Fractionation Trays

Innovation | Reliability | Dynamism

SINCE 1890 125 YEARS

www.baretti.it

65 YEARS OF TRAYS EXPERIENCE

BARETTI:
An established name in the fractionation column business.
Our trays have been installed in every type of columns and applications.

Tray Types

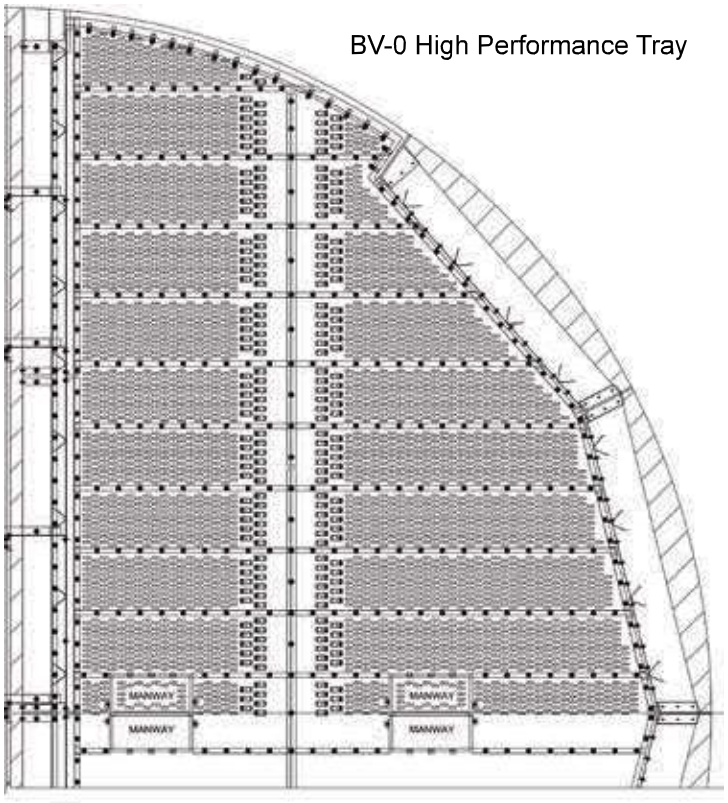
- Valve Trays
  - Rectangular Floating Valves
  - Round Floating Valves
  - Fixed Valves
- Sieve Trays
- Bubble Cap Trays
- Baffle Trays
- Cartridge Trays
- Liquid/Liquid Extraction Trays
- High Performance Trays - HPT
- Special Features
  - Lip Joint Connection
  - Quick Opening Manway
- Anti- clogging Technologies
- Hardware
  - Clamps
  - Bolting
  - Valves

Applications

- Atmospheric Crude Towers
- Fuel Vacuum Towers
- Lube Vacuum Towers
- FCC Main Fractionators
- Coker Fractionators
- Stabilizers
- Amine Absorption Towers
- Regenerators
- Light-ends Distillation Towers
- Super Fractionators
- Quench Towers

THE NEW FRONTIERES FOR TRAYS

High Performance Trays



FEATURES

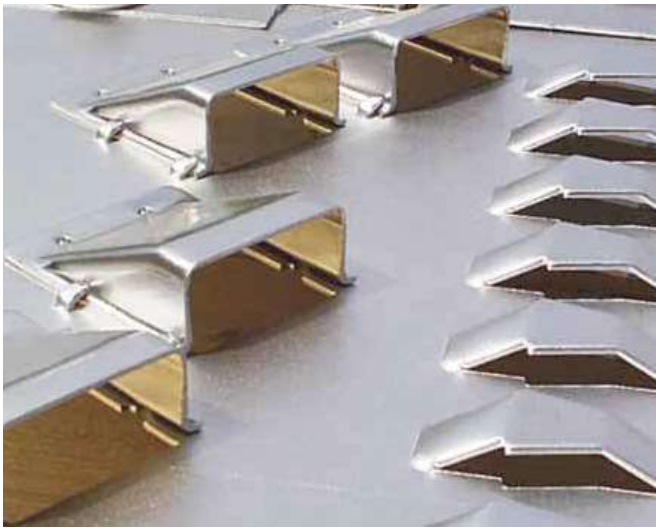
- Maximised active area
- Swept-back Downcomers
- Sloped Downcomers
- Micro Valves
- Bubble Promotors
- Push Valves
- Clear Liquid Separators

RESULTS

- Increased Efficiency
- Increased Capacity

ADVANTAGES

- More trays in the same space
- Lower reflux ratio
- Lower pressure drop



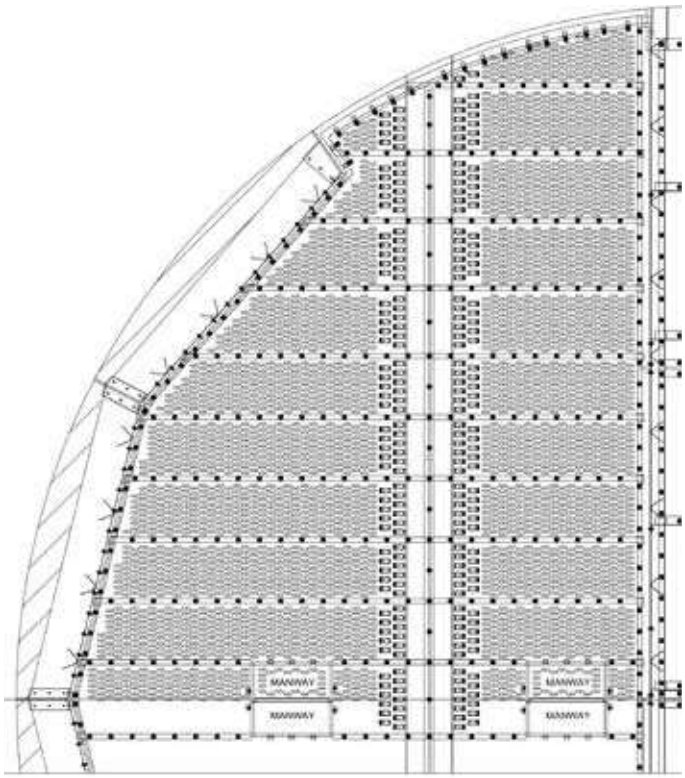
BUBBLE PROMOTORS

Bubble promotors installed at downcomer outlet enhance tray activity across the trays and reduce pressure drops.

PUSH VALVES

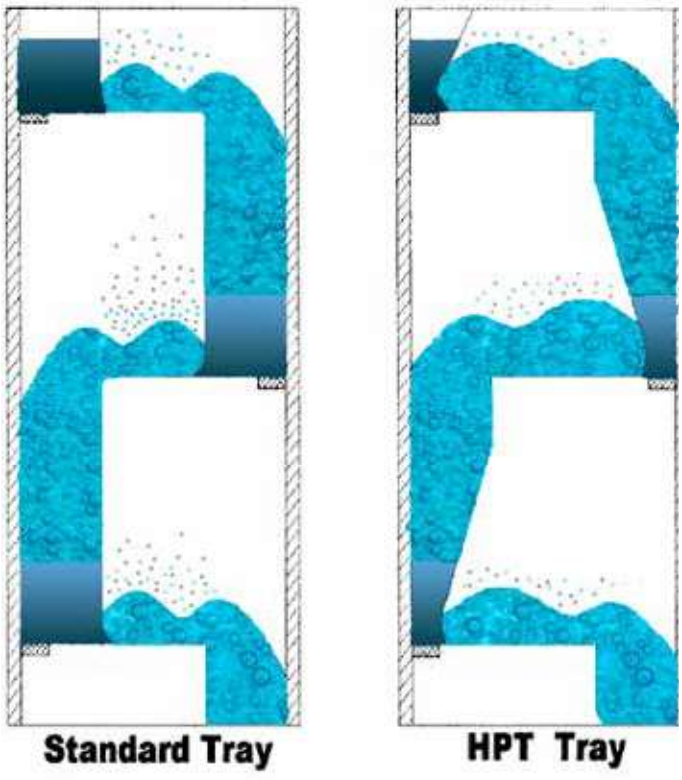
Placing push valves around the tray periphery prevents liquid stagnation zones.

THE NEW FRONTIERES FOR TRAYS



SWEPT-BACK outlet weirs offers the following advantages:

- Reduction of side dead areas with relevant improvement in overall tray activity
- Longer outlet weirs provide pressure drop reduction and more uniform liquid flow across the trays
- Longer outlet clearances reduce the under downcomer velocities and back-up
- Equal side and center weir length



BARETTI HIGH PERFORMANCE TRAYS are designed including all the following features:

- The tray's active area is uniformly active.
- There are non dead zones created by too short weir length.
- The active area and the downcomer area are well balanced to maximize the use of column area
- The downcome bottom outlet area is reduced only to a peripheral zone of the tray and no active area is blocked by the seal area of the tray above
- Clear liquid bypass helps to reduce downcome size in services with high liquid loading.

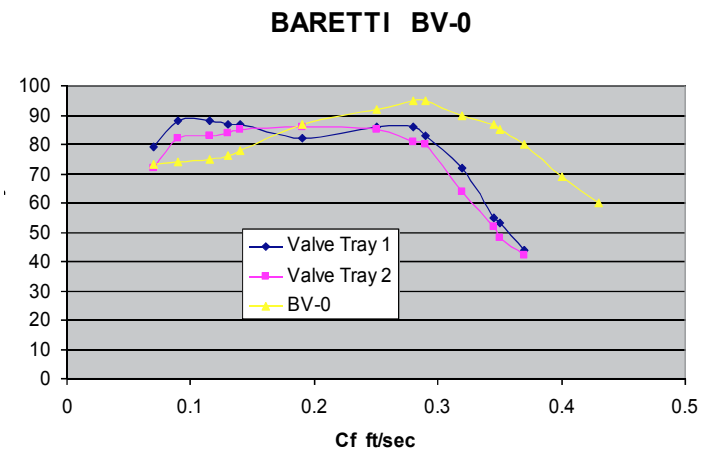
THE NEW FRONTIERES FOR TRAY

High Performance Baretti Micro Valve BV-0

Our BV-0 tests have demonstrated its superiority over traditional valves in four areas:

- Greater capacity by an average of 10% as compared to any other type of floating and fix valves
- Lower pressure drop.
- Lower leakage. Infact BV-0 valve has tapered shape with legs of different width. The larger one is facing the liquid flow so to deflect the liquid, preventing the liquid to flow into the valve aperture
- High mechanical strength mainly based on two large legs

ADVANTAGES: Directional, low leakage, higher capacity, lower entrainment, suitable for fouling services



Other additional points to consider are:

- BV-0 extra capacity can be used to reduce the tray spacing in existing tray columns and allowing to increase the actual number of installed trays
- BV-0 units are available only as fix valves, since a floating unit of this size would be so light to get blocked in a random position.

CONVENTIONAL VALVES TRAYS

Baretti can design trays with proprietary and conventional valves for any type of service

BARETTI FLOATING VALVES

Baretti BDH
Standard Valves

Baretti BV-1
Round valves

Baretti BV-2
Round low pressure drop

Baretti BA-2
Caged

BARETTI V-GRID FIX VALVES

Baretti SVG
Fouling Services

Baretti ACVG
Anti-clogging Valves

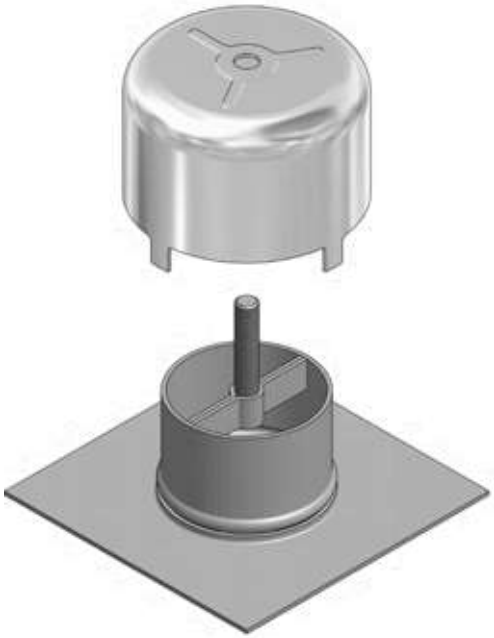
Baretti BV-0
High Capacity

CONVENTIONAL BUBBLE CAPS & SIEVE TRAYS

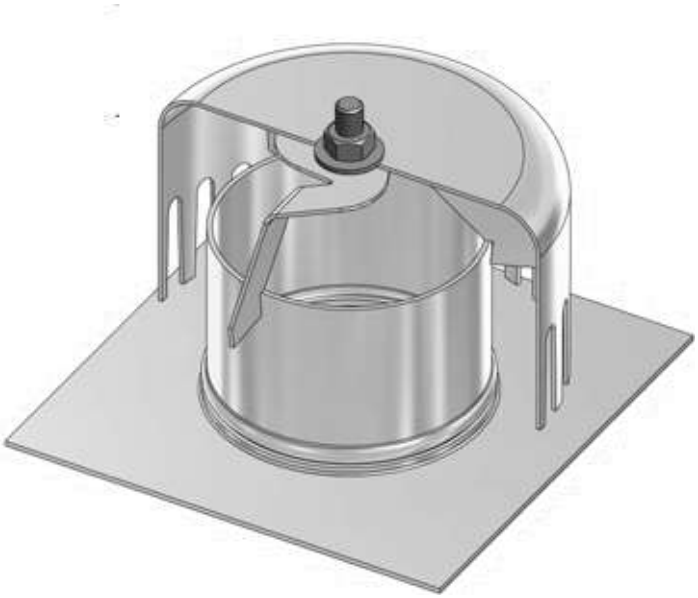
Bubble Caps Trays

Bubble Caps are one of the oldest contacting devices used in distillation columns. For very low liquid rates services and special applications, Bubble caps are still used today.
There are basically two types:

