

# MANHOLE CASTING REFERENCE GUIDE





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1320 City Center Dr., Suite 200, Carmel, IN 46032  
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## Materials

### QUICK REFERENCE

All the iron provided in a product should have a minimum recycled material content of 85%. All manufacturers should provide material certifications on product that includes country of origin and material quality and if requested, shall provide load test data on the casting.

### Gray Iron

Iron conforming to ASTM A48, Class 35B, as noted in section 7.1.1 and 7.1.3 of AASHTO M306. Class 35B exhibits the best corrosion and wear resistance properties as well as the desirable quality of high compressive strength. Therefore it makes a good load bearing street hardware. 35,000 psi minimum tensile strength iron is furnished.

### Ductile Iron

Iron conforming to ASTM A536. Ideal material for construction castings when standard gray iron castings do not have the load bearing capabilities. Ductile Iron has greater strength characteristics than structural carbon steel without the corrosion characteristics of steel. It is usually used in areas subjected to loads greater than H20 loadings. Also because it has excellent compressive strength it is often recommended as a cost effective approach to mate ductile iron lids or grates with gray iron frames.

### Steel Grates

Material shall be hot rolled steel conforming to ASTM A36. Galvanizing is recommended for all steel frame, grates & covers, conforming to ASTM 123. Steel grates can be compatible with cast iron frames.

# Load Bearing

## QUICK REFERENCE

### Light Duty

These castings are suitable for a wide range of non-traffic locations. Castings labeled light duty are recommended for sidewalks, terraces, landscape applications, and very light duty vehicular traffic, such as golf carts or lawn mowers.

### Heavy Duty AASHTO M306 Highway Loading

According to AASHTO M306 castings must meet a minimum of 40,000 lbs proof load on a 9" x 9" load test area. After the test, the cover grating or frame is inspected for cracks or deformation. This specification allows for a safety factor of

2.5 over 16,000 lbs requirement of H20 and HS20. This load designation is appropriate for general traffic applications.

### Extra Heavy Duty (Airport and Port Authority)

Castings listed in this category can accommodate wheel loads of 100 psi or greater. They are considered for airports and any place where concentrated loads might be applied. These castings can also accept proof loads from 100,000 to 200,000 lbs, which meets the design loading associated with the FAA wheel loading.

# Key Dimensions of Round Frame and Cover

## QUICK REFERENCE

### Clear Opening

Clear opening is the diameter of the smallest opening located near the top of the frame. It is also known as the "C" dimension.

### Cover Diameter

The cover diameter is the diameter of the lid. It is also known as the "A" dimension.

### Cover Thickness

Cover thickness is the thickness of the lid at the perimeter. It is also known as the "B" dimension.

### Frame Height

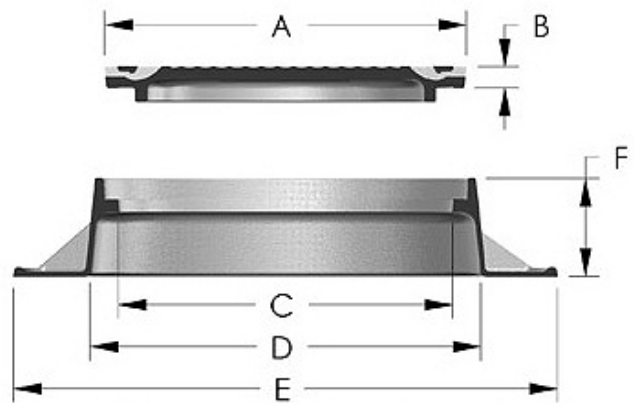
The frame height is the height of the frame. It is also known as the "F" dimension.

### Base Flange Opening

Base flange opening is the opening at the bottom of the frame. It is also known as the "D" dimension.

### Frame flange diameter

Frame flange diameter is the diameter of the whole frame or the length from the outermost part of the flange directly across to the other outermost side. It is also known as the "E" dimension.



# Key Dimensions of Inlet Frame and Grate

## QUICK REFERENCE

### Clear Opening

Clear opening is the length of the opening located near the top of the frame. It is also known as the “C” dimension.

