Hobas Pipe USA Manholes:

From Fiberglass Pipes to Fittings to Manhole Structures

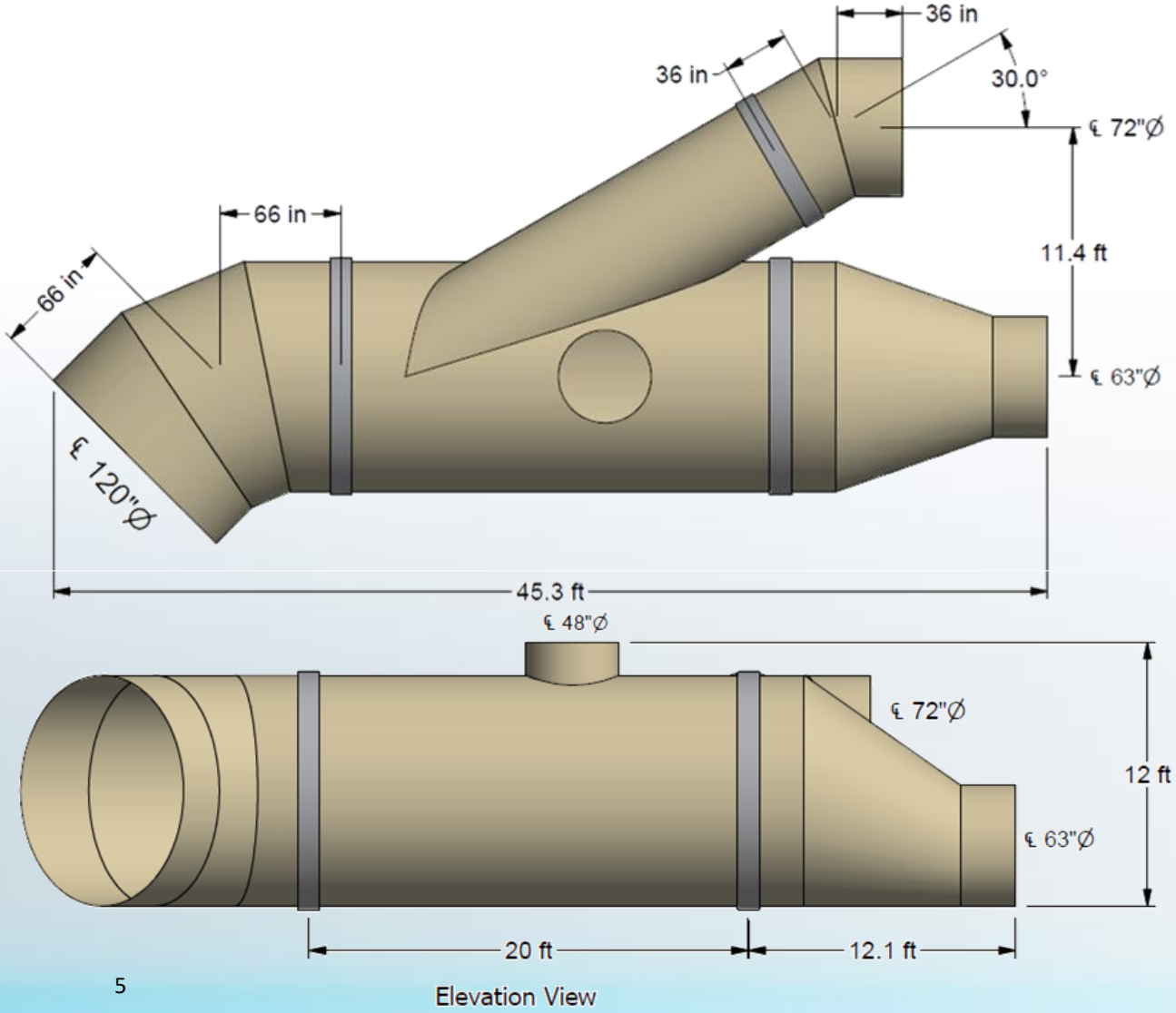
Introduction-Universal Benefits

- HOBAS Pipe USA has been manufacturing Centrifugally Cast FRPM pipe for more than 35 years in the North America. Over 10 million feet of pipe installed and counting!
- Corrosion resistant
- Fully structural
- Extended long life (100+ years)