Unslottered type Bubble Caps



Slotted type Bubble Caps



Sieve Trays

ASSOCIATED INTERNALS

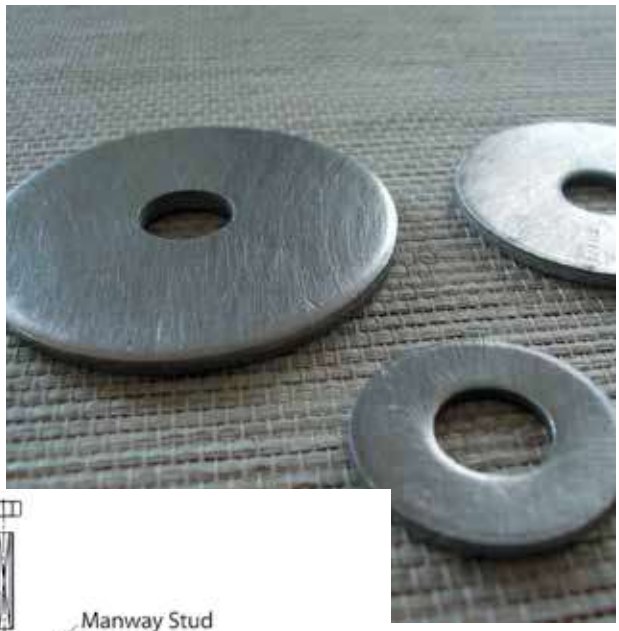
A number of complementary Internals are designed and manufactured by Baretti in order to provide a complete set of internals

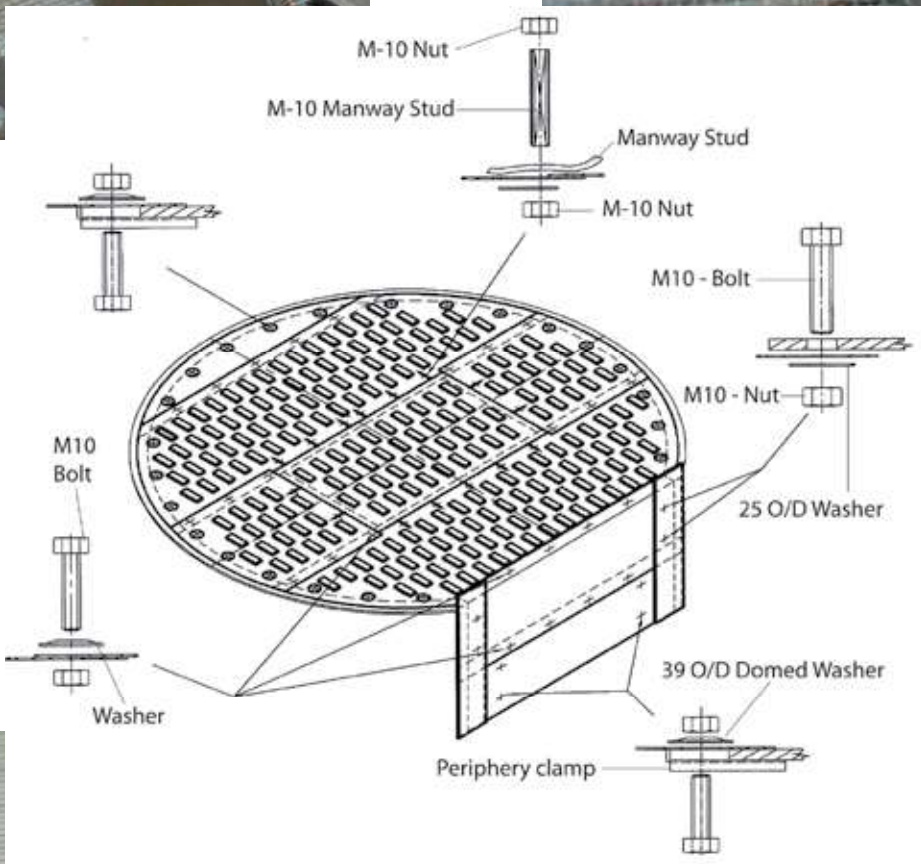
The most common are:

- Transition Trays
- Collector Tray
- Draw-Off Pans
- Feed Pipes
- Flashing Feed Devices
- Reinforced Trays
- Surge Relief Manways
- Quick Opening Manways
- Blanking Plates
- Liquid/Liquid Extraction Trays
- Cartridge Trays

Liquid Distributors Test Ring

INSTALLATION HARDWARE





BARETTI TRAY DESIGN FEATURES

Baretti trays are designed for maximum operability and reduced operating costs (OPEX). Special features are incorporated for an easy and quick installation reducing maintenance costs. Baretti standard design includes Quick Opening Manway and Lip Joints Connections**.** Cartridge trays with feautures for quick and smooth installation are designed for columns diameters below 900 mm.

Quick Opening Manway

Lip Joint Connection

Cartridge Trays

INLET VANE DISTRIBUTOR

Vacuum Tower - Feed Inlet Vane Distributor
Column diameter 16.000 mm - Nozzles diameter 3.600 mm

BARETTI ADVANTAGES

Design, Engineering and Manufacturing

Baretti is committed to providing our customers with the latest technical services.

Baretti design procedures, based on the performance of thousands of successful installations, are the heart of our design philosophy.

Baretti computerized hydraulic and drafting procedures are mantained at the highest standards in order to keep improving our services quality

Baretti's technical office and fabrication facilities are located in northen Italy, close to the heart of Europe.

We can deliver vital materials and spare parts in matter of hours to most of our clients.

We are close to the major ports of Europe allowing us to easily deliver materials that allow us to serve our client's emergency parts and harware of any kind.

Our technical team is available 24 hours a day to assist our clients

BARETTI ADVANTAGES

A Complete Services

Baretti in addition to supplying trays and internals, provides a full range of services including:

- Process simulation design and optimization
- Mechanical design
- Installation supervision
- Column inspection
- Turn-around assistance
- Spare parts
- Turn-key Jobs

Baretti provides mechanical and functional inspection to analyze your systems for:

- Erosion
- Corrosion
- Polymerization
- Cocking
- Pressure Profile
- Temperature Profile

BARETTI ADVANTAGES

Tray Design Software

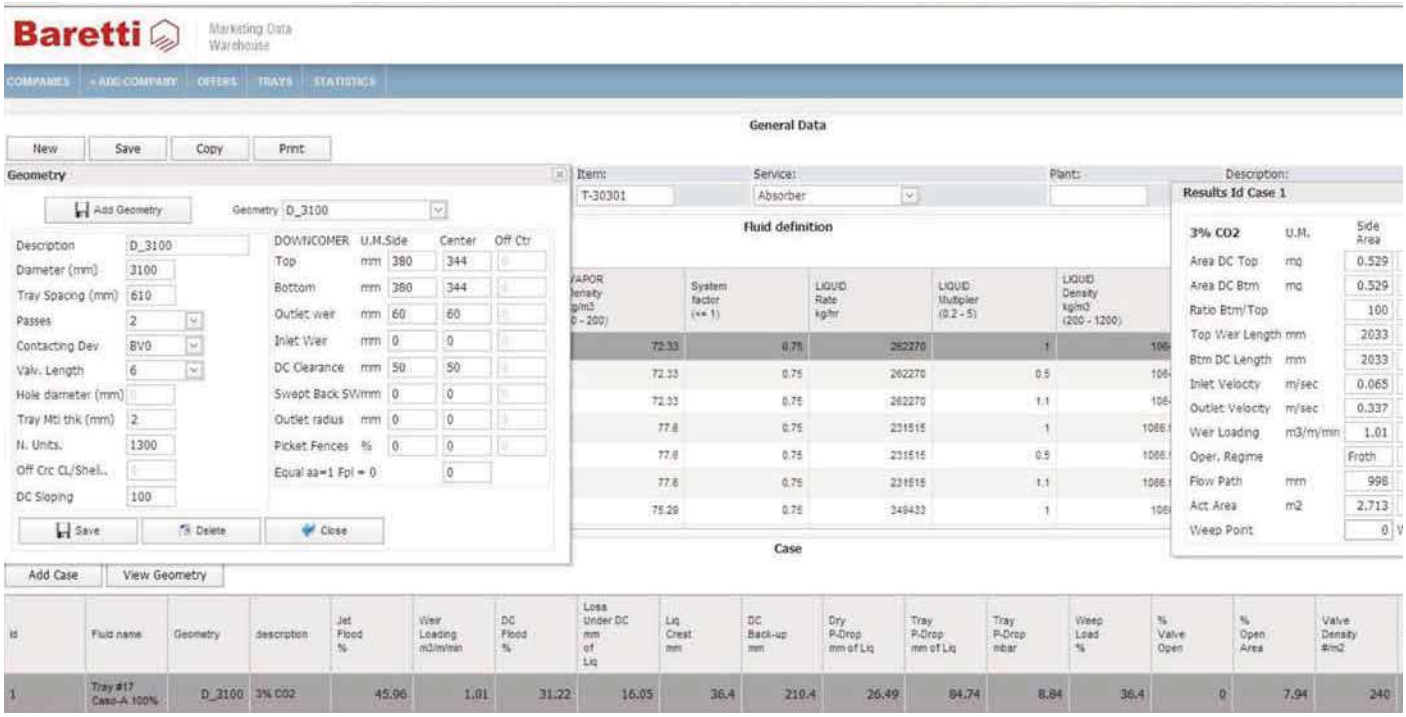
Baretti has developed a new version of its Software working on the web.
This software is at disposal of all our clients and it is accessibile at our server.

In order to have the possibility to use it, the following few imputs need to be given

- Contact our sales secretary at baretti@baretti.it
- Ask for a personal USERNAME and PASSWORD

You'll be furnisched via e-mail with these data and an instruction file will guide you through the peculiarities of this software.

Our sales office will be always at your disposal to help you in special or complex cases.



LIQUID DISTRIBUTOR

- **Resistance to fouling**

  This is a very important characteristic because the blockage of some holes due to presence of scales, polymers or coking of the distributor can badly affect its performance. In particular the following points should be considered:

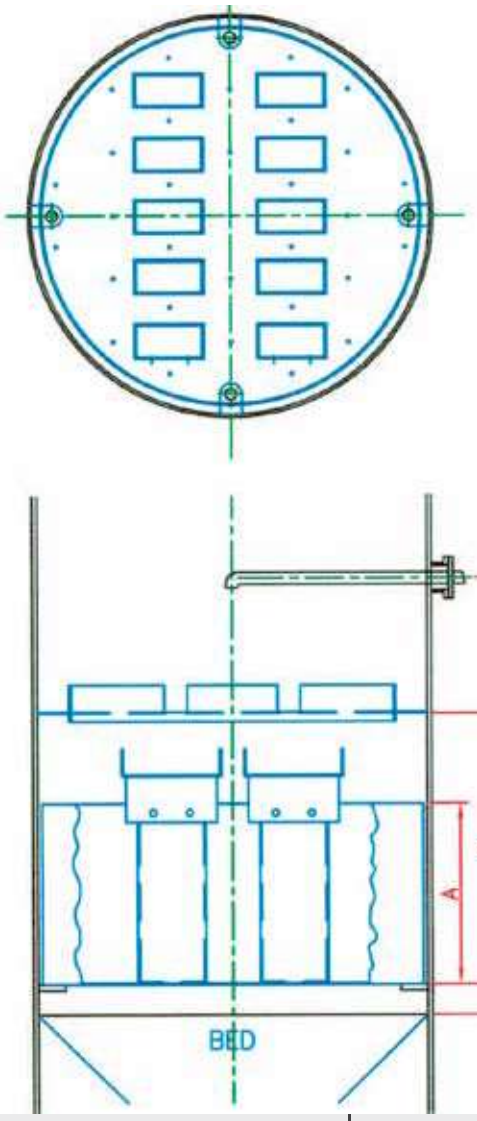
  - **Trough type distributors**. These should be used for any fractionation bed where a low or medium specific liquid load is used. Under these conditions holes tend to be small and the possibility of plugging becomes important. For this reason holes must be punched at sides of the trough and should not be smaller than 5mm. The hole is positioned at minimum 50mm from the bottom of the trough.

  - **Pan type distributors**. These can be used only for high liquid rate services (typically) Absorbers or heat transfer beds). In these cases the holes are large (10-20 mm) and can be located on the distributor deck without major problem of plugging.

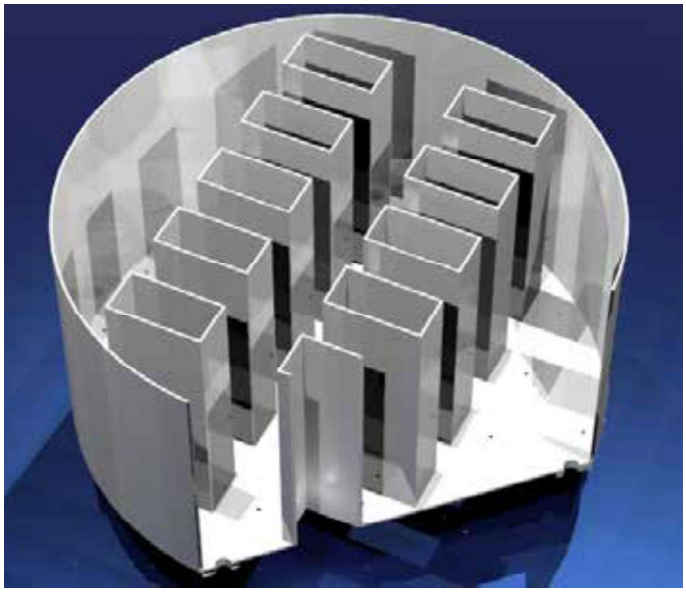
- **Turndown**

  Turndown is normally limited to 50-110%, but higher ones (1:10) can be achieved by use of multiple levels of holes. Pan, V notched or spray distributors cannot have a very high turndown due to the impossibility of having more than one level of holes.