### Grate Diameter

The grate diameter is the diameter of the lid. It is also known as the “A” dimension.

### Grate Opening

The width of the opening between bars in the grate. It is also known as the “G” dimension.

### Grate Thickness

Grate thickness is the depth of the grate at the perimeter. It is also known as the “B” dimension.

### Frame Height

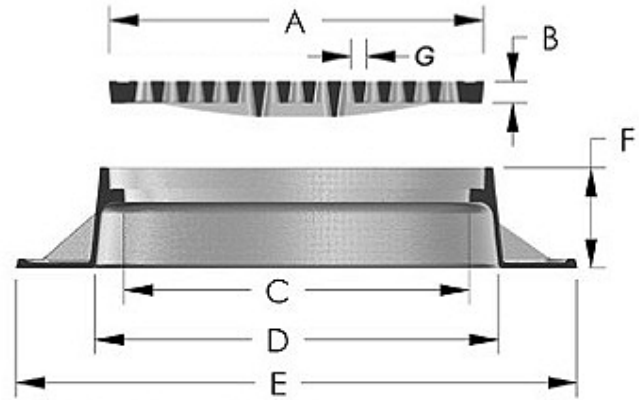
The frame height is the height of the frame. It is also known as the “F” dimension.

### Base Flange Opening

Base flange opening is the opening at the bottom of the frame. It is also known as the “D” dimension.

### Frame Flange Diameter

Frame flange diameter is the diameter of the whole frame or the length from the outermost part of the flange directly across to the other outermost side. It is also known as the “E” dimension.

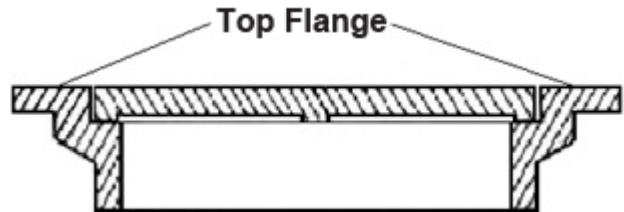
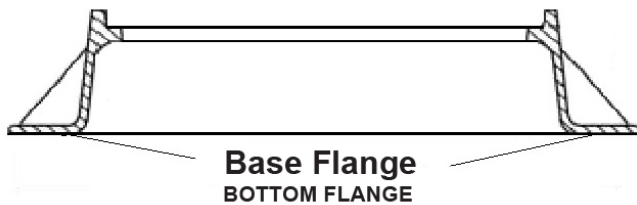


# Frame Designs

## QUICK REFERENCE

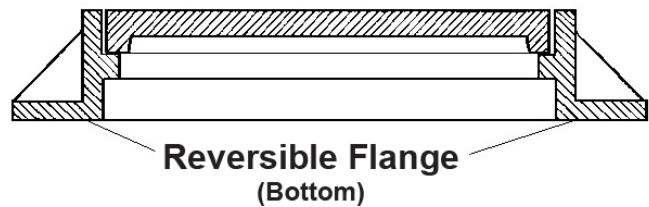
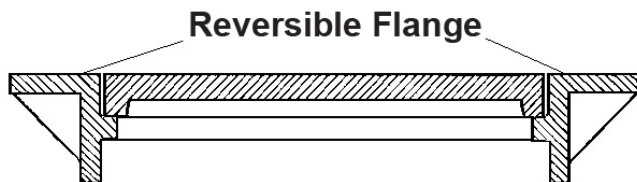
### Bottom & Top Flange

A bottom flange is a flange that is located at the base of the frame. A top flange is a flange that is located at the top of the frame, and is typically installed in a concrete slab application.



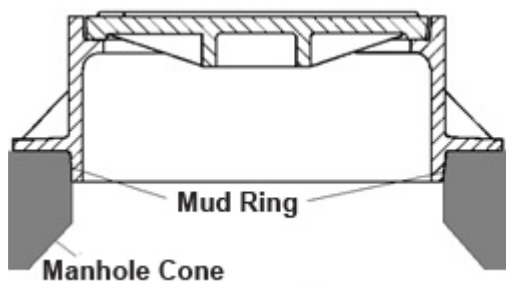
### Reversible Flange

A reversible flange can be either on the top or bottom of the frame depending on how the lid is placed on the frame. Top flange is also known as the slab type and the bottom flange is also known as the built up type.