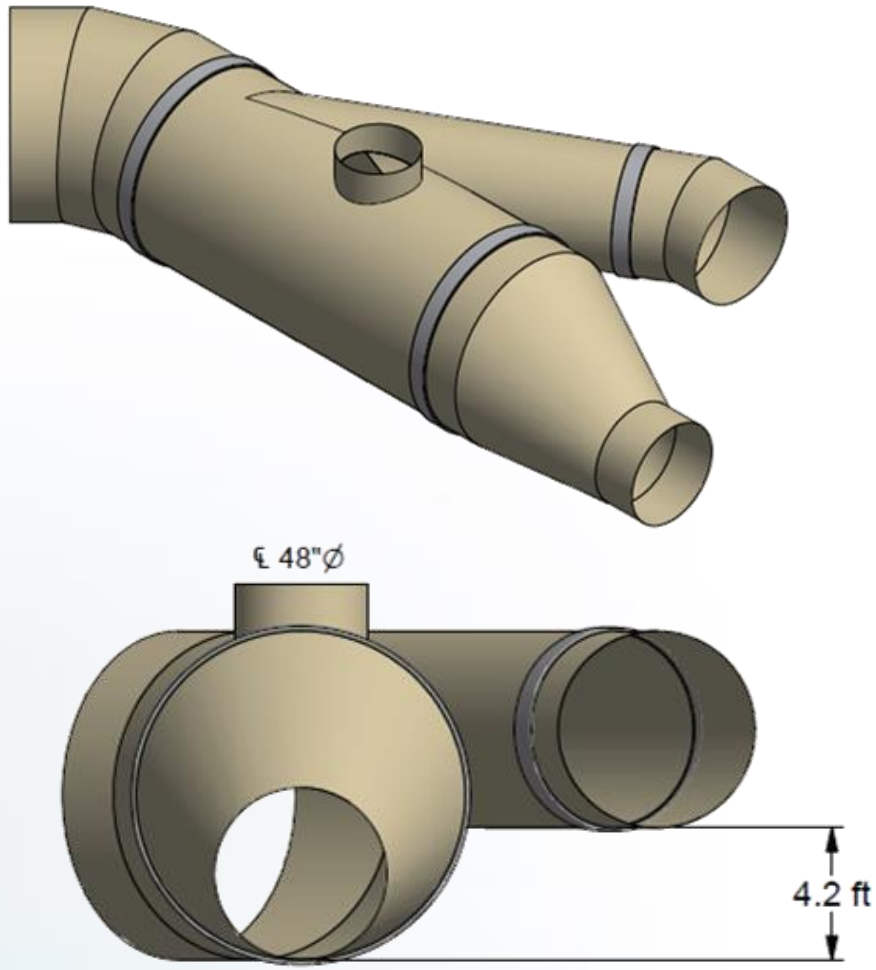
Hobas Fittings

Hobas Fittings

Hobas Custom Fittings



Elevation View



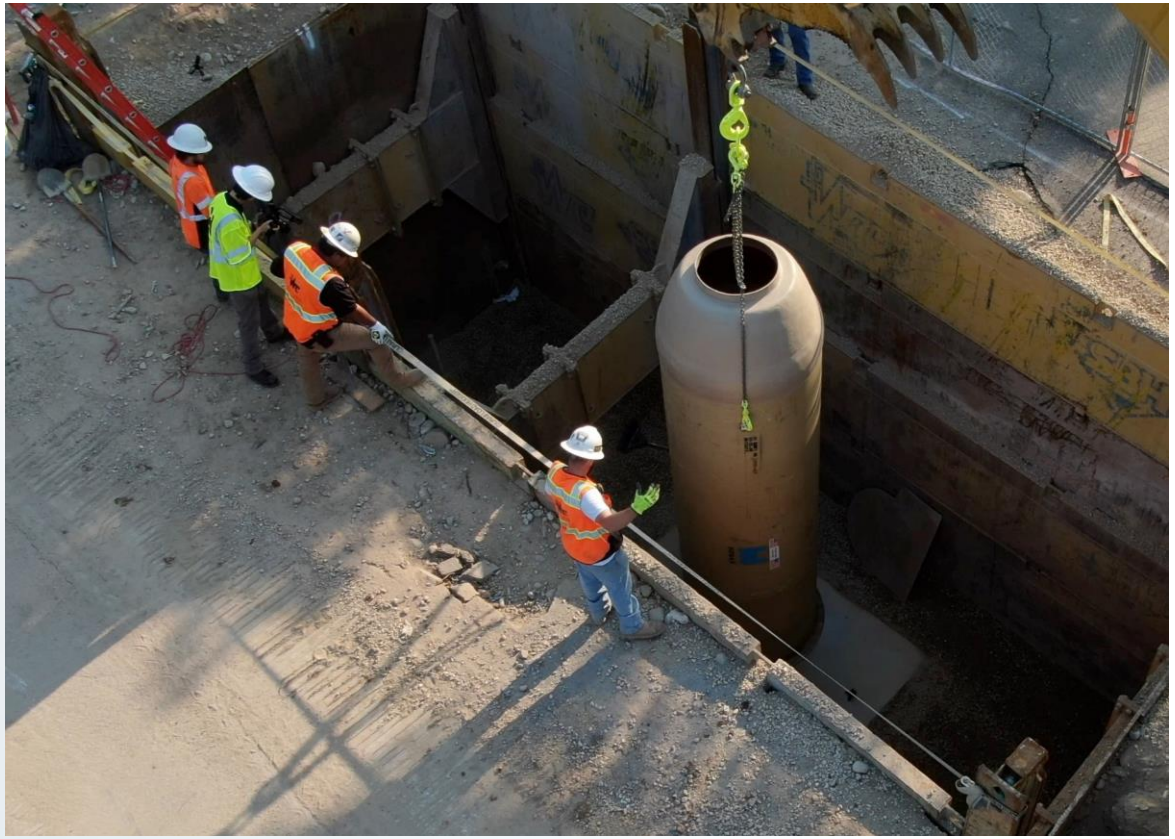
You asked and we delivered

- FRP Heavy Wall Construction
  - Pipe Stiffness Min 46 PSI 15 x Stiffer than ASTM Wall standard
  - 50% thicker design
- Bridges the Gap between Strength and Cost

Manhole Requirements

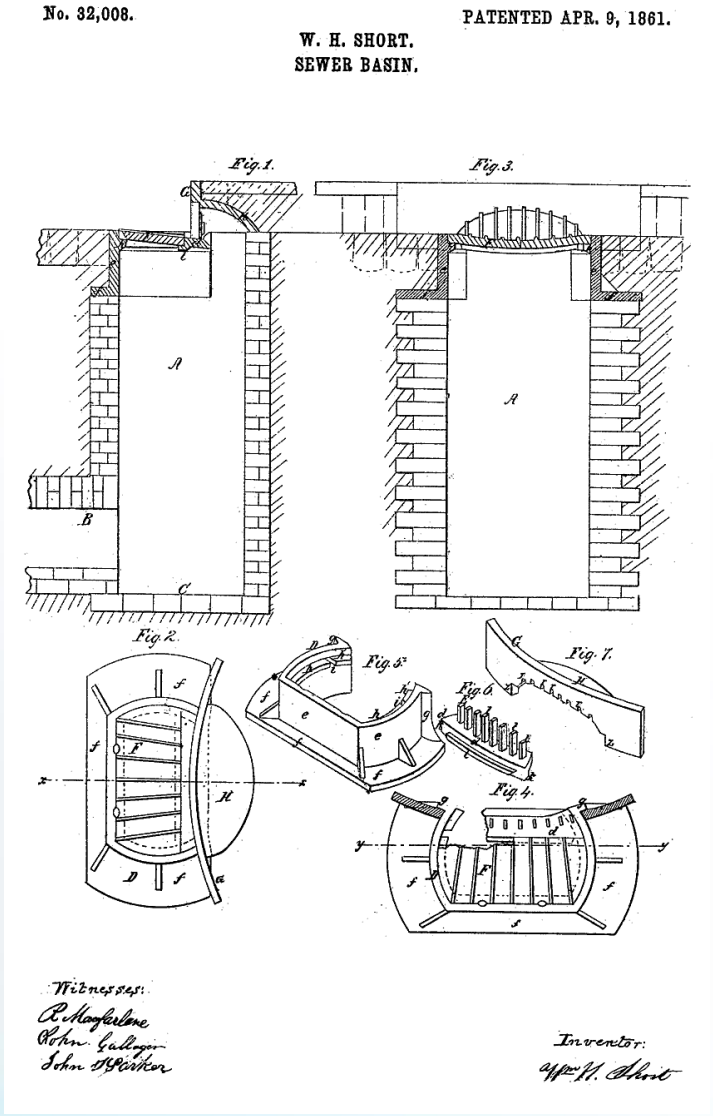
What the Industry has been asking for in a MH

- Provide convenient, safe access to active sewer systems
- Support traffic loads, soil loads, hydrostatic loads and construction loads
- Resist chemical attack and groundwater infiltration
    - Manhole walls, riser joints, pipe connections



Evolution of Manhole Improvements

- Dig a rectangular Trench
- Build a rectangular access



No. 32,008. PATENTED APR. 9, 1861.