B - 106 / B - 107 DISTRIBUTORS



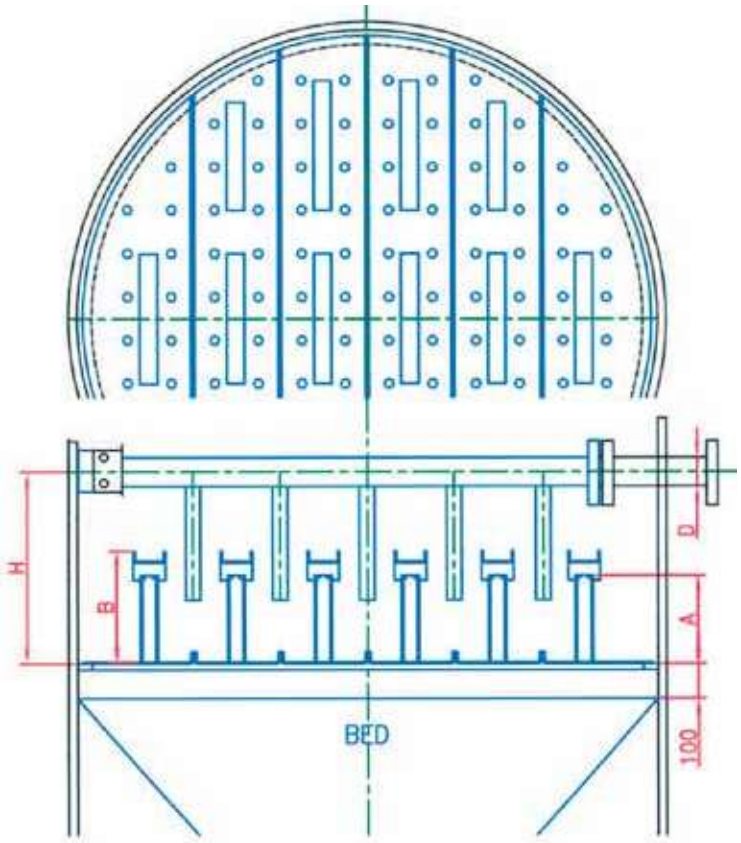
Diameter	300 - 800 mm
Liquid range	>5m³/h/m²
Resistance to fouling	Low
Standard turndown	2 : 1



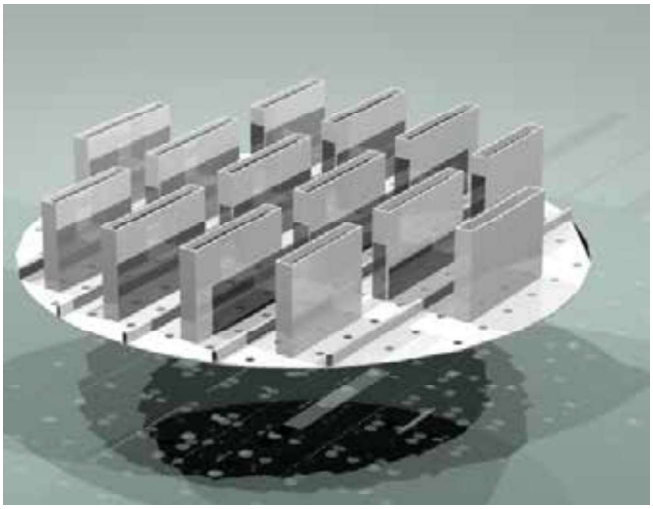
A Standard	300 mm
B	A + 150 mm
H for feed at Top H for Intermediate Feed	A + 150 mm B + 150 mm

Type	Pan type liquid Distributor
Holes position	Square or triangular pattern punched in the pan floor
Drip points	60 - 100/ m²
Support at Shell	Nr 3 - 4 clips welded to shell or, in case of structured packing, supported on the bed
Construction Type	One piece
Levelling method	By washer at clip position
Liquid	Need of wall wiper
Redistributor	Welded at shell / Expandable / Inserted in shell flanges
Hats	Available wiyh redistributor model B- 107
Feed Device	Due to size of column, feed pipe should be extractable to allow distributor installation and dismantling

B - 116 / B - 117 DISTRIBUTORS



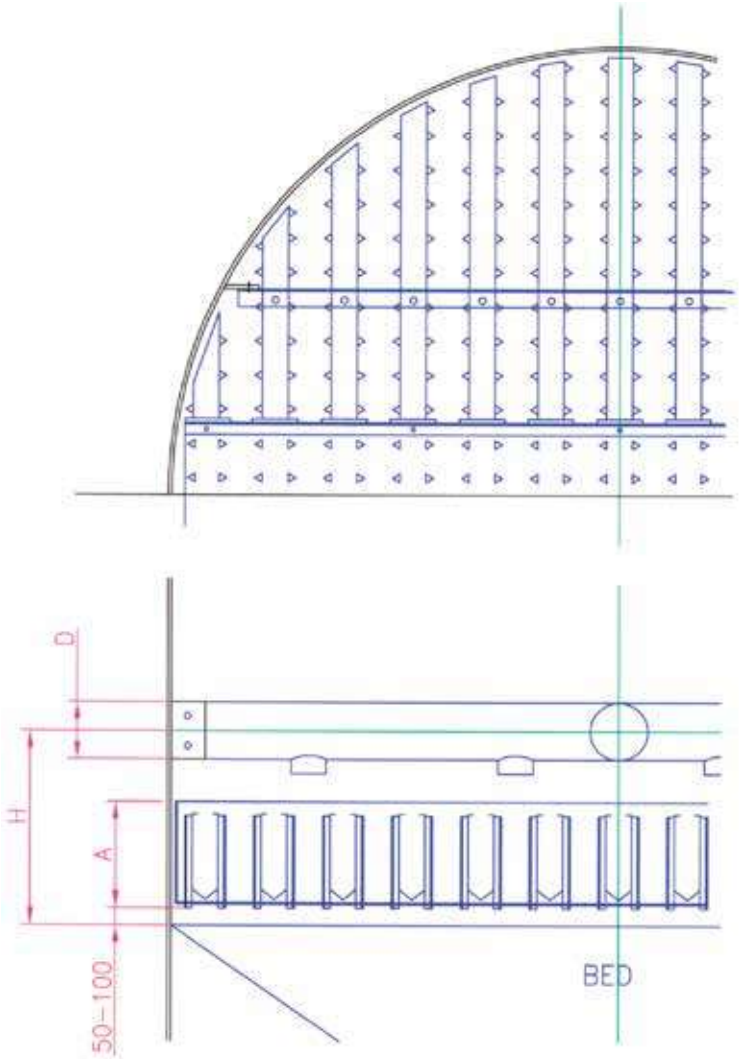
Diameter	900 mm
Liquid range	>30m³/h/m²
Resistance to fouling	Low
Standard turndown	2 : 1



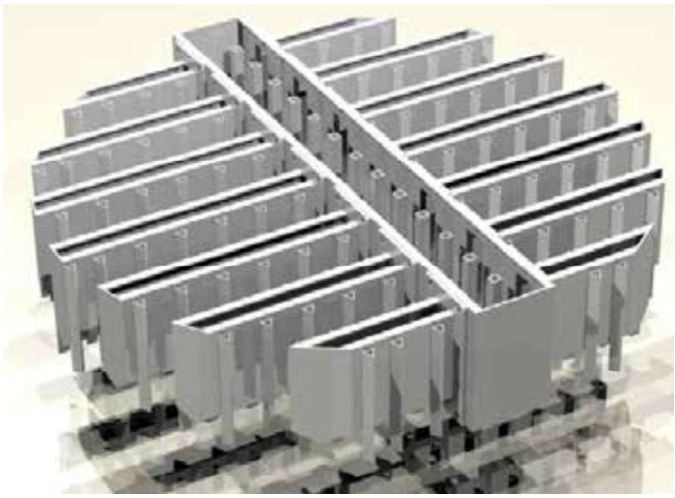
A Standard	250 mm
B	A + 150 mm
H for feed at Top H for Intermediate Feed	A + D + 150 mm B + D + 150 mm

Type	Deck type Distributor
Holes position	Square pattern punched in the distributor deck
Drip points	70 / 100 Drip points / m²
Support at Shell	Support ring and gussets welded to shell for support beams if the diameter > 2500 mm
Design Type	Multiple parts bolted each other
Levelling	Distributor level depends on ring levelness
Hats	Available with redistributor model B - 117
Feed Device	**Liquid feed** : pipe distributor type B -119 **Flashing Feed:** flashing device type B -955
Turndown	Standard is 2 : 1 Higher turndown can be achieved using higher raisers

B - 136 / B - 137 DISTRIBUTORS



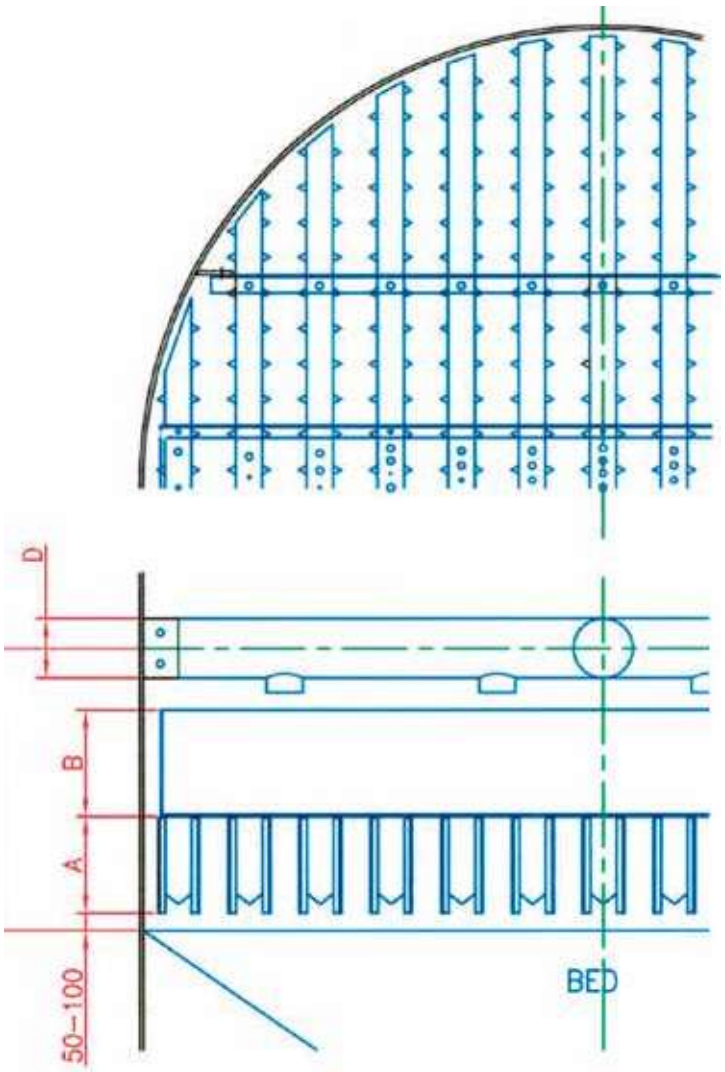
Diameter	1000 mm
Liquid range	0.8 - 30m³/h/m²
Resistance to fouling	Medium
Standard turndown	2 : 1 (10 : 1 max)



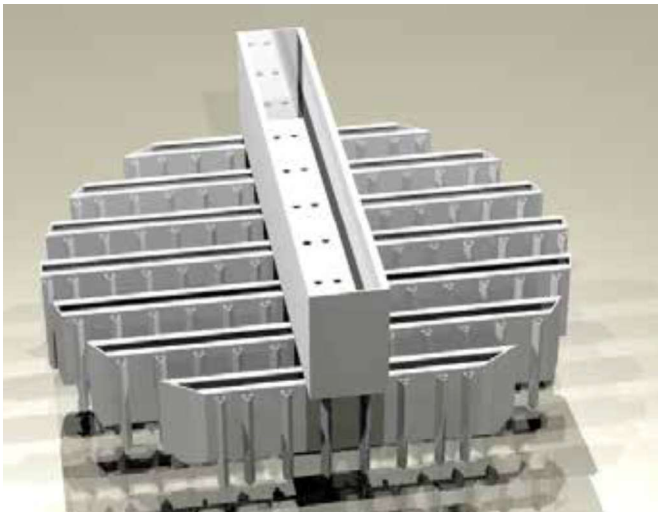
A standard	325 mm
H	>100 + A + 2xDmm

Type	Trough type liquid Distributor
Holes position	Square pattern punched in the trough's sides. Multiple series of holes can be punched to increase the turndown
Drip points	Standard design is for 100 Drip points / m²
Supports	Gussets welded to shell for support beams
Design Type	Multiple parts boltedto main through
Levelling	Distributor can be levelled by levelling support beams
Hats	Available with redistributor model B - 137
Redistributor	Need for a wall wiper: welded at shell or expandable
Feed Device	**Liquid feed** : pipe distributor type B -119 **Flashing Feed:** flashing device type B -955
Turndown	With multiple levels of holes > 4 : 1 can be reached

B - 186 / B - 186 L DISTRIBUTORS



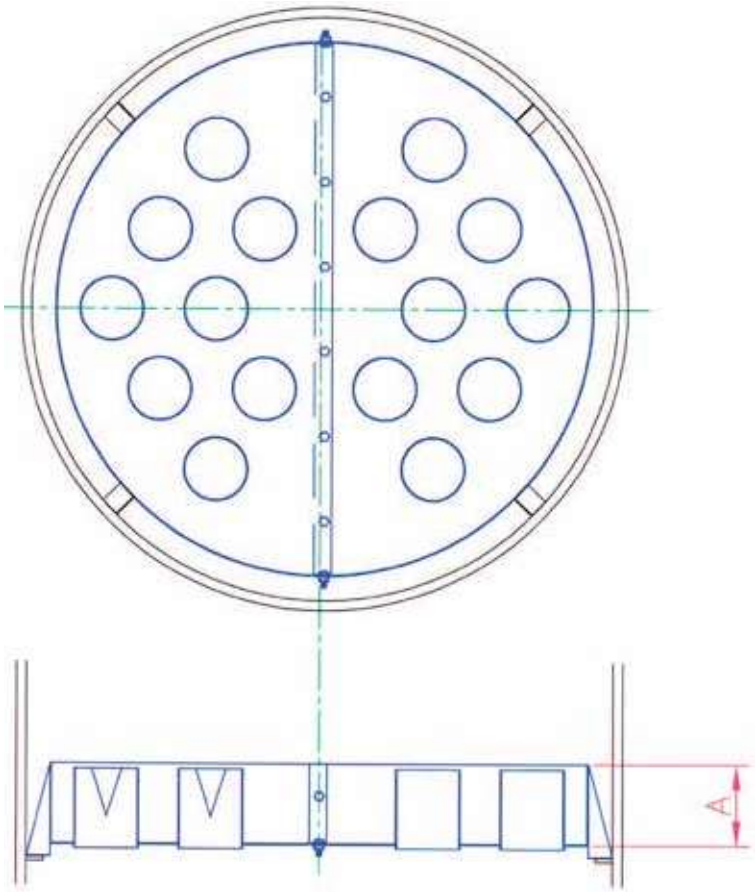
Diameter	>1000 mm
Liquid range	0.8 - 30m³/h/m²
Resistance to fouling	High
Standard turndown	2 : 1 (10 : 1 max)