### Mud Ring

A mud ring is cast into the frame on the bottom below the flange so the frame centers properly on the manhole cone.



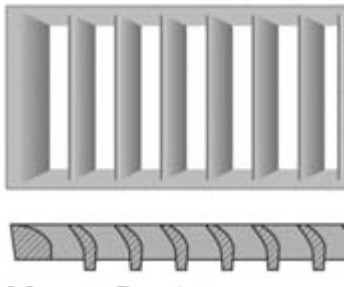
Manhole Frame with Mud Ring

# Grate Designs

## QUICK REFERENCE

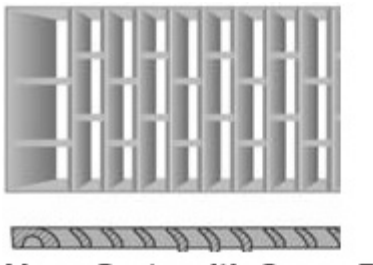
### Vane Grate

The vane grates allows better hydraulic efficiency.



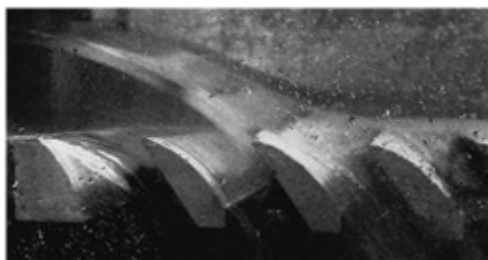
### Vane Grate with Cross Bars

Vane grates, which have better hydraulic efficiency, are angled toward the flow of water. The vane grate offers longitude bars that are friendlier toward bicycles.



## Hydraulic Efficiency

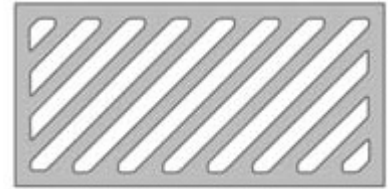
The hydraulic efficiency of a grate is its rated ability to intercept storm water. Hydraulic tests prove that the Vane style grate, properly installed, will accept as much as 20% more water than any of the conventional grate styles.



**Cross section of vane-style grate in testing flume showing hydraulic performance at 2 cfs.**

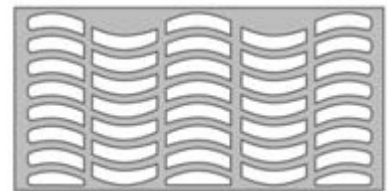
### Diagonal Grate

The designer must be aware of the ADA requirements before using this grate.



### Sinusoidal

Sinusoidal grates have a "S" type appearance.



### Beehive

Beehive grates are used where clogging of a flat grate is prevalent and unacceptable. This grate is not recommended in traffic areas or pedestrian areas.



## Americans with Disabilities Act Grate

ADA style grates are available in various shapes and sizes. These grates are designed for pedestrian applications. Grates placed on pedestrian walkways must follow certain laws required by the Americans with Disabilities Act which set guidelines that manufacturers follow. These guidelines specified that grating must be conscience of narrow-tired bicycles and wheelchairs and practice proper caution for pedestrian safety on walkways. Grating placed in these areas must have spaces or holes no greater than ½ inch in one direction. If they are placed in the direction of travel then they must be placed so that the long dimension is perpendicular to the travel. The act dictates that designers carefully consider the safety of the type of grating selected for various applications.

