring segment **705**. When the small ends of two ring segments **705** are joined, the clip bosses **1215** of each ring segment **705** may be aligned. Clip **1220** may be placed around each of the pairs of aligned clip bosses **1215** to secure the small ends of two ring segments **705** together. Clip **1220** may comprise notches that may engage with clip bosses **1215** of the ring segments **705** to connect the small ends of two ring segments **705** together.

[0077] The foregoing description has been presented for purposes of illustration. It is not exhaustive and is not limited to precise forms or embodiments disclosed. Modifications and adaptations of the embodiments will be apparent from consideration of the specification and practice of the disclosed embodiments. For example, while certain components have been described as being coupled to one another, such components may be integrated with one another or distributed in any suitable fashion.

[0078] Moreover, while illustrative embodiments have been described herein, the scope includes any and all embodiments having equivalent elements, modifications, omissions, combinations (e.g., of aspects across various embodiments), adaptations and/or alterations based on the present disclosure. The elements in the claims are to be interpreted broadly based on the language employed in the claims and not limited to examples described in the present specification or during the prosecution of the application, which examples are to be construed as nonexclusive. Further, the steps of the disclosed methods can be modified in any manner, including reordering steps and/or inserting or deleting steps.

[0079] The features and advantages of the disclosure are apparent from the detailed specification, and thus, it is intended that the appended claims cover all systems and methods falling within the true spirit and scope of the disclosure. As used herein, the indefinite articles “a” and “an” mean “one or more.” Similarly, the use of a plural term does not necessarily denote a plurality unless it is unambiguous in the given context. Words such as “and” or “or” mean “and/or” unless specifically directed otherwise. Further, since numerous modifications and variations will readily occur from studying the present disclosure, it is not desired to limit the disclosure to the exact construction and operation illustrated and described, and, accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the disclosure.

[0080] Other embodiments will be apparent from consideration of the specification and practice of the embodiments disclosed herein. It is intended that the specification and examples be considered as example only, with a true scope and spirit of the disclosed embodiments being indicated by the following claims.

[0081] Embodiments of the present disclosure may further be described with respect to the following clauses: [0082] Clause 1. A manhole assembly comprising: [0083] a plurality of interconnected longitudinal manhole segments, wherein each of the plurality of longitudinal manhole segments comprise: [0084] a first edge comprising a plurality of dowel pins; [0085] a second edge comprising a plurality of dowel holes; [0086] a curved wall extending between the first edge and the second edge; and [0087] a plurality of clip bosses extending periodically along

the first edge and the second edge. [0088] Clause 2. The manhole assembly of clause 1, wherein an inner surface of the curved wall comprises a plurality of vertical reinforcements and a plurality of horizontal reinforcements. [0089] Clause 3. The manhole assembly of clause 1, wherein the manhole assembly further comprises a gasket between each of the plurality of longitudinal manhole segments. [0090] Clause 4. The manhole assembly of clause 1, wherein the plurality of clip bosses extend parallel to an outer surface of the curved wall. [0091] Clause 5. The manhole assembly of clause 1, wherein the plurality of interconnected longitudinal manhole segments comprises three longitudinal manhole segments. [0092] Clause 6. The manhole assembly of clause 1, wherein the plurality of clip bosses of a first of the plurality of longitudinal manhole segments are aligned with the plurality of clip bosses of a second of the plurality of longitudinal manhole segments. [0093] Clause 7. The manhole assembly of clause 6, wherein the plurality of clip bosses of the first of the plurality of longitudinal manhole segments are connected with the plurality of clip bosses of the second of the plurality of longitudinal manhole segments using at least one clip. [0094] Clause 8. The manhole assembly of clause 7, wherein the at least one clip comprises notches configured to engage with the plurality of clip bosses of the first of the plurality of longitudinal manhole segments and the plurality of clip bosses of the second of the plurality of longitudinal manhole segments. [0095] Clause 9. The manhole assembly of clause 1, wherein a diameter of the manhole assembly is 48 inches. [0096] Clause 10. A manhole assembly comprising: [0097] a plurality of interconnected longitudinal manhole segments, wherein each of the plurality of longitudinal manhole segments comprise: [0098] a first edge comprising a plurality of dowel pins; [0099] a second edge comprising a plurality of dowel holes; [0100] a curved wall extending between the first edge and the second edge; and [0101] a plurality of hinges extending periodically along the first edge and the second edge. [0102] Clause 11. The manhole assembly of clause 10, wherein the manhole assembly further comprises a gasket between each of the plurality of longitudinal manhole segments. [0103] Clause 12. The manhole assembly of clause 10, wherein an inner surface of the curved wall comprises a plurality of vertical reinforcements and a plurality of horizontal reinforcements. [0104] Clause 13. The manhole assembly of clause 10, wherein the plurality of interconnected longitudinal manhole segments comprises three longitudinal manhole segments. [0105] Clause 14. The manhole assembly of clause 10, wherein the plurality of hinges of a first of the plurality of longitudinal manhole segments are aligned with the plurality of hinges of a second of the plurality of longitudinal manhole segments. [0106] Clause 15. The manhole assembly of clause 14, wherein the plurality of hinges of the first of the plurality of longitudinal manhole segments are connected with the plurality of hinges of the second of the plurality of longitudinal manhole segments using at least one hinge pin. [0107] Clause 16. The manhole assembly of clause 15, wherein the at least one hinge pin is placed through the connected plurality of hinges. [0108] Clause 17. The manhole assembly of clause 10, wherein a diameter of the manhole assembly is 48 inches. [0109] Clause 18. The manhole assembly of clause 10, wherein the plurality of longitudinal manhole segments are connected by living hinges. [0110] Clause 19. The manhole assembly of clause 18, wherein the living hinges are integral to the plurality of longitudinal manhole segments. [0111] Clause 20. The manhole assembly of clause 18, wherein a plurality of hinge pins are installed adjacent to the living hinges. [0112] Clause 21. A manhole assembly comprising: [0113] a plurality of interconnected ring segments, wherein the plurality of interconnected ring segments comprise: [0114] a large end having a first plurality of external tabs spaced between a first plurality of external rims; and [0115] a small end having a plurality of internal tabs spaced between a plurality of internal rims; [0116] a manhole base having a second plurality of external tabs spaced between a second plurality of external rims; and [0117] a manhole cover having a third plurality of external tabs spaced between a third plurality of external rims. [0118] Clause 22. The manhole assembly of clause 21, wherein a diameter of the small end is less than a diameter of the large end. [0119] Clause 23. The manhole assembly of clause 21, wherein the first plurality of external tabs, the second plurality of external tabs, and the third plurality of external tabs extend in a lengthwise