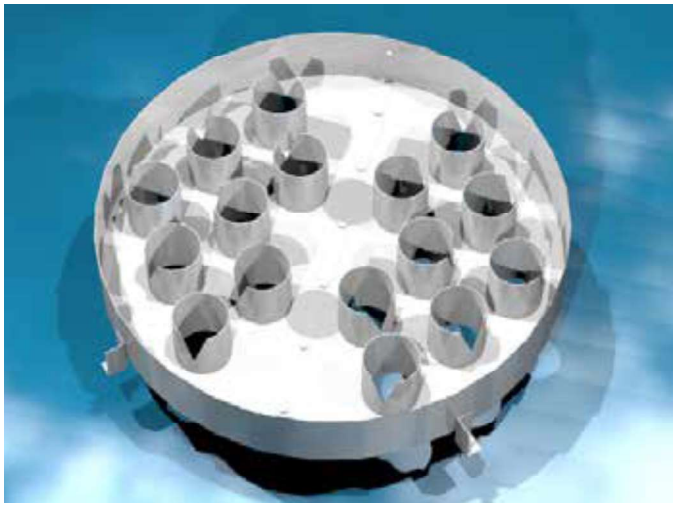
A Standard	325 mm
B Standard	300 mm
H	100 + A+ B + 2xD mm

B - 186	Trough type liquid Distributor
B - 186 L	Trough type liquid Distributor with drip point multiper (page 37)
Holes position	Square pattern punched in the trough's sides. Multiple series of holes can be punched to increase the turndown
Drip points	Standard design is for 100 Drip points / m²
Supports	clips welded to shell the support beams
Design Type	Two levels designed. the Parting Box is above the troughs and distributes the liquid to them. The distributor is supplied in parts to pass through the column manway
Levelling	Distributor can be levelled by levelling support beams
Redistributor	In case the distributor is receiving liquid from the bed above and there is an intermediate feed, a collector tray is needed (Type B-633 or B-733)
Feed Device	**Liquid feed** : pipe distributor type B -119 **Flashing feed:** Flashing device type B -955
Turndown	With multiple levels of holes > 4 : 1 can be reached

B - 798 PAN DISTRIBUTOR



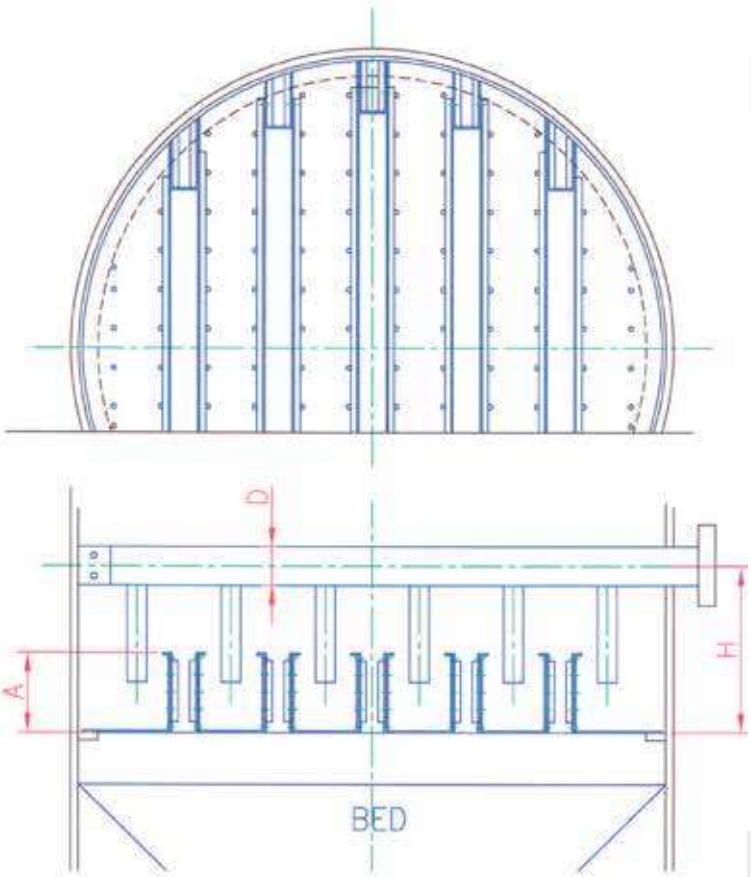
Diameter	>300 - 1200 mm
Liquid range	2 - 30m³/h/m²
Resistance to fouling	High
Standard turndown	3 : 1



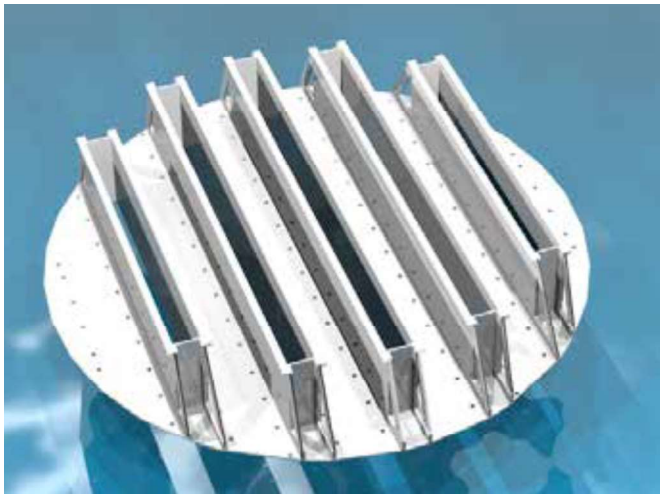
A standard	150 mm

Type	Pan Liquid distributor
Holes position	Liquid is distributed through V notches cut in the risers
Drip points	Up to 50 / m²
Supports at shell	Nr 4 clips welded to shell or, in case of structured packing, supported on the bed
Contruction Type	One piece for flanged towers. Multiple pieces for towers with manway (Tower diameter > 800mm)
Levelling method	By washers at clip position
Feed Device	When the distributor is in one piece, the feed pipe has to be extractable to allow distributor installation and dismantling

B - 816 / B- 817 DISTRIBUTORS



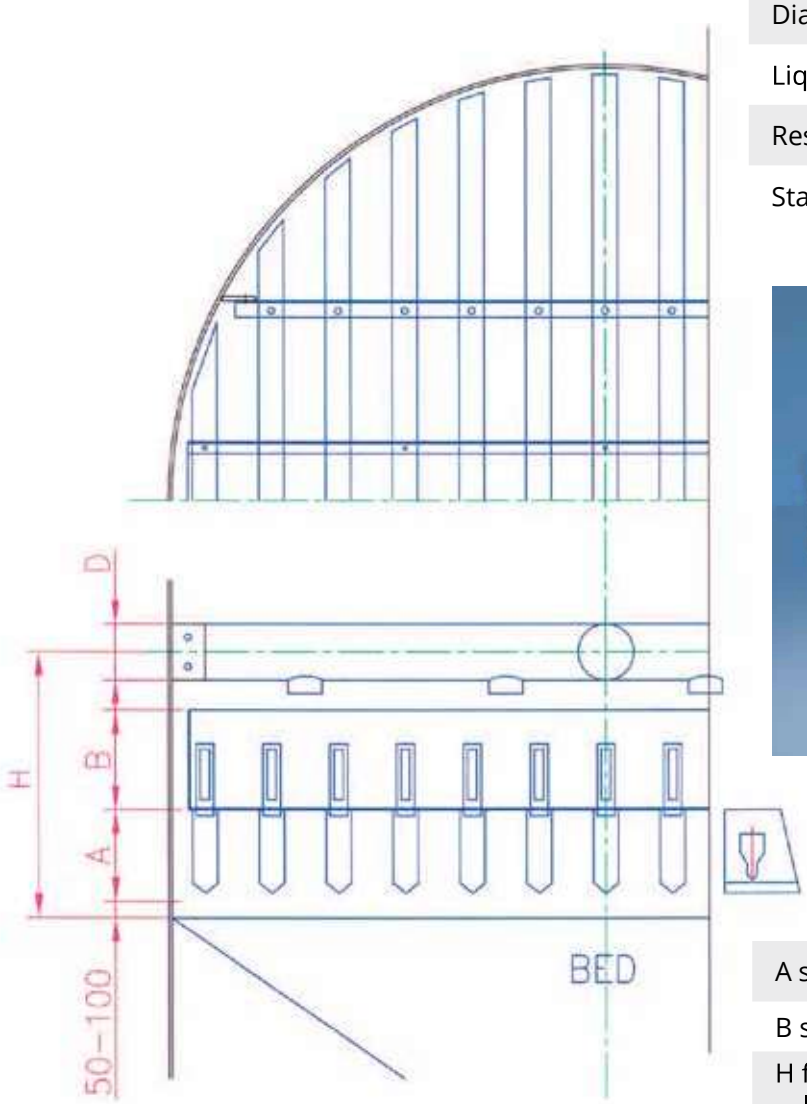
Diameter	>800 mm
Liquid range	4 - 150m³/h/m²
Resistance to fouling	Medium
Standard turndown	2 : 1



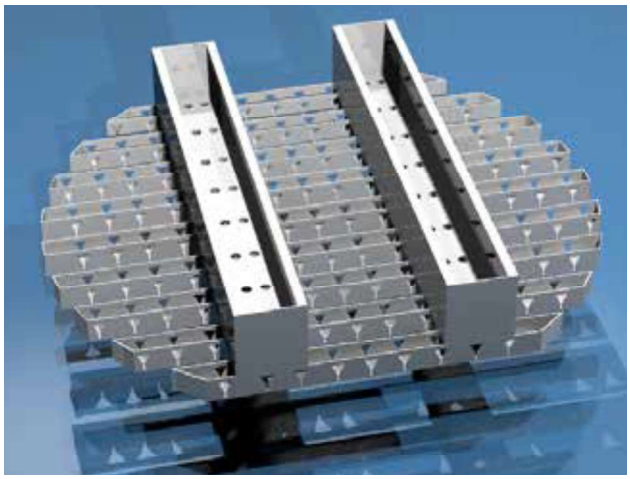
A standard	250 mm
H for feed at Top	A + 150 + D/2 mm

Type	Deck type Distributor
Holes position	Square pattern punched in the distibutor deck
Drip points	70 Drip points / m²
Supports	Support ring and gussets welded to shell for support beams if the diameter > 2500mm
Design Type	Multiple parts bolted each other
Levelling	Distributor level depends on ring levelness
Heats	Available with Redistributor model B - 817
Feed Device	**Liquid feed** : pipe distributror type B -119 **Flashing feed:** Flashing device type B -955

B - 806 TROUGH TYPE DISTRIBUTORS



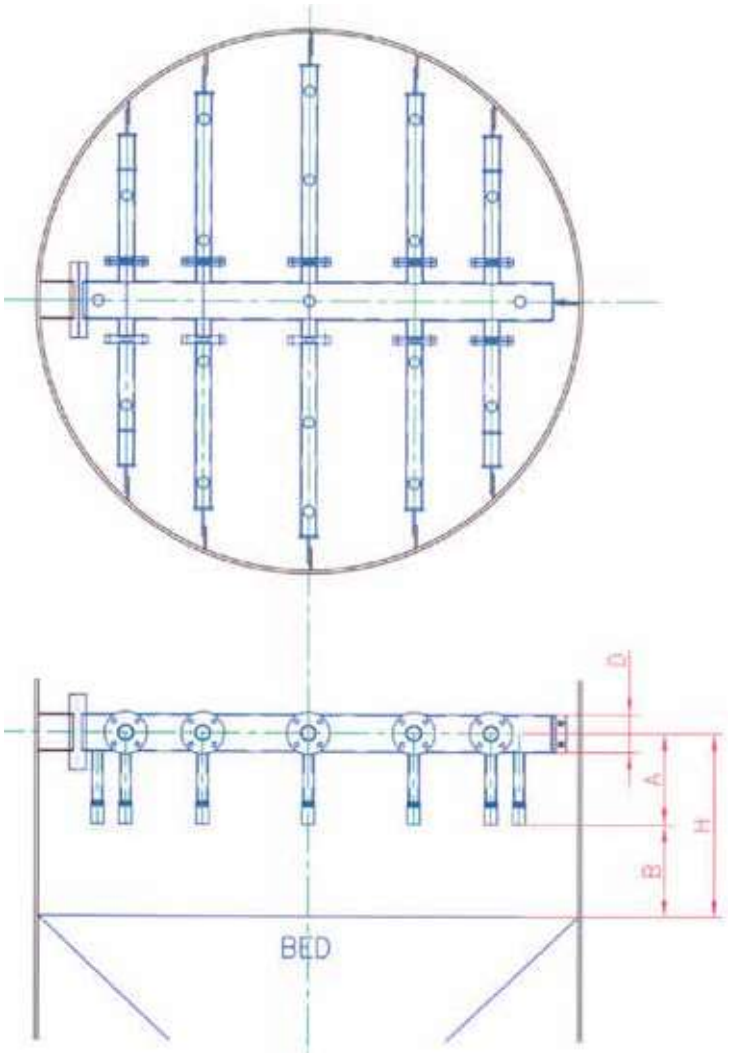
Diameter	>1000 mm
Liquid range	4 - 150 m³/h/m²
Resistance to fouling	High
Standard turndown	3 : 1



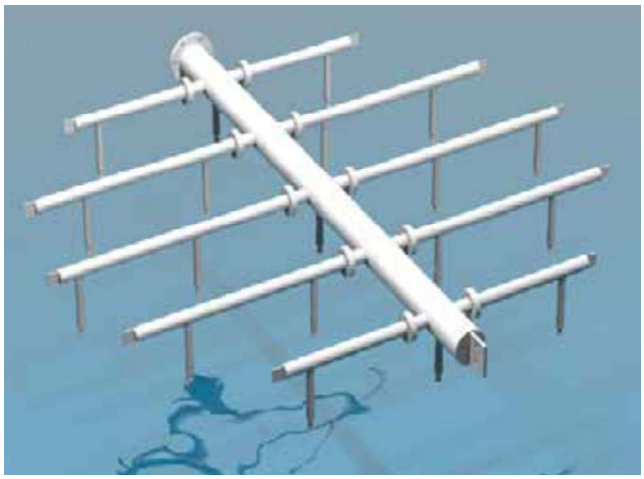
A standard	200 mm
B standard	250 mm
H for feed at Top and Intermediate Feed	>A+B+100+2xD mm