W. H. SHORT.
SEWER BASIN.

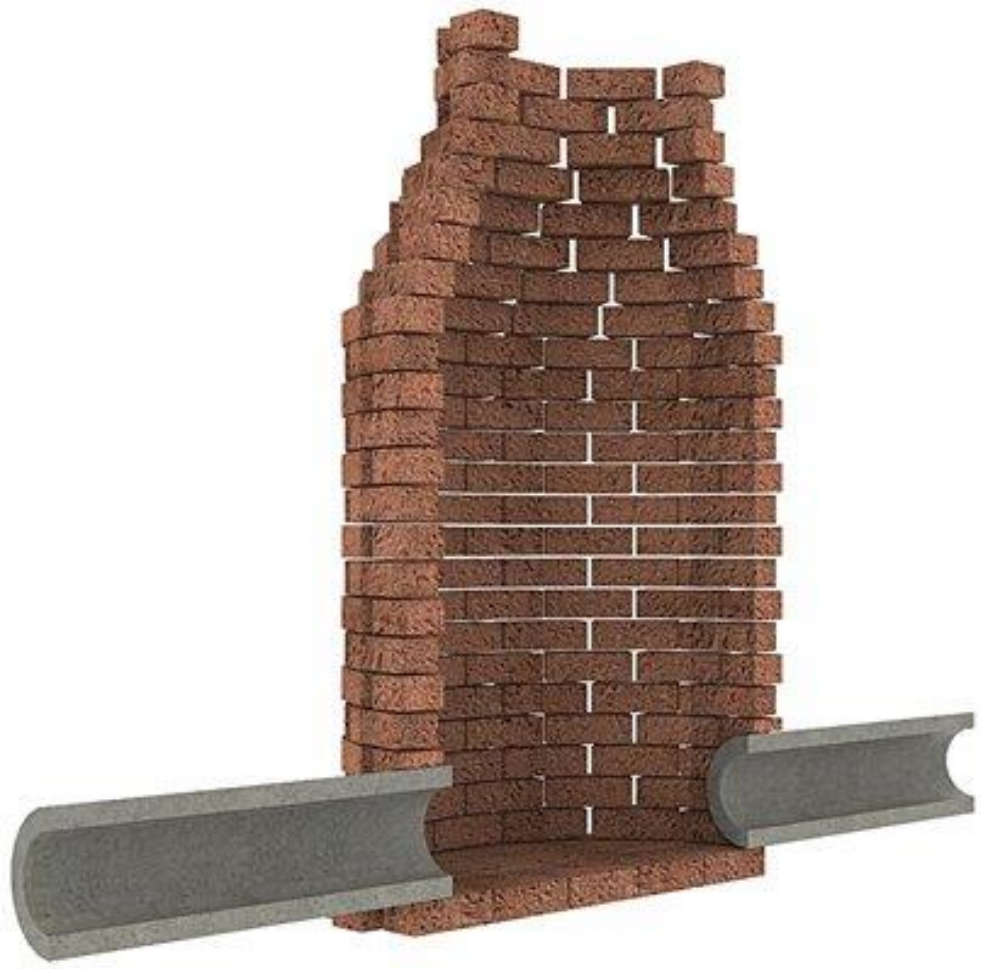
Fig. 1. Fig. 3. Fig. 2. Fig. 5. Fig. 7. Fig. 6. Fig. 4.

Witnesses:
R. Macfarlane
John Gallagher
John H. Parker

Inventor:
Wm. H. Short

Evolution of Manhole Improvements

Brick Manhole



- **Square to Round for strength**
- Easily constructed
- Low cost of construction
- Brick is resistant to corrosion

- Challenges
  - Mortar Decay/corrosion
  - Ground Movement/ side loading
  - Infiltration – hundreds of joints

Evolution of Manhole Improvements

The Concrete Manhole

- **Elimination of cement mortar**
- **Vast reduction in number of joints**
- Strong, easily constructed
- Low cost of construction

- Challenges
  - Corrosion
  - Infiltration
  - Weight
  - High Cost with added epoxy or PVC liners

Evolution of Manhole Improvements

The Light Weight FRP Manhole

- Designed for H20 Loading Strength, water-tightness, corrosion resistant, light weight, and low cost

- Challenges
  - Very Low Required Stiffness

TABLE 1 Stiffness Requirements

Manhole or Wetwell Length, ft (mm)	$F/\Delta Y$, psi (kPa)
6 (1829)	0.72 (4.96)
12 (3658)	1.26 (8.69)
20 (6096)	2.01 (13.86)
25 (7620)	3.02 (20.82)
35 (10668)	5.24 (36.13)
50 (15240)	8.42 (58.81)

ASTM D3753 Minimum Stiffness Requirements

Evolution of Manhole Improvements

The Heavy Weight Polymer Concrete

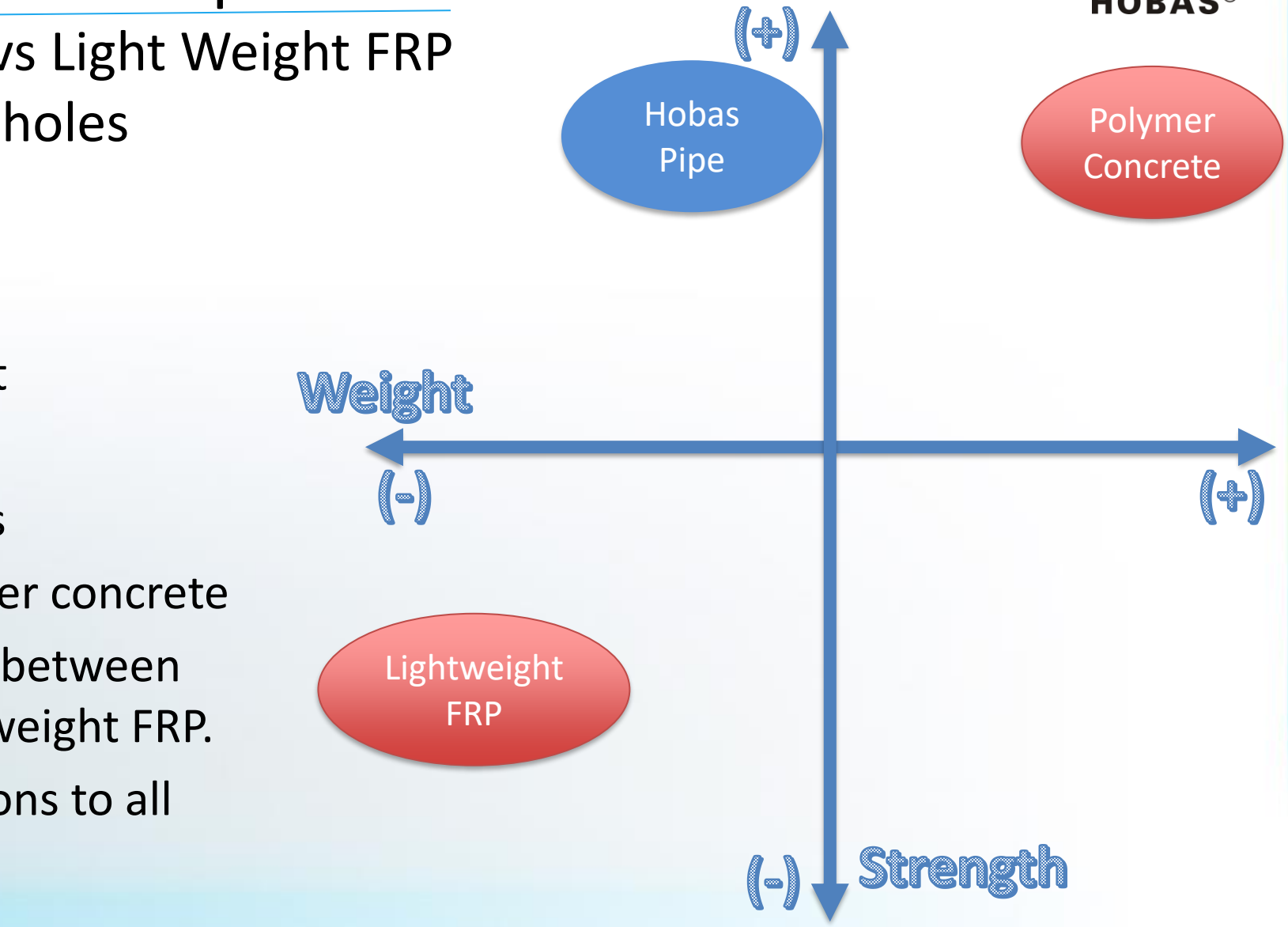
- Developed by Concrete MH manufacturers
- Very strong and corrosion resistant
  - Polyester Resin in lieu of Cement

- Challenges
  - Weight
  - Pipe connections/joints
  - Repairability
  - **Cost**