direction from an exterior surface of the ring segment, an exterior surface of the manhole base, and an exterior surface of the manhole cover. [0120] Clause 24. The manhole assembly of clause 21, wherein the plurality of internal tabs extend in a lengthwise direction from an interior surface of a wall of the ring segment. [0121] Clause 25. The manhole assembly of clause 21, comprising at least one internal joint between a small end of a first of the plurality of interconnected ring segments and a small end of a second of the plurality of ring segments. [0122] Clause 26. The manhole assembly of clause 21, comprising at least one external joint between a large end of a first of the plurality of ring segments and a large end of a second of the plurality of ring segments. [0123] Clause 27. The manhole assembly of clause 21, wherein each of the first plurality of external tabs, the second plurality of external tabs, the third plurality of external tabs, and the plurality of internal tabs comprise angled ends. [0124] Clause 28. The manhole assembly of clause 21, wherein each of the first plurality of external rims, the second plurality of external rims, and the third plurality of external rims has a boss shaped to receive a screw. [0125] Clause 29. The manhole assembly of clause 21, wherein each of the plurality of internal rims has a boss shaped to receive a screw. [0126] Clause 30. The manhole assembly of clause 21, further comprising a gasket between each of the plurality of interconnected ring segments. [0127] Clause 31. A manhole assembly comprising: [0128] a plurality of interconnected ring segments, wherein the plurality of interconnected ring segments comprise: [0129] a large end having a first external flange; and [0130] a small end having an internal flange; [0131] a manhole base having a second external flange; and [0132] a manhole cover having a third external flange. [0133] Clause 32. The manhole assembly of clause 31, wherein the internal flange extends inwardly from the small end of the plurality of ring segments. [0134] Clause 33. The manhole assembly of clause 31, wherein each of the first external flange, the second external flange, and the third external flange extends outwardly from the large end of the plurality of ring segments, the manhole base, and the manhole cover. [0135] Clause 34. The manhole assembly of clause 31, wherein the plurality of interconnected ring segments further comprise a weld element molded into the first external flange and the internal flange. [0136] Clause 35. The manhole assembly of clause 31, wherein the manhole base further comprises a weld element molded into the second external flange. [0137] Clause 36. The manhole assembly of clause 31, wherein the manhole cover further comprises a weld element molded into the third external flange. [0138] Clause 37. The manhole assembly of clause 31, wherein each of the internal flange, the first external flange, the second external flange, and the third external flange further comprises a groove configured to hold a weld element. [0139] Clause 38. A manhole assembly, comprising: [0140] a plurality of interconnected ring segments, wherein each of the plurality of interconnected ring segments comprises: [0141] a large end having a first plurality of external clip bosses; and [0142] a small end having a plurality of internal clip bosses; [0143] a manhole base having a second plurality of clip bosses; and [0144] a manhole cover having a third plurality of external clip bosses. [0145] Clause 39. The manhole assembly of clause 38, wherein each of the first plurality of external clip bosses, the second plurality of clip bosses, and the third plurality of clip bosses extends parallel to an outer surface of the large end, an outer surface of the manhole base, and an outer surface of the manhole cover. [0146] Clause 40. The manhole assembly of clause 38, wherein each of the plurality of internal clip bosses extends parallel to an inner surface of the small end. [0147] Clause 41. The manhole assembly of clause 38, further comprising at least one external joint between a large end of a first of the plurality of interconnected ring segments and a large end of a second of the plurality of interconnected ring segments. [0148] Clause 42. The manhole assembly of clause 38, further comprising at least one internal joint between a small end of a first of the plurality of interconnected ring segments and a small end of a second of the plurality of interconnected ring segments. [0149] Clause 43. The manhole assembly of clause 42, further comprising one or more clip connecting the external joint. [0150] Clause 44. The manhole assembly of clause 43, further comprising one or more clip connecting the internal