Type	Weir notch, trough Type Distributor
Holes position	V shaped notches punched on distribution channels sides
Drip points	Up to 60 Drip points / m²
Supports	Support ring and gussets welded to shell for support beams if the diameter >2500mm
Design Type	Multiple distribution channels fed by one/two parting boxes. The typical use of this distributor is for fouling services. The distribution quality is low and it should be used mainly for heat transfer and washing services
Levelling	Distributor depends on ring levelness
Feed Device	**Liquid feed** : pipe distributor type B -119 **Flashing feed:** Flashing device type B -955

B - 1044 LIQUID SPRAY DISTRIBUTORS



Diameter	>1000 mm
Liquid range	0.5 - 150m³/h/m²
Resistance to fouling	Medium
Standard turndown	2 : 1



B	>500 mm
A	> 2 x D

Type	Composed by a main header and secondary flanged branches with spray nozzles
Design	Four standards are available for different diameters and liquid flows

Number of Nozzles	Tower Diameter
7	1000 - 3000
19	2500- 6000
37	3500 - 8000
61	5000 - > 10000

Nozzle type	Spray nozzles are characterised by: Spray angle (60 - 120°) Liquid flow (liters/ min) Pressure drop across the nozzle (std 1.5 bar)
Support	The main header and the secondary branches are supported at shell by means of gussets
Application	Main application is for Heat Transfer beds. Due to poor liquid distribution it should not be used for distillation beds

SUPPORT GRIDS AND PLATES

The type of support plate depends on:

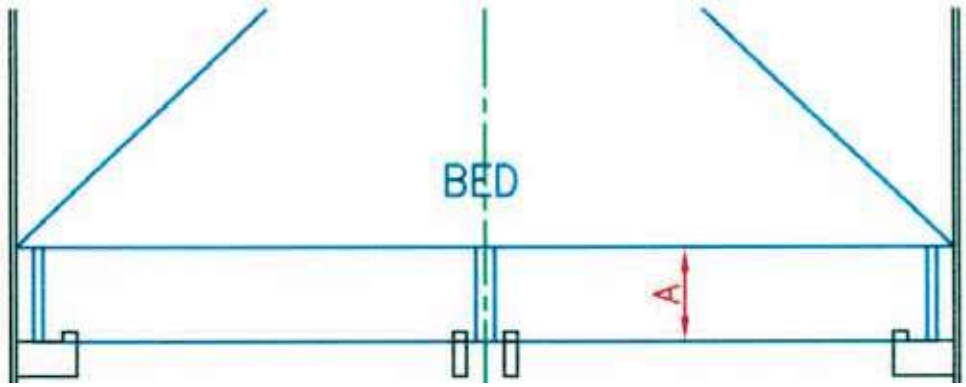
- **Type of Packing**
  - **Random Packing**. A gas injenction type offers an higher mechanical resistance compared with a support grid and it allows a better gas feed into the bed due to the injenction effect of the support.
  - **Structured packing**. This type of packing requires only an open grid supported by beams

- **Open area required**
  - Most of the gas injenction type support plates offer an open area greater than 100% of the column area. Different heights are available.
  - The support grid for structured packing has an open area greater than 96% of the column area.

- **Size of the column**
  - For columns up to 1000 mm the gas injection plate can be in one or two pieces and the height is less than 120mm (Type B - 818)
  - For columns greater than 1000 mm the type B - 804 should be used. This can be provided in different heights depending on strength or open area requirements.

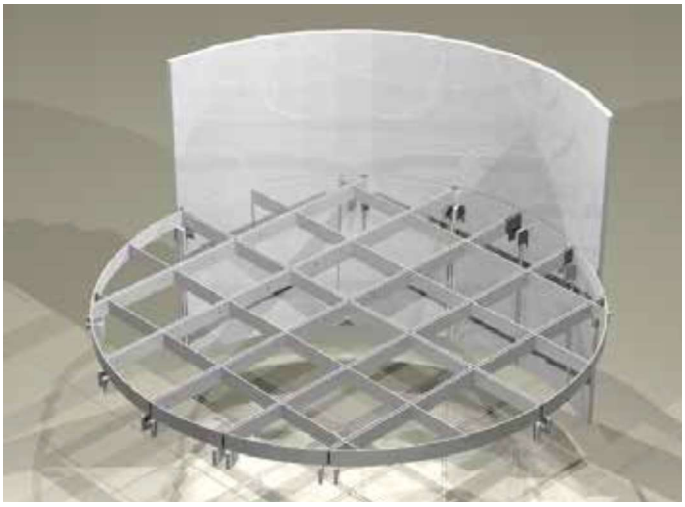
B - 134 STRUCTURED PACKING SUPPORT GRID

Diameter	>1000 mm



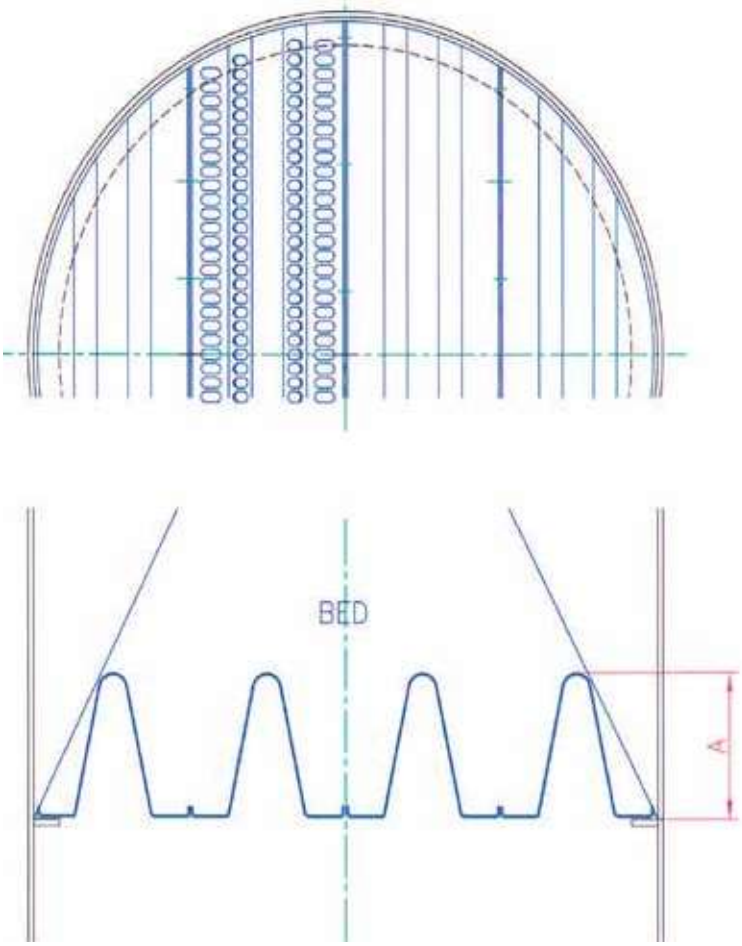
Beam height (A) as function on the load for a grid span of 2000mm

Grid Height (mm)	Specific Load (Kg/m²)
50	200
80	600
100	1000

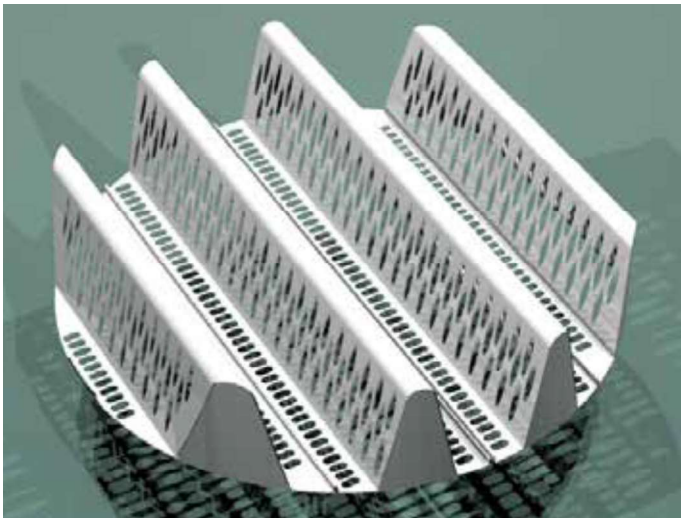


Type	Flat bars type. Panels are approximately 400 mm wide and bolted together. Bars height is variable and depends on the specific load
Supports	The grid is supported at each other panel joint by two clips welded to shell. For diameters >2000mm a major beam could be necessary. In this case additional gussets welded to the shell are required to support the beam.
Design Type	The support plate is supplied in parts to pass through the column manway to be bolted each other. The beam rests on the supports with no need of clamping

B - 804 RANDOM PACKING SUPPORT PLATE



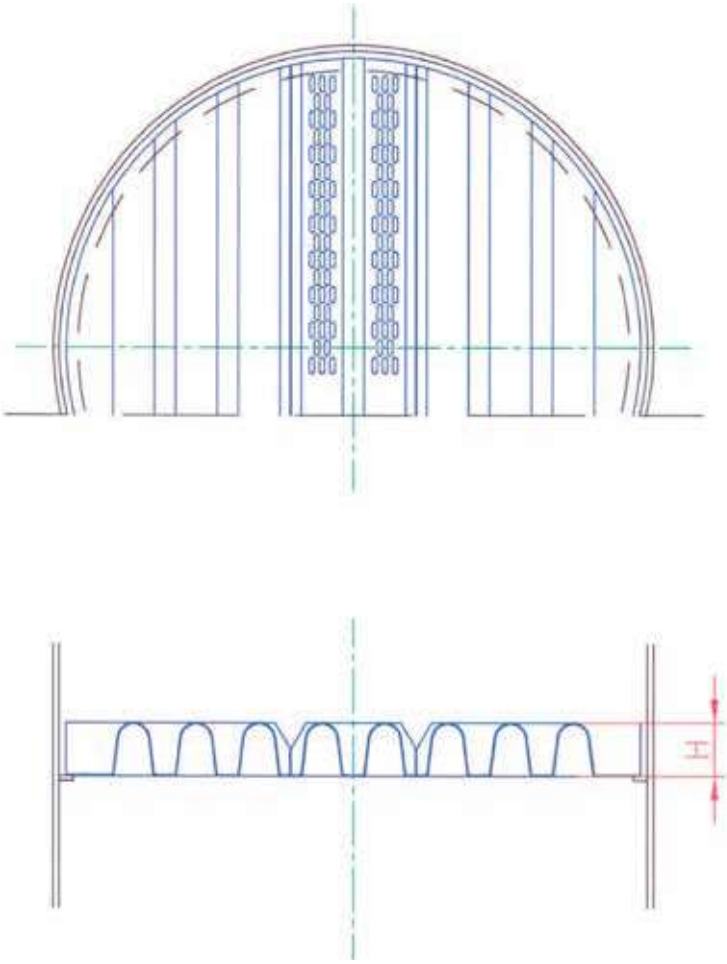
Diameter	>1000 mm
Liquid range	0.8 - 150 m³/h/m²
Resistance to fouling	High
Standard turndown	NA



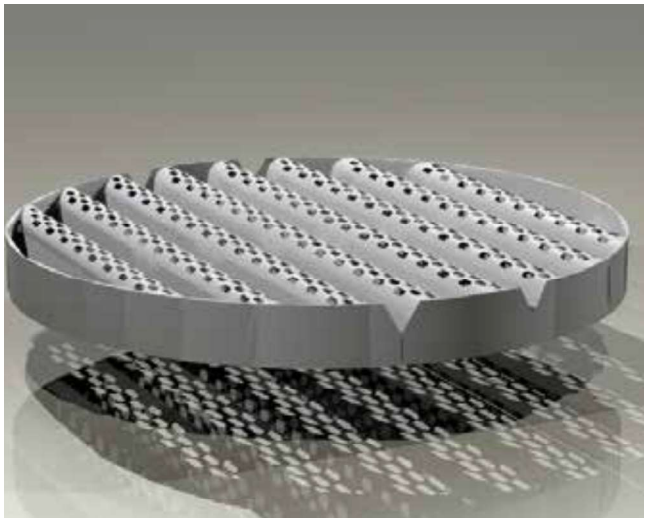
Available elements height A	200 mm
	250 mm
	300 mm

Type	Gas injenction type, is supplied in different heights depending on load or specification
Holes position	Perforation for gas is on the side of the supporting elements while the perforation for liquid drainage is on the bottom flange. Perforation size is adequate to retain 1 " rings. Total open area can exceed 100% of tower area
Supports	Support ring and gussets welded to shell for support beams (if needed)
Design Type	The support plate is supplied in parts to pass through the column manway to be bolted each other and clamped to the suppor ring

B - 818 RANDOM PACKING SUPPORT PLATE



Diameter	300 - 1200 mm
Liquid range	0.8 - 150 m³/h/m²
Resistance to fouling	High



Standard element height	120 mm

Type	Gas injenction type, is supplied in one standard design.
Holes position	The entire surface is perforated to maximize the opening of the support plate.
Supports	Support ring and gussets welded to shell for support beams (if needed)
Design Type	The support plate is supplied in parts to pass through the column manway to be bolted each other and clamped to the support ring
Application	It can be used for any size of metal and plastic random packing