Features/Benefits Comparison

Polymer Concrete vs Light Weight FRP vs Hobas Pipe Manholes

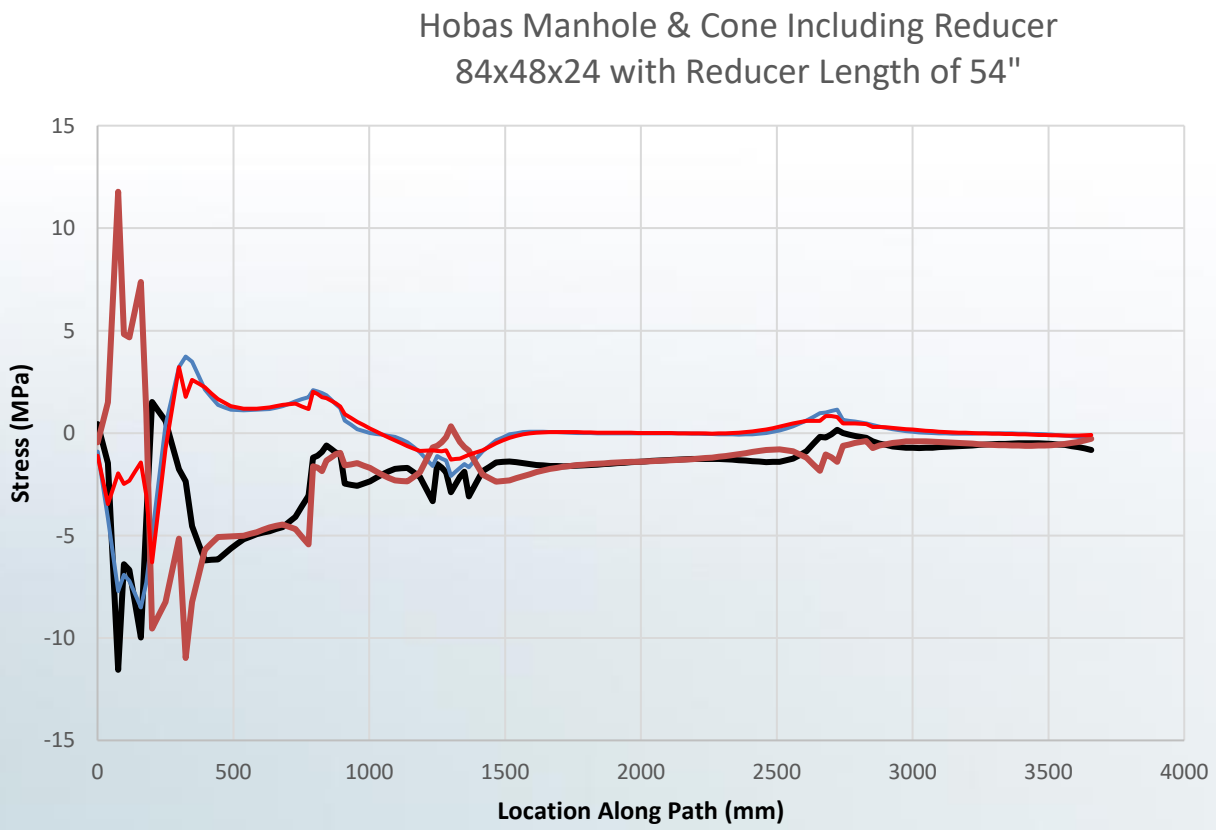
- Shared benefits
  - Corrosion Resistant
  - Extended Life
- Hobas unique benefits
  - As strong as polymer concrete
  - A balanced weight between concrete and lightweight FRP.
  - Leak free connections to all components.

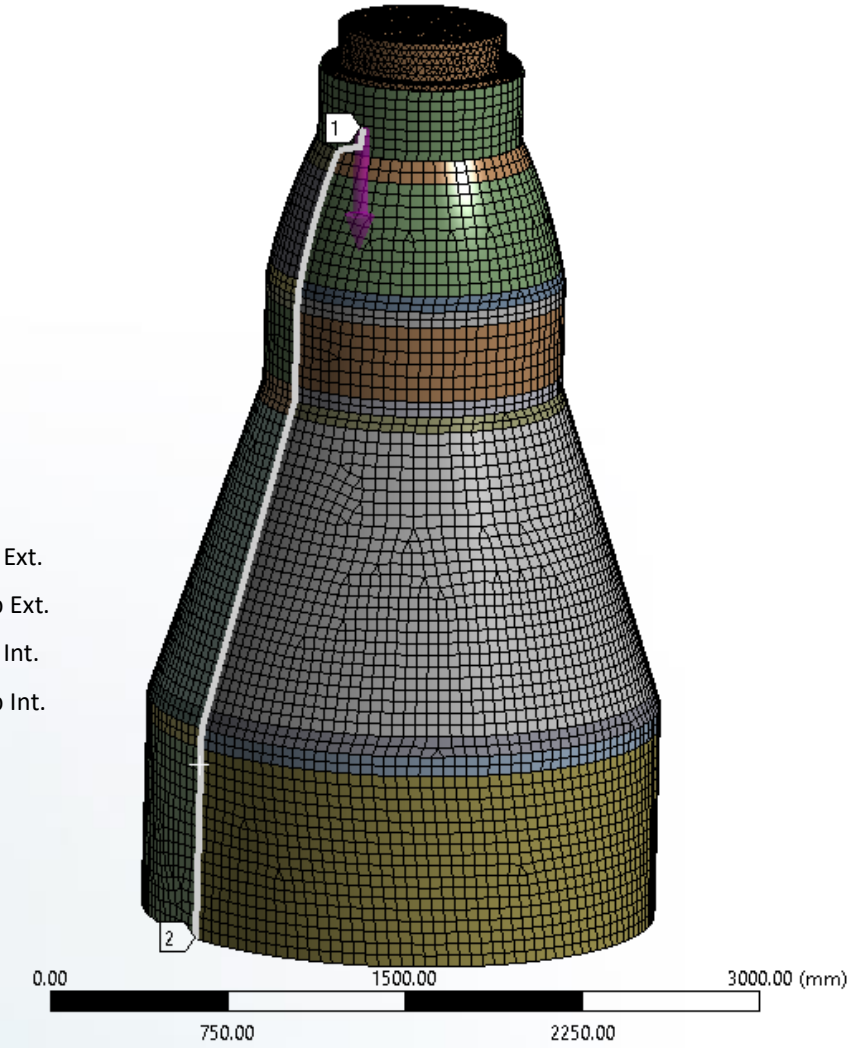


Hobas Manhole Bases

- Made from Hobas Pipe
- Same Zero Leakage FWC Couplings
- Reduced turbulence
  - Smooth interior
- Highly customizable
- Corrosion resistant