joint. [0151] Clause 45. The manhole assembly of clause 38, further comprising a gasket between each of the plurality of interconnected ring segments.

## Claims

1. A manhole assembly comprising: a plurality of interconnected longitudinal manhole segments, wherein each of the plurality of longitudinal manhole segments comprise: a first edge comprising a plurality of dowel pins; a second edge comprising a plurality of dowel holes; a curved wall extending between the first edge and the second edge; and a plurality of clip bosses extending periodically along the first edge and the second edge.
2. The manhole assembly of claim 1, wherein an inner surface of the curved wall comprises a plurality of vertical reinforcements and a plurality of horizontal reinforcements.
3. The manhole assembly of claim 1, wherein the manhole assembly further comprises a gasket between each of the plurality of longitudinal manhole segments.
4. The manhole assembly of claim 1, wherein the plurality of clip bosses extend parallel to an outer surface of the curved wall.
5. The manhole assembly of claim 1, wherein the plurality of interconnected longitudinal manhole segments comprises three longitudinal manhole segments.
6. The manhole assembly of claim 1, wherein the plurality of clip bosses of a first of the plurality of longitudinal manhole segments are aligned with the plurality of clip bosses of a second of the plurality of longitudinal manhole segments.
7. The manhole assembly of claim 6, wherein the plurality of clip bosses of the first of the plurality of longitudinal manhole segments are connected with the plurality of clip bosses of the second of the plurality of longitudinal manhole segments using at least one clip.
8. The manhole assembly of claim 7, wherein the at least one clip comprises notches configured to engage with the plurality of clip bosses of the first of the plurality of longitudinal manhole segments and the plurality of clip bosses of the second of the plurality of longitudinal manhole segments.
9. The manhole assembly of claim 1, wherein a diameter of the manhole assembly is 48 inches.
10. A manhole assembly comprising: a plurality of interconnected longitudinal manhole segments, wherein each of the plurality of longitudinal manhole segments comprise: a first edge comprising a plurality of dowel pins; a second edge comprising a plurality of dowel holes; a curved wall extending between the first edge and the second edge; and a plurality of hinges extending periodically along the first edge and the second edge.
11. The manhole assembly of claim 10, wherein the manhole assembly further comprises a gasket between each of the plurality of longitudinal manhole segments.
12. The manhole assembly of claim 10, wherein an inner surface of the curved wall comprises a plurality of vertical reinforcements and a plurality of horizontal reinforcements.
13. The manhole assembly of claim 10, wherein the plurality of interconnected longitudinal manhole segments comprises three longitudinal manhole segments.
14. The manhole assembly of claim 10, wherein the plurality of hinges of a first of the plurality of longitudinal manhole segments are aligned with the plurality of hinges of a second of the plurality of longitudinal manhole segments.
15. The manhole assembly of claim 14, wherein the plurality of hinges of the first of the plurality of longitudinal manhole segments are connected with the plurality of hinges of the second of the plurality of longitudinal manhole segments using at least one hinge pin.
16. The manhole assembly of claim 15, wherein the at least one hinge pin is placed through the connected plurality of hinges.
17. The manhole assembly of claim 10, wherein a diameter of the manhole assembly is 48 inches.
18. The manhole assembly of claim 10, wherein the plurality of longitudinal manhole segments are



connected by living hinges.

**19.** The manhole assembly of claim 18, wherein the living hinges are integral to the plurality of longitudinal manhole segments.

**20.** The manhole assembly of claim 18, wherein a plurality of hinge pins are installed adjacent to the living hinges.

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