BED LIMITERS

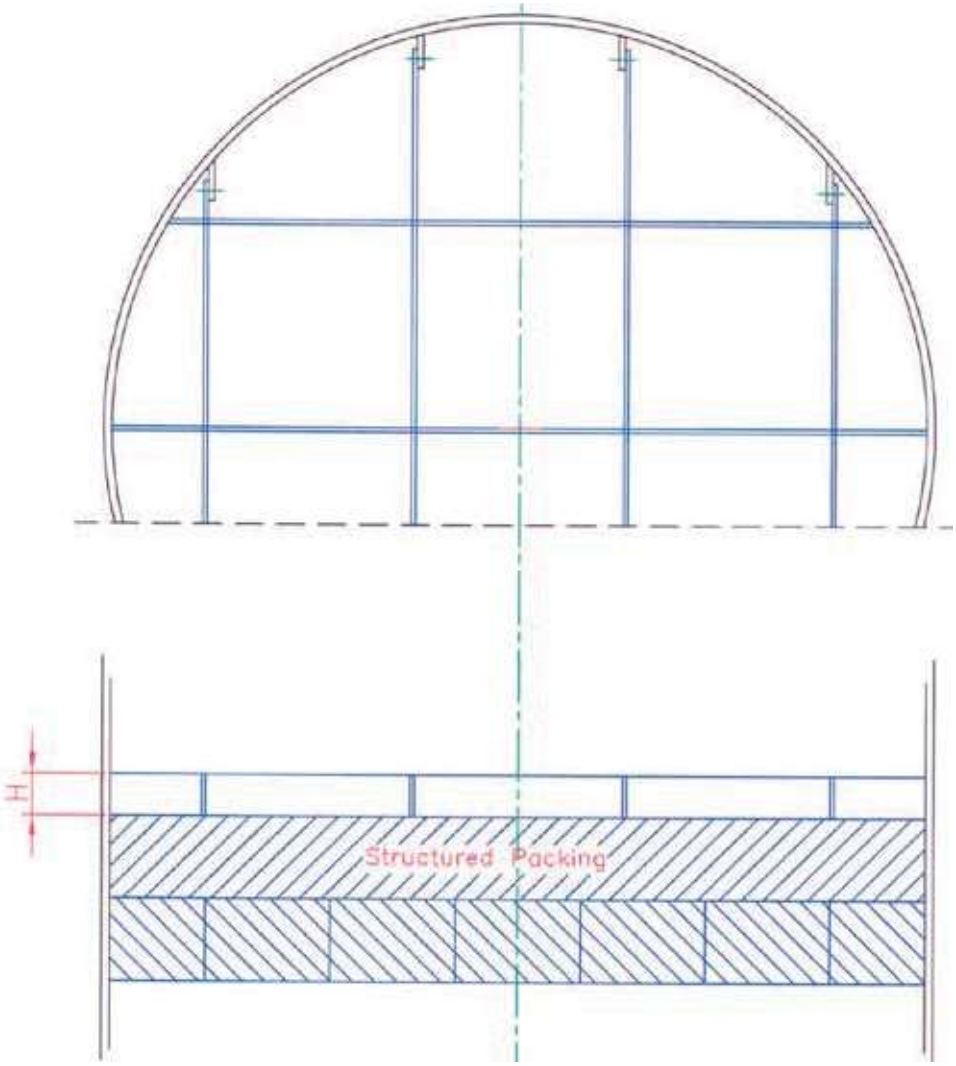
There are different types of bed limiters in function of the type of packing used in the bed.

- **Random packing**
  - **Ceramic Packing:** In this case the hold- down device must be heavy and rest onto the bed in order to avoid the movement of the rings that otherwise could brake.
  - **Metal Random Packing:** In this case the bed limiter normally rests on a support ring and beams in case of large towers. The function on the hold-down device is to mantain the top of the bed flat enough to avoid possible vapor or liquid channeling. Most bed limiters can be designed to be integral with the distributors.

- **Structured packing**
  - This type of packing in many cases doesn't require an hold - down device. In services where the operation of the column could be subject to surges or upset, it is advisable to use a bed limiter. In these cases it could be used an hold- down that does not interfere with the liquid distribution, like the type B-133-R.

B -133 STRUCTURED PACKING BED LIMITERS

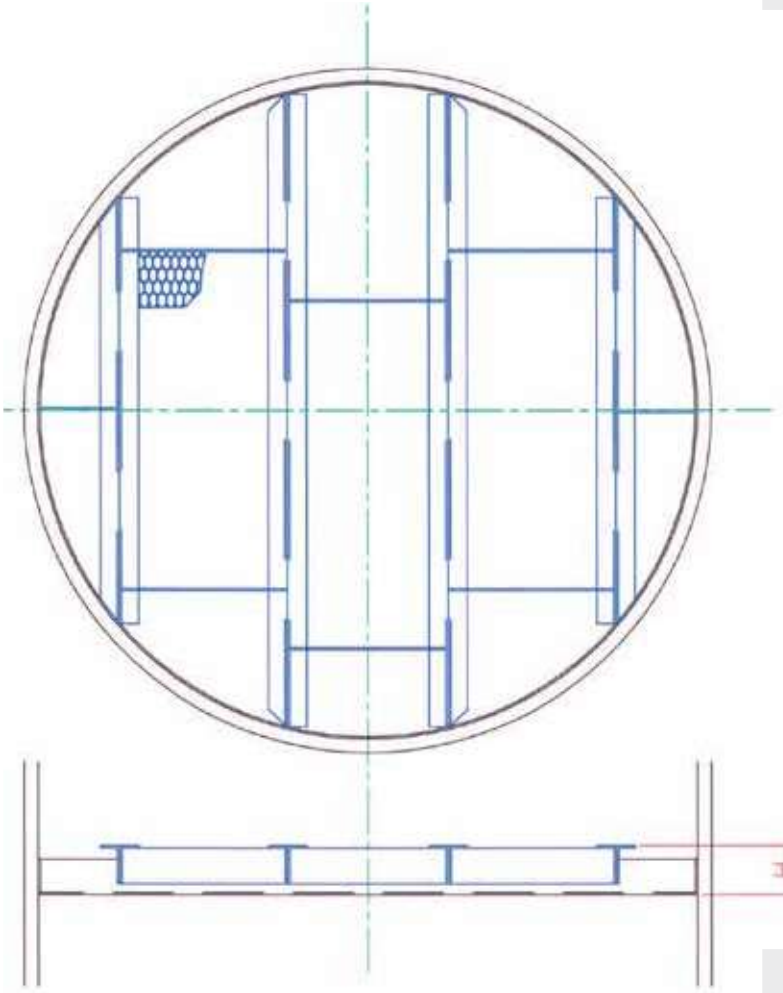
Diameter	>1000 mm
B - 133 elements Height H	50 mm
	100 mm
B - 133 - R	10 mm rod

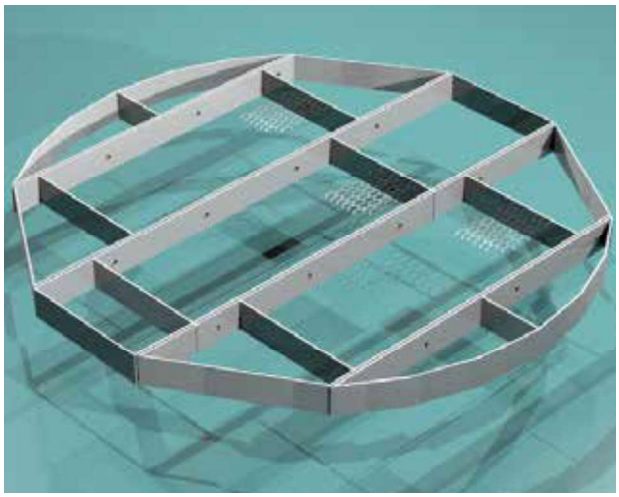


Type	Metal bars
Design Type	It can be provided in two styles: • Metal bars connected each other and to clips welded to the tower shell. This design is very similar to the support grid type B - 134 • Metal rods B- 133 - R running perpendicular to the structured packing panels and attached to clips welded to the tower shell
Supports type B - 133	Support ring and gussets welded to shell for support beams (if needed)
Support type B - 133 - R	Clips welded to Shell
Applications	It is mainly used to mantain in position a bed of structured packing. Mainly the second style (Rods) is purposely designed to offer the least disturbance to the irrigation of the bed . Futhermore the rod design is very resistant and it avoids the need of major structural members to hold-down the bed.

B - 823 RANDOM PACKING BED LIMITER

Diameter	>300 mm





Available elements heigh H	50 mm
	100 mm
	1500 mm

Type	Metal bars and expanded metal
Design Type	It can be provided into two style: • As separate item in panels to be installed on tower support ring and beams for diameter >3000 • Integral with the upper liquid distributor, mainly for diameters<1000 and flanged towers
Support	• Support rings and gussets welded to shell for support beams (if needed)
Application	• It is mainly used to mantain flat the surface of a random packing bed. Without the bed limiter the rings could move and get out of level. It has to be considered that the use this type of device could affect the proper liquid distribution since the elements of this device could disturb the liquid irrigation pattern

INLET FEED DEVICE

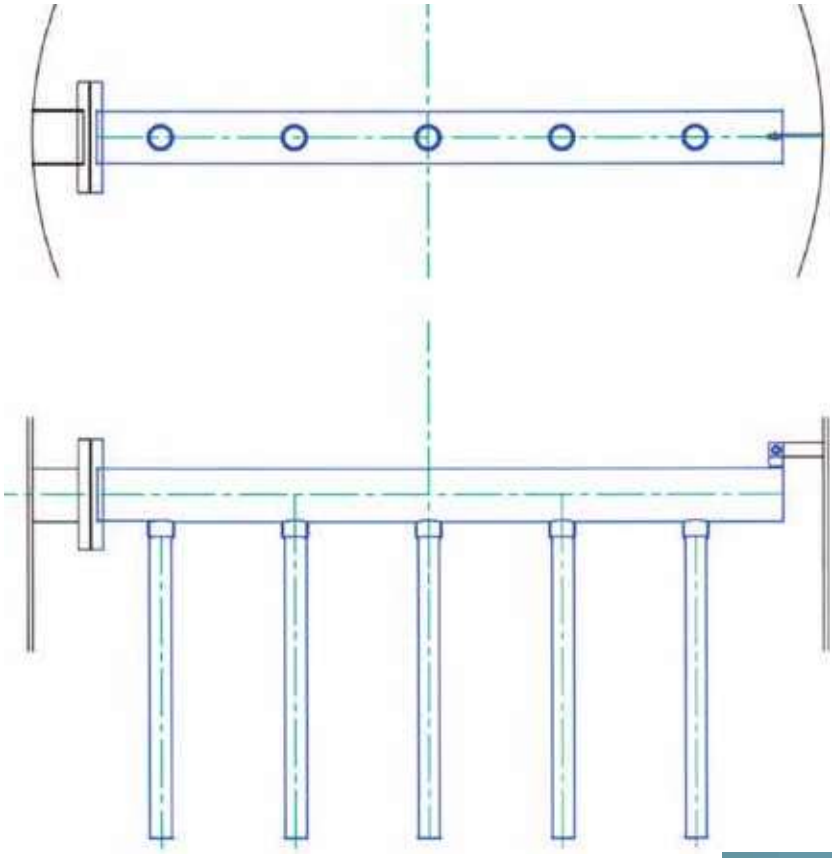
Feed devices are mostly piping systems that help to distribute the inlet liquid and vapor flow to the distributors or beds.

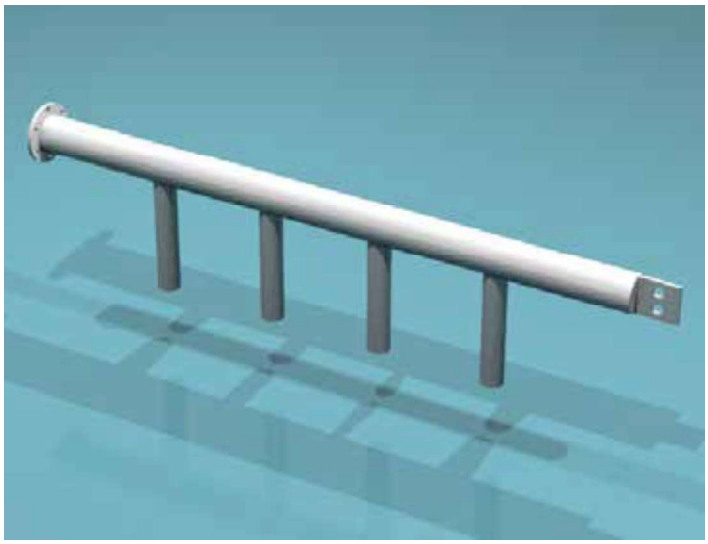
These can be classified as follows:

- Liquid feed entraining a maximum of 1 % vapor
    - These feed pipes allow the liquid being fed to a distributor to be pre-distributed to make easier the distributor operation. These are always used with trough or pan distributors. The type depends mainly from the required turndown.
- Flashing feeds above and between packed beds
    - These feeds require special attention since their selection depends on the actual flow and the type of flow.
- Vapor distributors below a bed
    - The distribution of the vapor entering a bed is as important as the liquid distribution on top of it. The vapor has to be controlled so to dissipate its kinetic energy and making it flowing uniformly to the bed.
    - A vapor distributor plate could be necessary in certain occasion to create a pressure drop that forces the vapor to spread throughout the column section.