Design of Hobas Riser

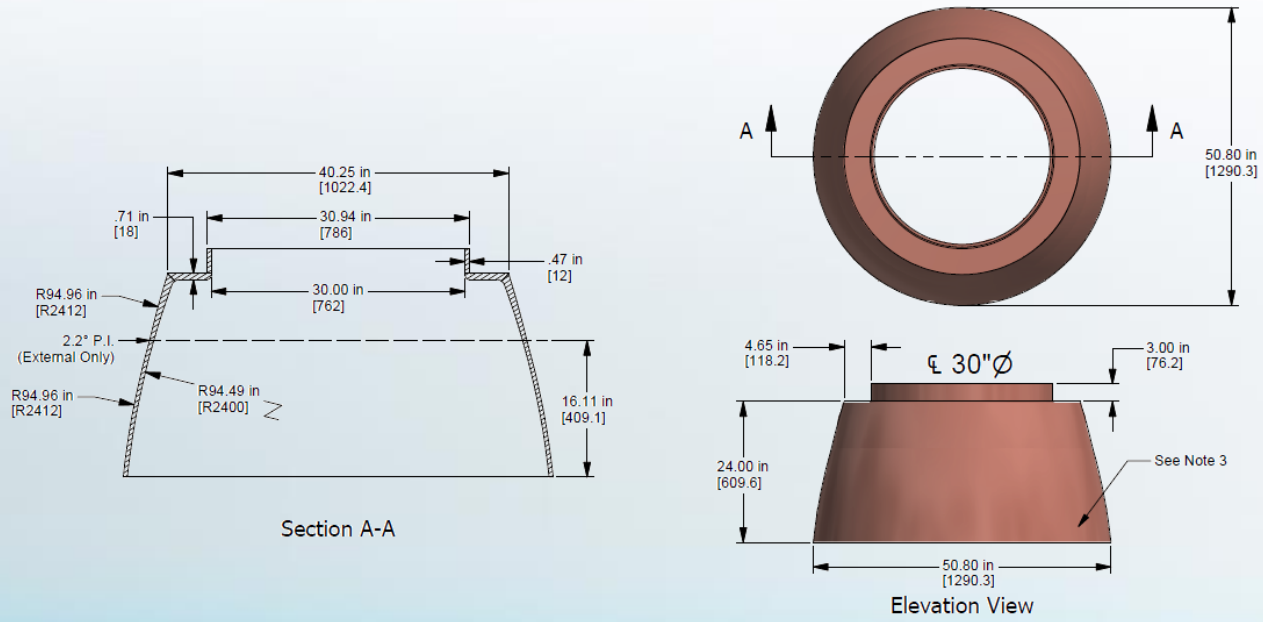


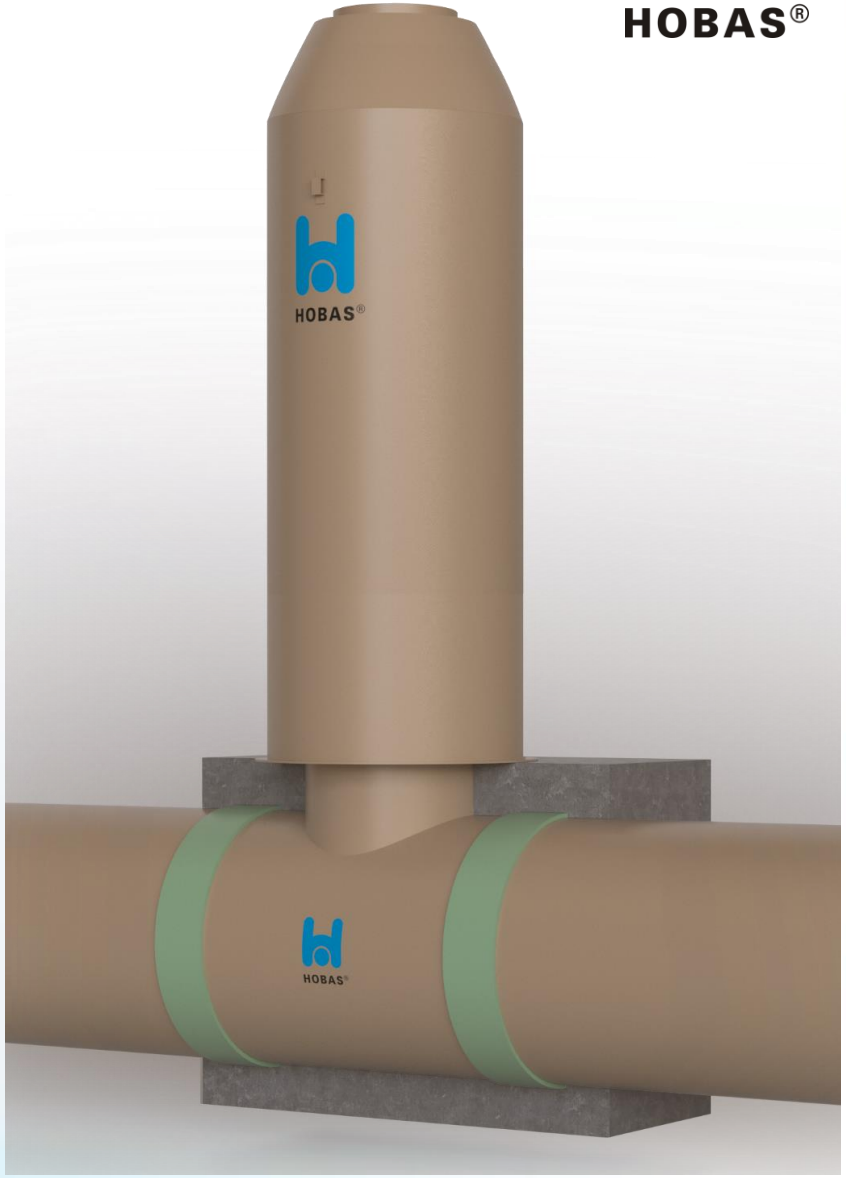


Topping the Hobas Riser with a Hobas Cone

- Designed not only meet standards but exceed them by 50%.