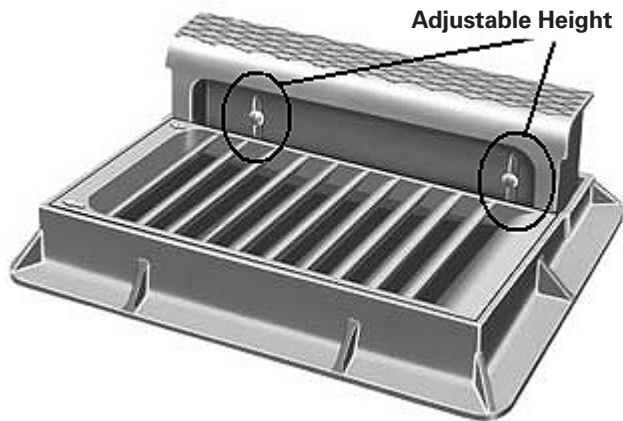


# Curb Inlets or Combination Inlets

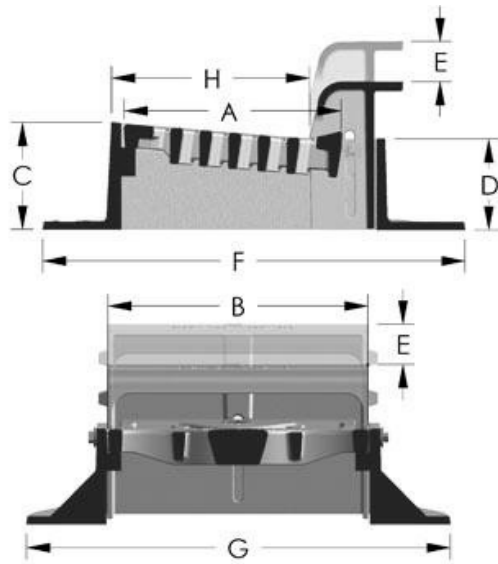
## QUICK REFERENCE

### Adjustable Height

Curb boxes can be adjusted to the right curb height. The picture above shows how the adjustment is accomplished.



Curb or combination inlet with adjustable height

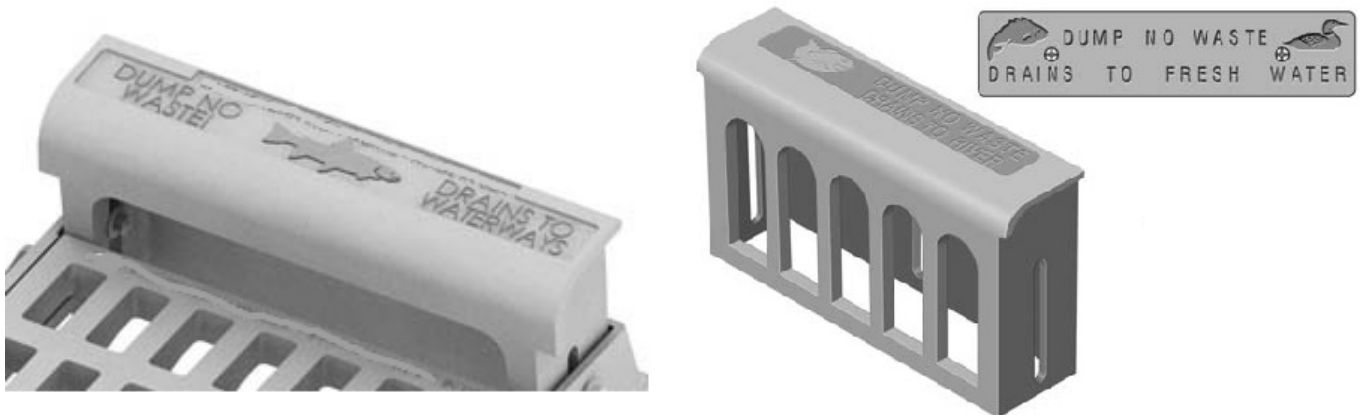


### Curb Inlet, Back, Frame and Grate

- A = Grate Width
- B = Grate Length
- C = Frame Height (Front)
- D = Frame Height (Back)
- E = Hood Adjustment
- F = Flange Frame Width or Diameter
- G = Flange Frame Length or Diameter
- H = Curb Width

### Environmental Messaging

Inlets can be furnished with environmental notices, such as the one below, which address specific drainage situations and NPDES messaging requirements.