B - 119 / B - 129 LIQUID FEED PIPES

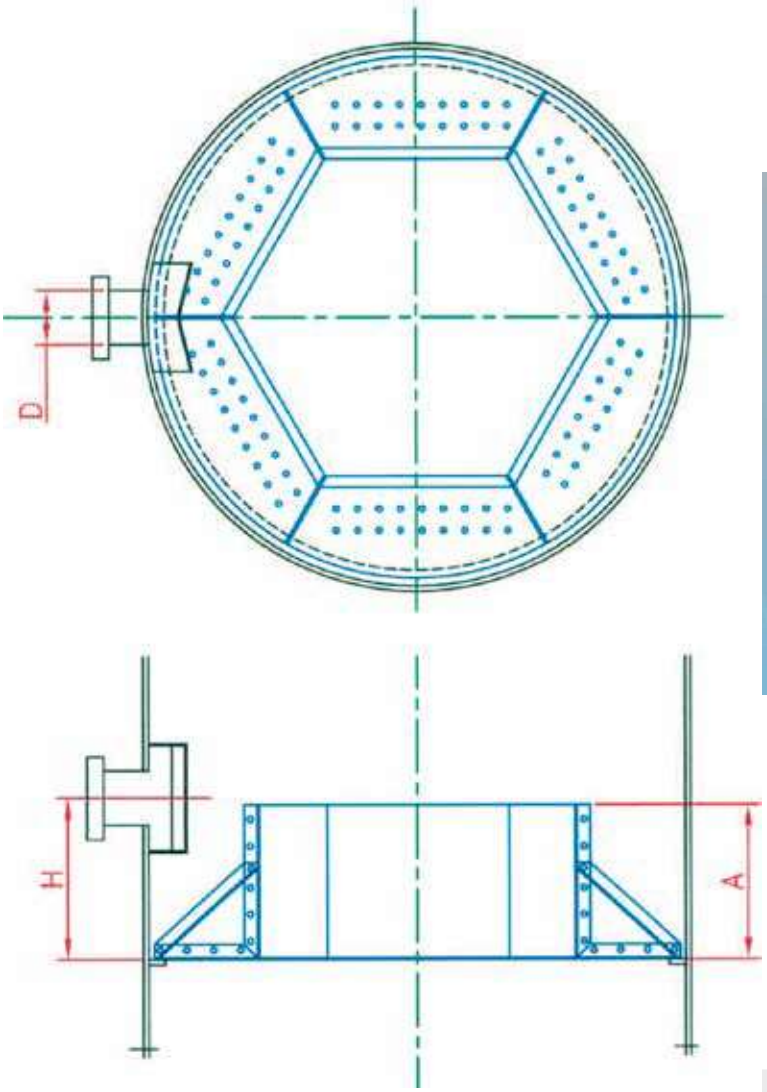
Diameter	>800 mm
Turn down	3 : 1



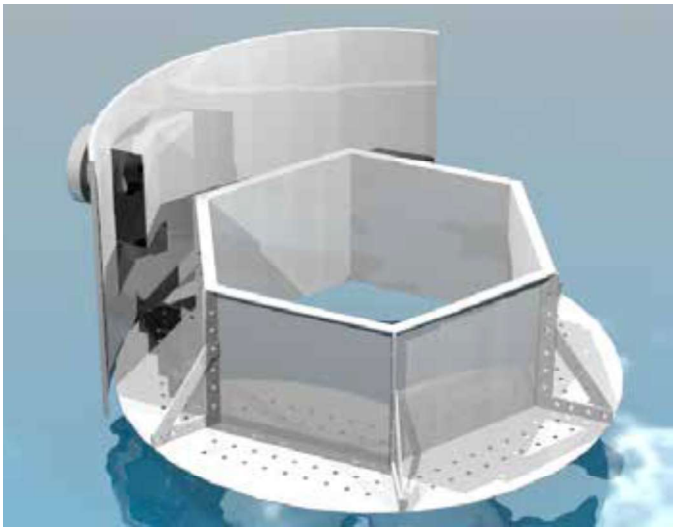


Type	Composed by main header and secondary flanged branches
Application	Main use of these liquid feed devices is for Baretti type distributors. Each feed nipple brings the correct amount of liquid to each part of the distributor.
Design	Two standards are available for different diameters and liquid flows: • 119 Main Header only (To feed mainly trough type disributors) • 129 With branches (to feed mainly pan type distributors)
Support	The main header and the secondary branches are supported at shell by means of gussets

B - 755 FLASHING FEED GALLERY



Diameter	>1000 mm
Resistance to fouling	Medium



A	> = H
H	> = 2 x D

Type	Two phases feed device
Design	The liquid is fed to the column through a nozzle and a deflector that discharges the flashing feed into the annular area. The residence time is designed to allow the gas to disengage from the liquid. The clear liquid flows through the holes in the deck on the liquid distributor positioned below the B - 755
Holes position	The perforation in the device deck is designed so that the holes diameter is > 10 mm to avoid possible plugging
Support	Support ring and gussets welded to shell for support beams (if needed)
Design type	The Flash Gallery is supplied in parts to pass through the column manway to be bolted each other and clamped to the support ring

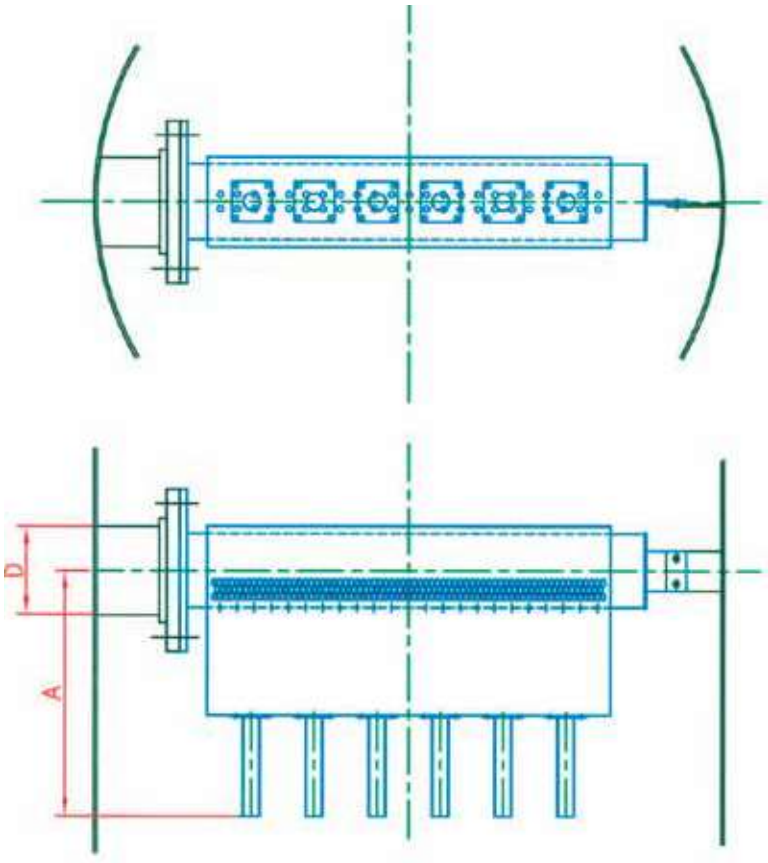
B - 855 FLASHING FEED CHAMBER

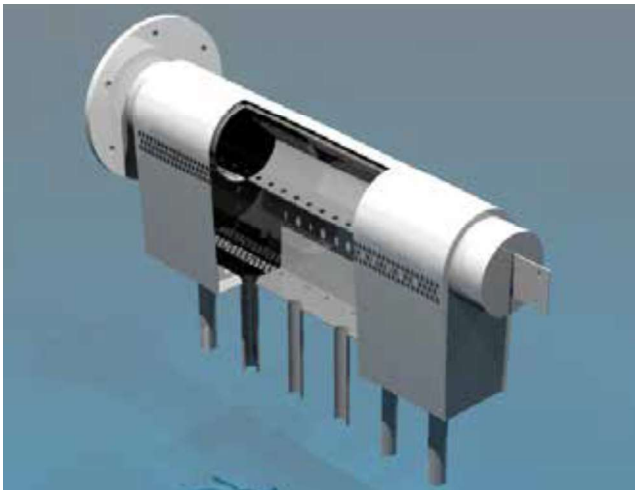
Diameter	<1000 mm
Resistance to fouling	High

Type	Double centrifugal expansion type
Pipe Design	vapor is fed in the double chamber and the centrifugal effect separates the two phases
Supports	It is normally flanged to the inlet nozzle
Installation	The unit is supplied in one piece

B - 955 F LASHING FEED PIPE

Diameter	>1000 mm
Resistance to fouling	High



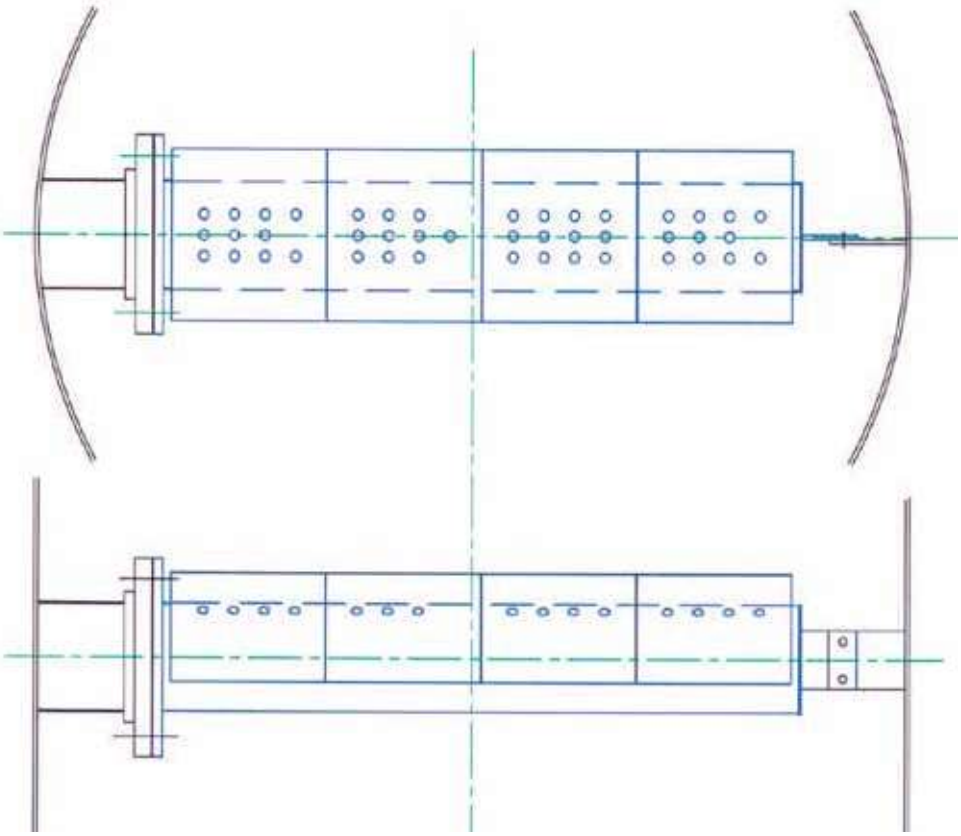


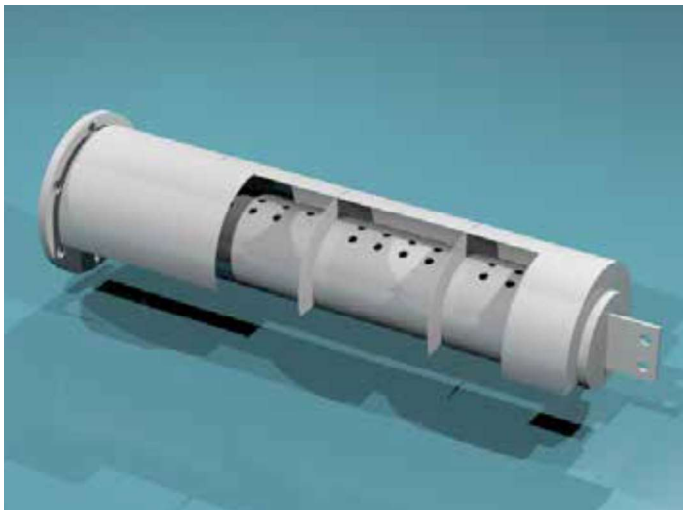
A	> 3 x D

Type	Double chamber expansion type. Vapor is released from the sides and liquid flows from the down pipes into the distributor.
Pipe Design	The mixed phase enter the internal pipe and the vapor is discharged from the upper slots while the liquid flows throuh the holes in the bottom of the pipe
Supports	A gusset welded to shell is necessary to provide additional resistance against possible vibration
Installation	The unit can be supplied in one piece if it passes through the column manway. Otherwise the nipples are bolted to the bottom of the main body and can be dismantled to insert the device into the column

B - 196 VAPOR FEED DIFFUSER

Diameter	>1000 mm
Resistance to fouling	High

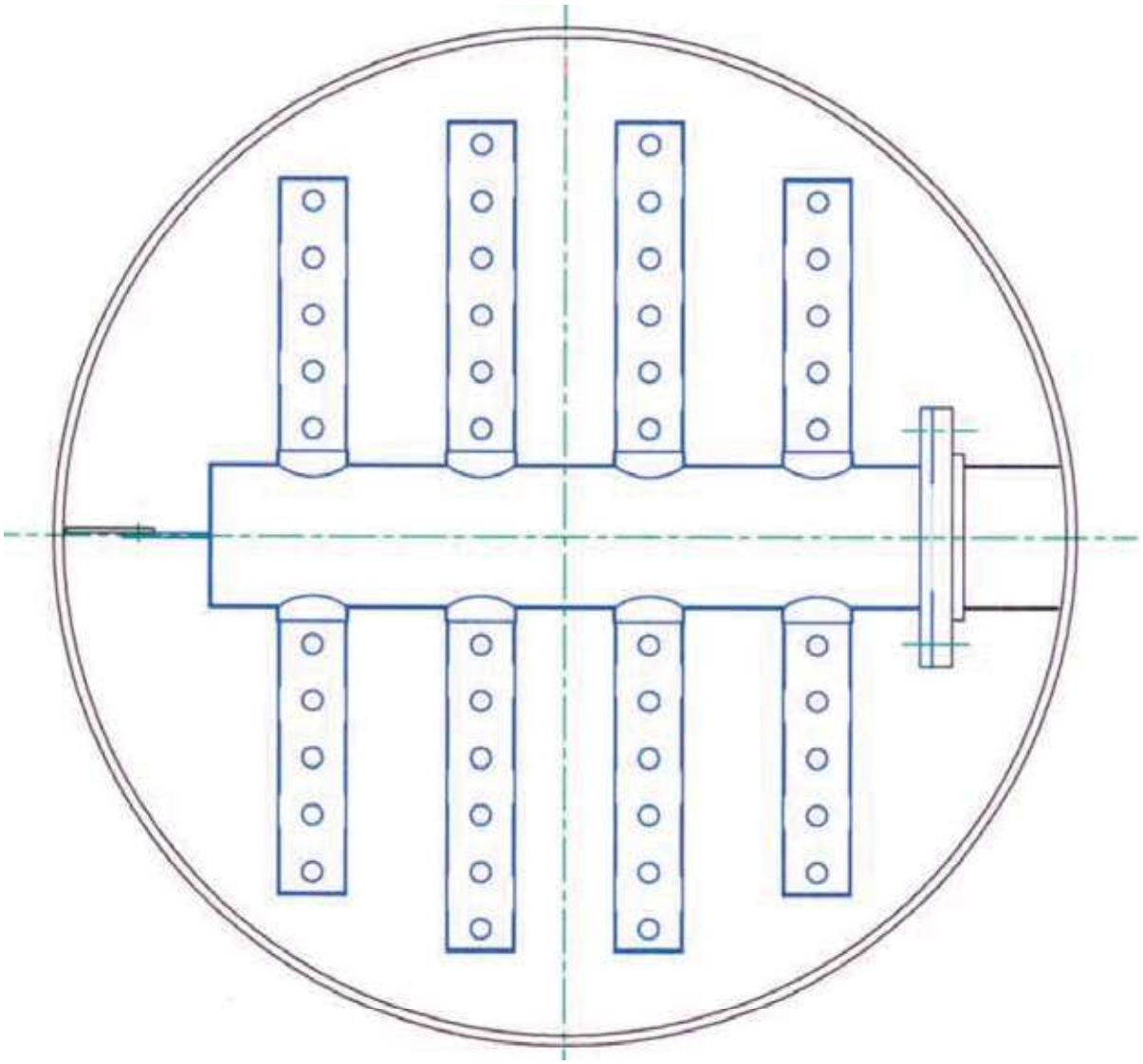




Type	Main feed pipe with perforations in the upper part. The incoming vapor is deflected and expanded to dissipate its energy
Supports	A gussets welded to shell is necesssary to provide additional resistance against possible vibrations
Installation	The unit can be supplied in one piece if it passes through the column manway. Otherwise the hat can be designed to be removable in order to reduce the overall size
Application	Typical application may be the return from a side stripper between two trays