48 x 30 Access Cone

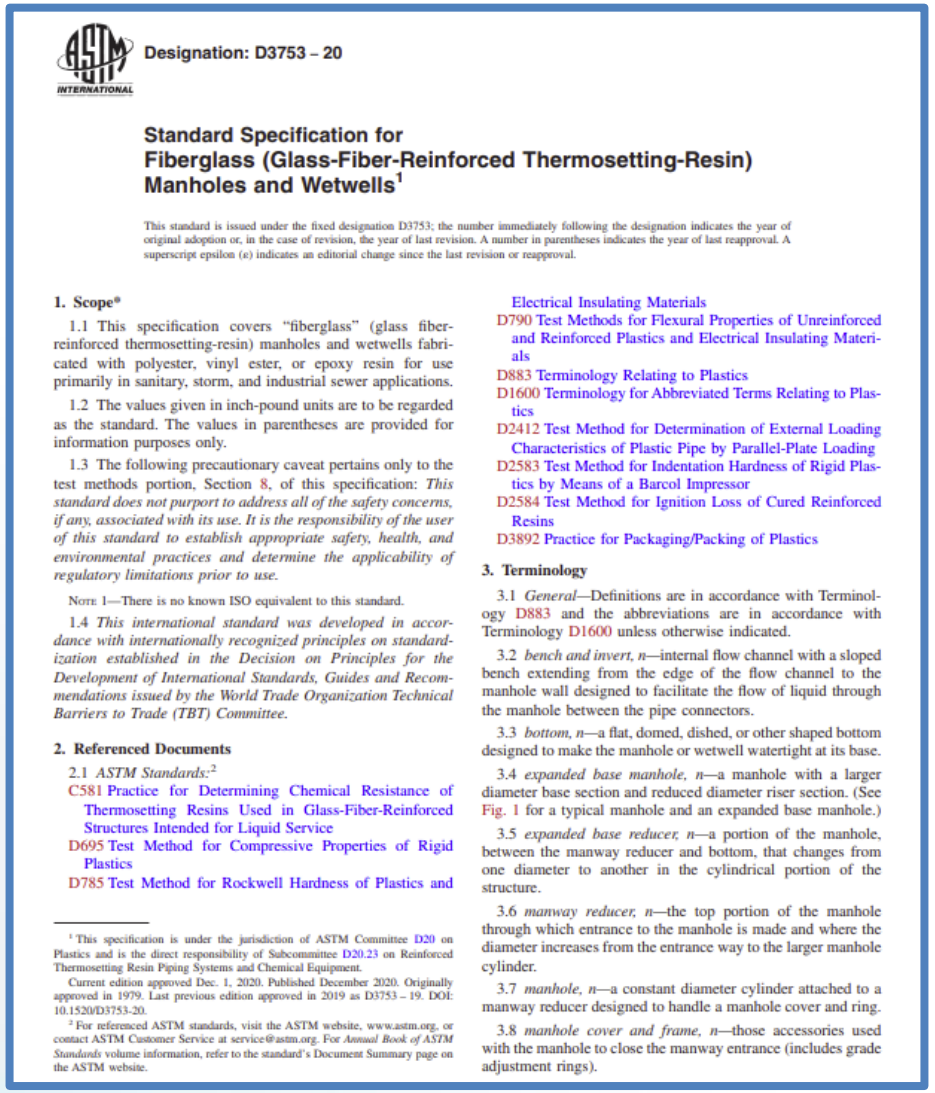




Thicker walls and more load capacity

Testing in Accordance with ASTM D3753

- Material Composition
- Mechanical Test for Flexure, Compression and Tensile strength
- Chemical Tests per C581 & D3681
- Load Tests per ASTM D3753
- Soundness Tests Per ASTM D3753
- Hardness and Thickness Verification



Designation: D3753 – 20

Standard Specification for Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Manholes and Wetwells[1]

This standard is issued under the fixed designation D3753; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope*

1.1 This specification covers "fiberglass" (glass fiber-reinforced thermosetting-resin) manholes and wetwells fabricated with polyester, vinyl ester, or epoxy resin for use primarily in sanitary, storm, and industrial sewer applications.

1.2 The values given in inch-pound units are to be regarded as the standard. The values in parentheses are provided for information purposes only.

1.3 The following precautionary caveat pertains only to the test methods portion, Section 8, of this specification: *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

NOTE 1—There is no known ISO equivalent to this standard.

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

C581 Practice for Determining Chemical Resistance of Thermosetting Resins Used in Glass-Fiber-Reinforced Structures Intended for Liquid Service

D695 Test Method for Compressive Properties of Rigid Plastics

D785 Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials

D790 Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

D883 Terminology Relating to Plastics

D1600 Terminology for Abbreviated Terms Relating to Plastics

D2412 Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading

D2583 Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor

D2584 Test Method for Ignition Loss of Cured Reinforced Resins

D3892 Practice for Packaging/Packing of Plastics

3. Terminology

3.1 *General*—Definitions are in accordance with Terminology D883 and the abbreviations are in accordance with Terminology D1600 unless otherwise indicated.

3.2 *bench and invert, n*—internal flow channel with a sloped bench extending from the edge of the flow channel to the manhole wall designed to facilitate the flow of liquid through the manhole between the pipe connectors.

3.3 *bottom, n*—a flat, domed, dished, or other shaped bottom designed to make the manhole or wetwell watertight at its base.

3.4 *expanded base manhole, n*—a manhole with a larger diameter base section and reduced diameter riser section. (See Fig. 1 for a typical manhole and an expanded base manhole.)

3.5 *expanded base reducer, n*—a portion of the manhole, between the manway reducer and bottom, that changes from one diameter to another in the cylindrical portion of the structure.

3.6 *manway reducer, n*—the top portion of the manhole through which entrance to the manhole is made and where the diameter increases from the entrance way to the larger manhole cylinder.

3.7 *manhole, n*—a constant diameter cylinder attached to a manway reducer designed to handle a manhole cover and ring.

3.8 *manhole cover and frame, n*—those accessories used with the manhole to close the manway entrance (includes grade adjustment rings).

[1] This specification is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.23 on Reinforced Thermosetting Resin Piping Systems and Chemical Equipment.

Current edition approved Dec. 1, 2020. Published December 2020. Originally approved in 1979. Last previous edition approved in 2019 as D3753 – 19. DOI: 10.1520/D3753-20.

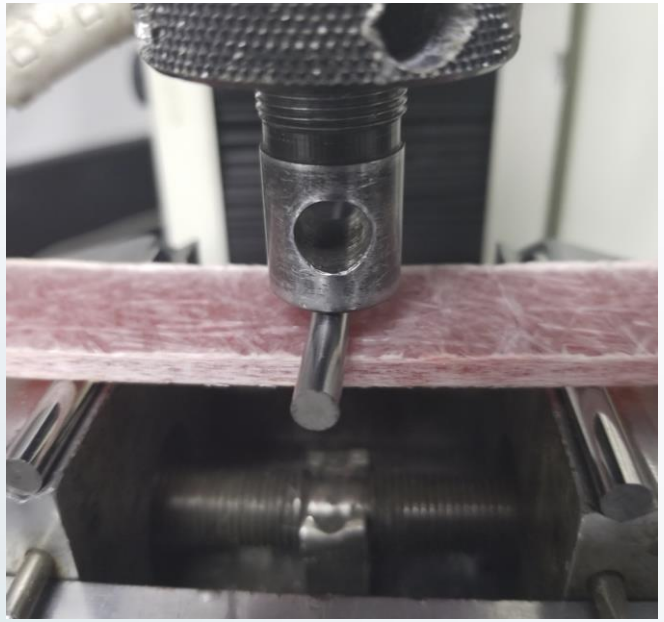
[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

Mechanical Testing

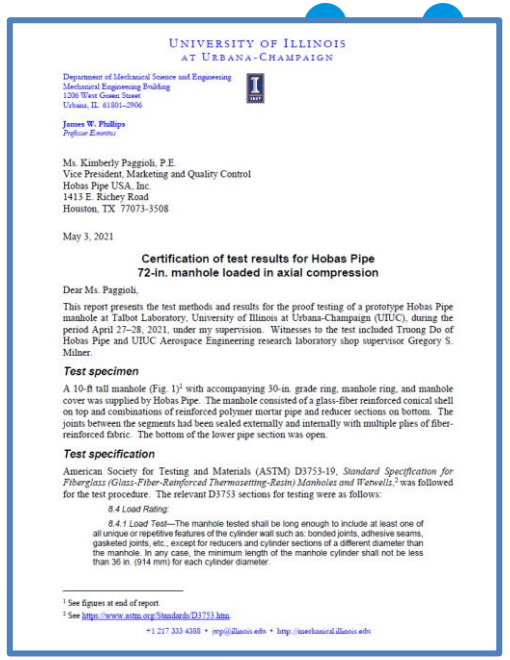
- ASTM D695 Test Method for Compressive Properties
- ASTM D638 Test Methods for Tensile Properties
- ASTM D790 Test Method for Flexural Properties

Chemical Testing

- Fiberglass and Resin Materials Used in the Hobas Manholes are the Same as Used in the Hobas Pipe
- Corrosion Testing for the Hobas Riser (pipe) is Performed in Accordance with ASTM D3681
- Corrosion Testing for the Cone Section is Performed in Accordance with ASTM C581 (per ASTM D3753)
  - Test Media Represents the Manhole Environment, sodium chloride, pH 10, pH 4, H_2SO_4



Load Testing – Conducted at the U of Illinois



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May 3, 2021

Certification of test results for Hobas Pipe 72-in. manhole loaded in axial compression

Dear Ms. Paggioli,

This report presents the test methods and results for the proof testing of a prototype Hobas Pipe manhole at Talbot Laboratory, University of Illinois at Urbana-Champaign (UIUC), during the period April 27–28, 2021, under my supervision. Witnesses to the test included Truong Do of Hobas Pipe and UIUC Aerospace Engineering research laboratory shop supervisor Gregory S. Milner.