# Watertight Frames and Covers

## QUICK REFERENCE

### Watertight Assembly

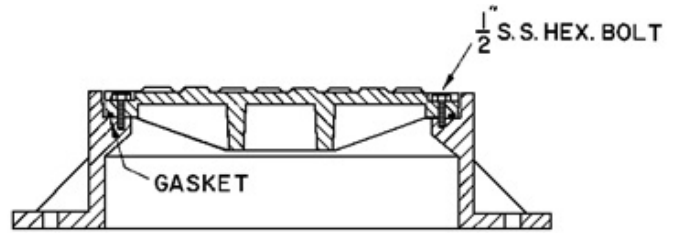
Watertight castings are gasket sealed with a bolted cover. These manholes are suitable for low pressure, gas or steam tight applications.

### Pressure Tight Bolting

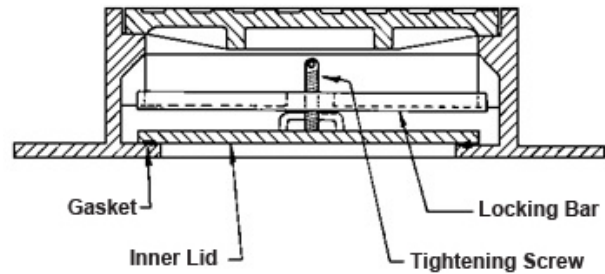
Pressure tight bolting, very similar to watertight bolting, are suitable for low pressure applications up to 20 p.s.i.

### Frost Proof

If a manhole is frost proof it has an extra inner cover, such as the one below. The typical inner cover has a neoprene gasket around the edge and a locking bar with tightening screw. When the locking bar is tightened the gasket creates an extremely tight seal to the sides of the frame which does not allow frost, debris, and other containments inside.



Water-resistant manhole frame and bolted lid

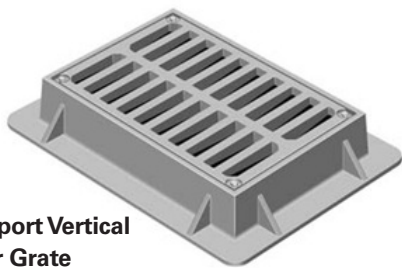


Frost-proof frame, solid lid and inner lid

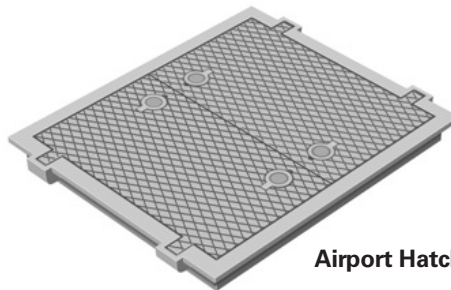
# Airport Castings

## QUICK REFERENCE

Airport castings are for heavier, dual-gear aircraft. Airport series products are capable of withstanding a minimum load of 100,000 pounds and in many applications, more than 200,000 pound proof load. All of the grates and covers are bolted to the frame as called for by the FAA Advisory Circular AC150/5370-10A. All airport castings must pass a load test required by the AASHTO M306.



Airport Vertical Bar Grate



Airport Hatch



Airport Manhole Frame and Grate



Bolted Trench Drain Assembly



# Manhole Features

## QUICK REFERENCE

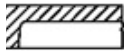
### Flange Anchor Bolt Holes

Allows the frame to be secured to the concrete cone.

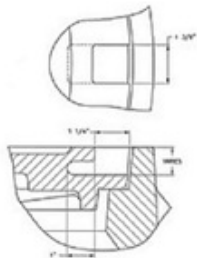


### Pick Hole Options (Open, Closed, etc.)

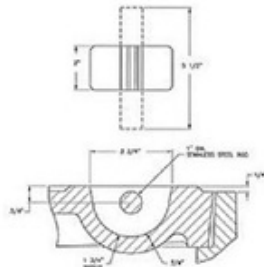
An open pick hole is a pick hole completely open to the interior of the manhole. A closed pick hole is accessible to workers opening the lid but also continues towards the center and hides within the lid making the manhole concealed to the outside. Closed pick holes are water resistant.