Test specimen

A 10-ft tall manhole (Fig. 1)[1] with accompanying 30-in. grade ring, manhole ring, and manhole cover was supplied by Hobas Pipe. The manhole consisted of a glass-fiber reinforced conical shell on top and combinations of reinforced polymer mortar pipe and reducer sections on bottom. The joints between the segments had been sealed externally and internally with multiple plies of fiber-reinforced fabric. The bottom of the lower pipe section was open.

Test specification

American Society for Testing and Materials (ASTM) D3753-19, *Standard Specification for Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Manholes and Wetwells*,[2] was followed for the test procedure. The relevant D3753 sections for testing were as follows:

8.4 Load Rating:

8.4.1 Load Test—The manhole tested shall be long enough to include at least one of all unique or repetitive features of the cylinder wall such as: bonded joints, adhesive seams, gasketed joints, etc., except for reducers and cylinder sections of a different diameter than the manhole. In any case, the minimum length of the manhole cylinder shall not be less than 36 in. (914 mm) for each cylinder diameter.

[1] See figures at end of report.
[2] See https://www.astm.org/Standards/D3753.htm.

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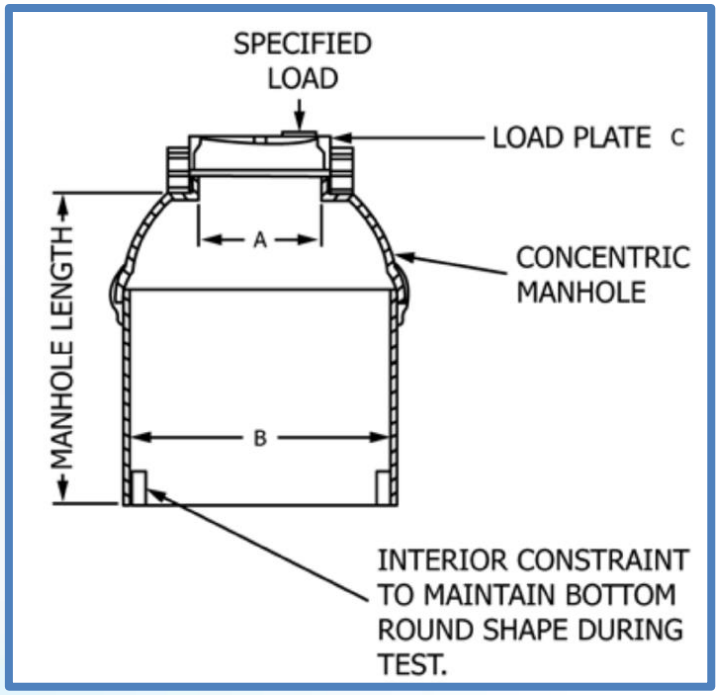
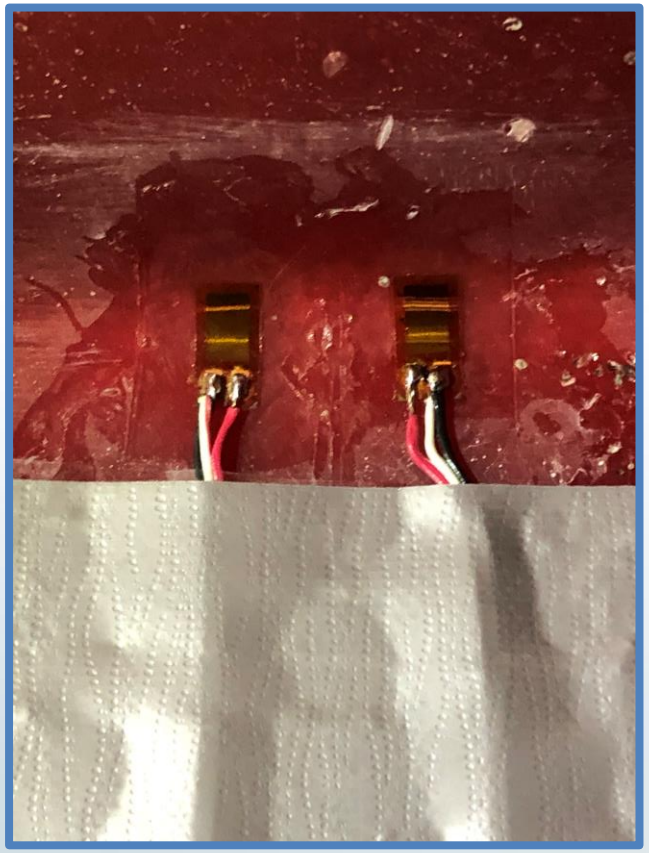


Data Acquisition Equipment

- Load Sensors
- Displacement Gauges
- Strain Gauges

Strain Gauges to Verify Model



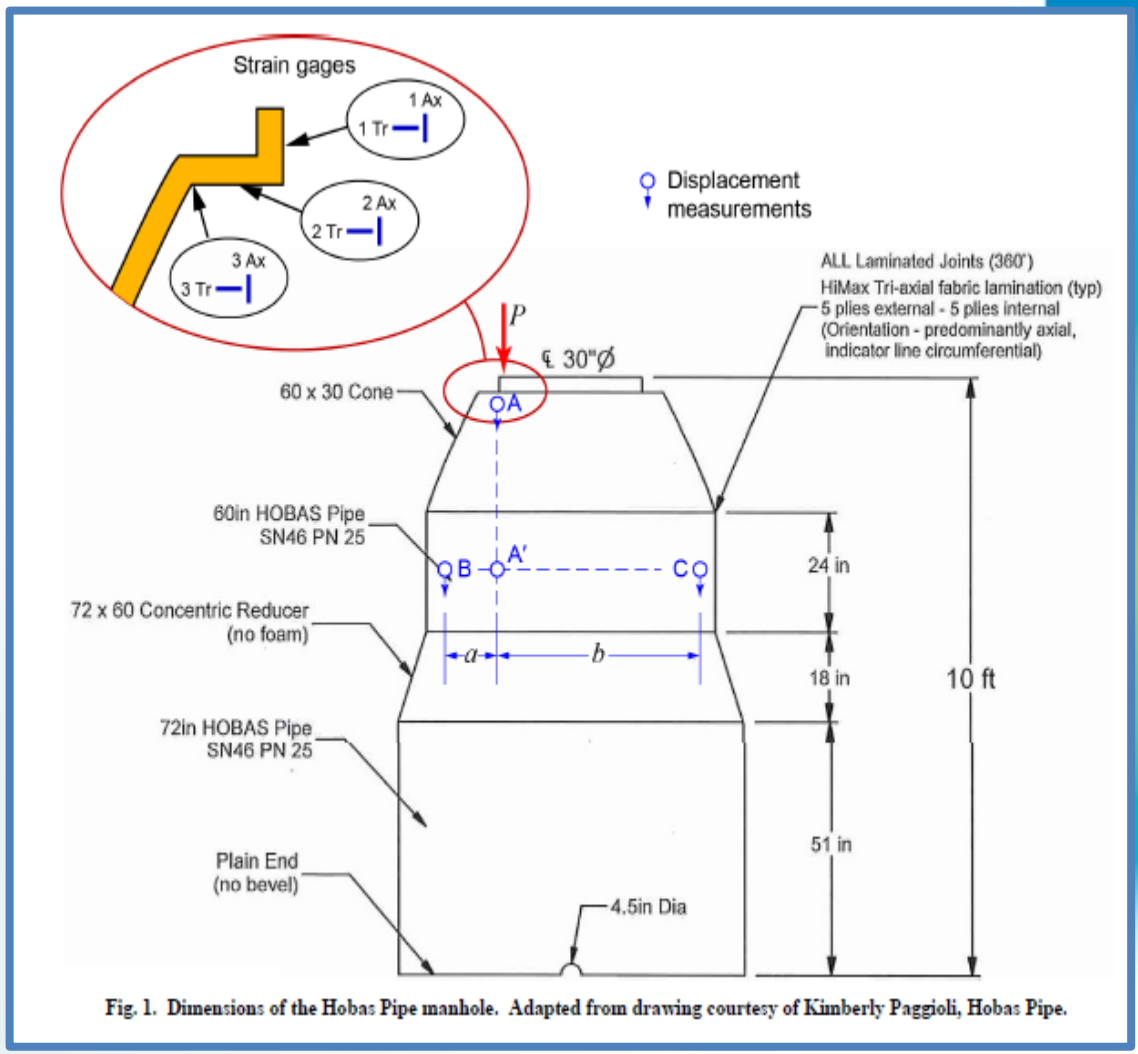


Fig. 1. Dimensions of the Hobas Pipe manhole. Adapted from drawing courtesy of Kimberly Paggioli, Hobas Pipe.

Strain Gauge Installation

Load Testing Results

- ASTM D3753 Requires
  - Minimum Length of Manhole Shall be 36-inches
  - The Complete Manhole Shall Have a Minimum Dynamic Load rating of 16,000 lb.
  - The Manhole Shall Not Leak or Crack When Tested to 40,000 lb.
  - Maximum Deflection of Manhole Under 24,000lbf is 0.25 in

- Hobas Exceeded Load Requirements
  - Total Height of Manhole was 10-feet
  - Hobas Manhole was loaded to 60,000 lbs. for 15 minutes without damage.
  - The total vertical defection of the manhole was 0.17 inches

Load Testing Results

Soundness Testing

- Vacuum
- Internal Pressure

element

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TEST CERTIFICATE — EAR-CONTROLLED DATA

Date: 03/12/2021
P.O. No.: 31901
W/O No.: **136424-2**
Leak Testing

Vacuum Test

Conducted Feb. 3, 2021. Both ends were sealed with pressure retaining assemblies supplied by Plug-It Products. The assembly inserted into the 48" diameter end has a bladder around the circumference; the bladder was inflated and pressurized to 57 psi to hold the assembly in place and create an internal seal. A vacuum pump was attached to the 24" diameter end assembly and created an internal vacuum pressure of -0.34 bar, equal to 4.9 psi (-10 Hg). This vacuum pressure was maintained for the allotted 1 minute test period.

element

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TEST CERTIFICATE — E

Date:
P.O. No.:
W/O No.:
Leak Testing

Internal Air Pressure Test

Conducted March 3, 2021. Both ends were sealed with pressure retaining assemblies supplied by Plug-It Products. The assemblies are equipped with circumferential bladders that are pressurized to hold the assemblies in place and allow the pipe to internally retain the applied test pressure. A pressure of 3 psi was maintained for the allotted 1 minute test period.

Manhole

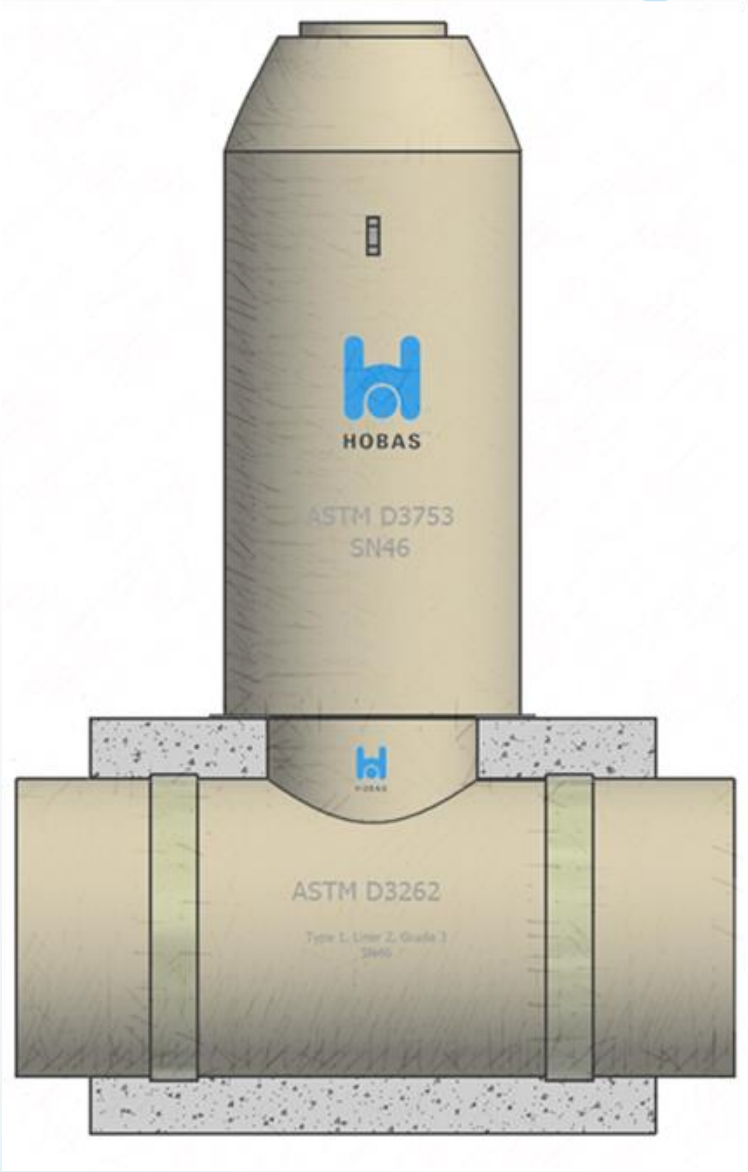
Sealed 48" diameter end

HP Trunk Sewer Rehab – Boise, ID
Whitaker Construction

- Manhole system Riser w/ cone
  - Delivered on May 28th to Boise, Idaho for Whitaker Const.
- Project Scope:
  - 3ea. Tee base risers with 48” riser pipe + cones
    - Originally designed to use Hobas riser / concrete flat top
    - Riser depths vary from 13’-18’
  - 2558 LF of 36” FR pipe to rehab existing 42” RCP.

The Complete Turnkey MH

- Features & Benefits
  - Structural
    - Exceeds ASTM D3753 by 50%
    - AASHTO HS20/HS25 rated.
  - Watertight
    - Cone laminated to pipe
    - Embedded FWC Coupling
    - 25 psi internal, 100 psi external
  - Lightweight system
  - Maintenance free service
  - Corrosion resistant



Presenters

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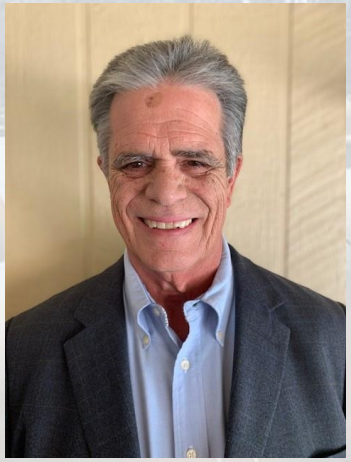

Terry Anderson
Product Manager