**Open Pick Hole**



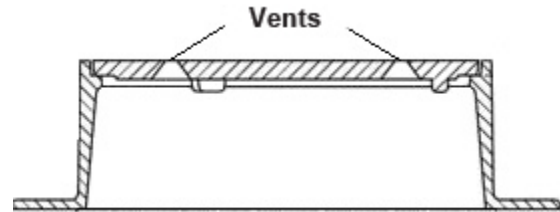
**Closed Pick Hole**



**Closed Pick Bar**

### Vented

Vented covers are covers that have strategically placed holes in the top of them that allow venting of the manhole structure.



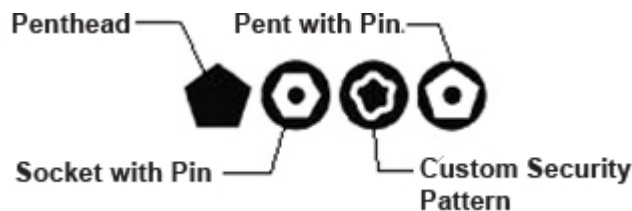
### Custom Logo and Special Lettering

Most foundries have the capabilities to make a custom logo that can be placed on top of the cover. Along with the logo, special custom lettering is an option. Minimum quantities may be required.



### Security Bolting

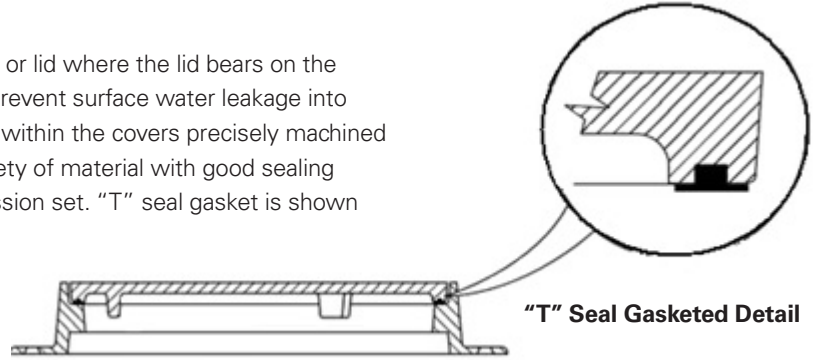
Security Bolting is an option that is available on most covers & some grates. Some of the most common bolting schemes include stainless steel hex head bolts and flat head slotted screws. The following security bolted options are available as well as cam devices which eliminate bolts.



**Cam Lock Device**

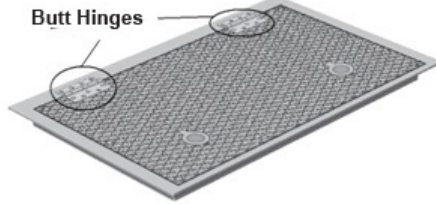
## Gasketed Lids

A Gasket that is placed on the bottom of a cover or lid where the lid bears on the frame helps create a seal. This gasket can help prevent surface water leakage into the manhole. The gasket fits firmly and securely within the covers precisely machined groove. The gasket material can consist of a variety of material with good sealing qualities, abrasion resistance and a low compression set. "T" seal gasket is shown below. Other options are available.

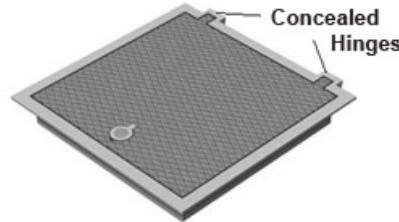


## Hinged Products

Some covers or grates can be hinged for easier lifting. Common types of hinges are concealed hinges, which are flush with the lid surface, and butt hinges, which are raised above the lid surface. Hinged assemblies are available on square, rectangular and round units.



Butt-hinged Frame and Lid



Concealed Frame and Lid



Hinged Manhole Assembly



Hinged Manhole Cover

## Lift Assist Hinged Covers

A hinged cover with a lift assist can be operated by an individual, eliminating the need for an additional lifting devise.