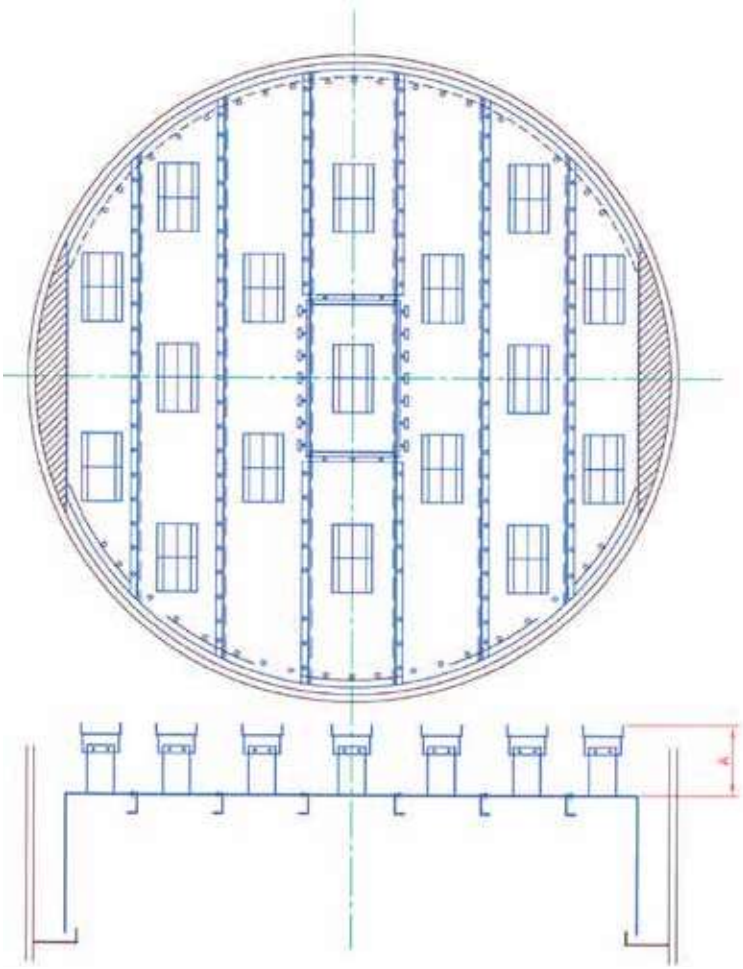
B - 198 VAPOR DISTRIBUTOR

Diameter	>1000 mm
Resistance to fouling	High

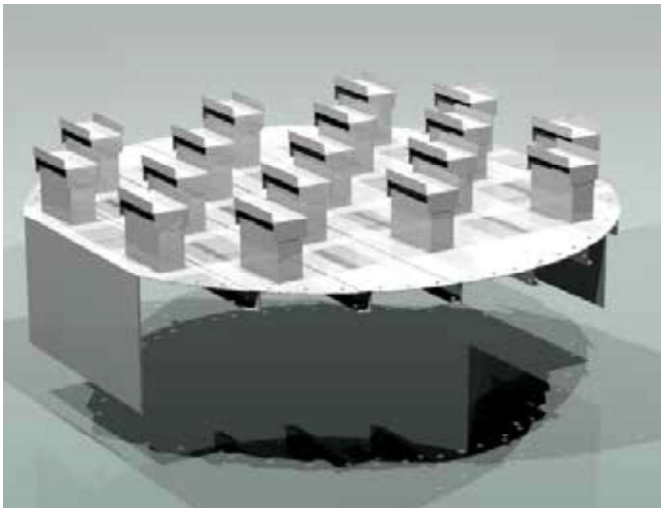


Type	Pipe arm vapor distributor
Supports	Gussets welded to column shell
Design	The distributor is normally designed with a main header and secondary branches perforated to distribute the vapor uniformly throughout the column section
Application	Typical application may be at the bottom of a packed column in order to have the vapor approaching the bed above uniformly

B - 896 VAPOR DISTRIBUTOR TRAY



Diameter	>1000 mm
Liquid Range	20.5 - 100 $m^3/h/m^2$
Standard turndown	2 : 1



A Standard	250 mm

Type	Vapor distributor and collector tray
Support at Shell	Support ring and clips for major beams if the diameter is >3000 mm
Construction type	Like a chimney tray it is designed in parts to pass through the column manway and to be bolted and gasketed together
Design	The distributor is designed to generate a controlled pressure drop through the chimneys that makes the vapor spreading across the entire section of the column. Normally the design pressure drop ranges from 10 to 50 mm H_2O
Levelling method	The operation of this device is not affected by a possible out of levelness of the support ring
Applications	Typical application is below packed beds, to distibute the vapor and collect the liquid to be drawn-off or redistributed to a lower bed

B - 960 INLET VANE DISTRIBUTOR

Diameter	>1000 mm
Resistance to fouling	High

Type	Vane type inlet distributor for mix feeds
Design	The mixed phase enters the flashing device and the lateral blades deflect the mixed phase by 90° separating by centrifugal effect the liquid from the gas. The chamber is tapered to maintain equal velocity in each section
Supports	A support welded to shell at the nozzle entrance and a gusset at the opposite side are necessary to provide adequate resistance against vibrations.
Installation	The unit can be supplied in one piece if it passes through the column manway. Otherwise the blades can be supplied in prewelded groups to be bolted to the casing
Construction	The size of the device is approximately 50 mm larger than the inlet nozzle external size. The length of the inlet vane can be as the tower diameter or shorter up to 50% of the tower diameter
Application	Typical application is for any flashing feed device. It is used as feed inlet for crude vacuum towers for its efficiency in separating the mix and because it requires a radial opening as compared to the traditional tangential entry

B - 960 LARGE DIAMETER

Vacuum Tower - Feed Inlet Vane Distributor
Column diameter 16.000 mm - Nozzles diameter 3.600 mm

LIQUID COLLECTORS

Liquid collectors are available in different designs depending on:

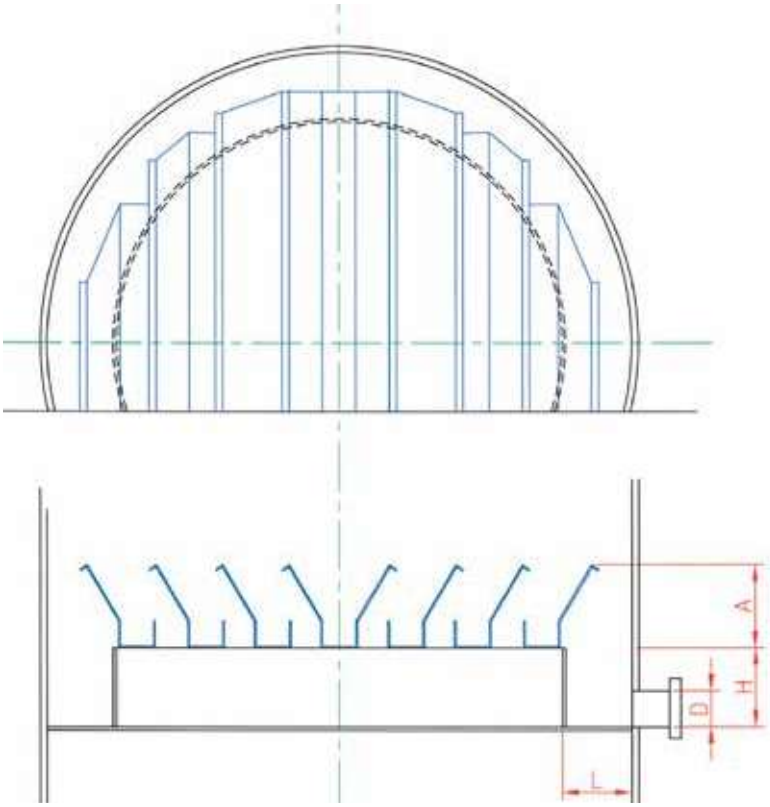
- High volume collectors. These are typical of pump-around or total draw-off services. Their characteristic is the large amount of liquid hold-up required. The typical design is the B - 833 where the amount of liquid is proportional to the stacks height.

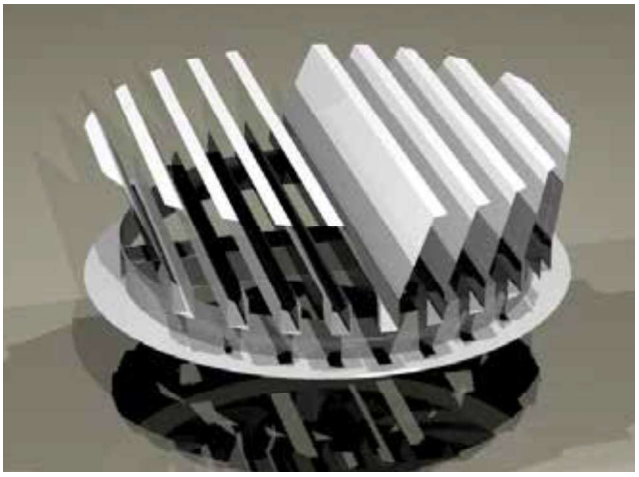
- Partial draw-off collectors. The design to be used depends again on the hold-up required and the allowable pressure drop. For vacuum services the type B - 633 could be used due to its high open area and low pressure.

- Low -hold-up Collectors. The type B - 733 is typical of services where the hold-up could generate liquid cracking or polymerization. This type of collector is purposely designed to have a fast drainage into the draw-off sump.

B - 633 CHEVRON LIQUID COLLECTOR

Diameter	>1000 mm
Liquid Range	0.5 - 30 m³/h/m²



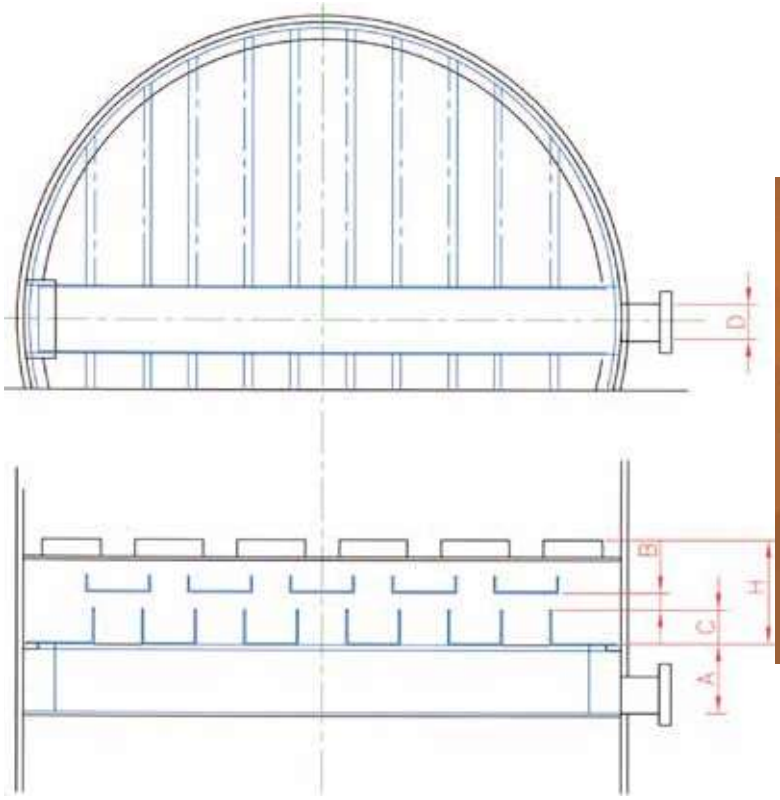


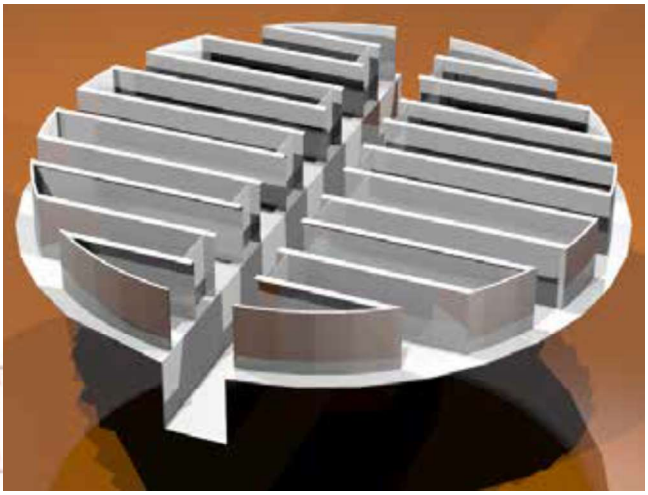
A standard	250 mm
L and H	depend on service

Type	Low pressure drop liquid collector tray
Support at shell	A circular trough is welded to the column shell. This acts as support of the chevron collecting devices that bring the liquid into the channel
Construction Type	Like a chimney tray it is designed in parts to pass through the column manway and to be bolted to the support
Design	Two types of design are available: • Light gage metal collector acting only as liquid collector • Heavy duty design to act both as collecting device and support of a structured packing bed above it The open area is extremely high and results in a very low pressure
Application	Typical application is below packed beds to collect the liquid coming from the bed. It cannot be considered a vapor distributor since the pressure drop is minimal and not enough to uniform the gas flow.

B - 733 TROUGH LIQUID COLLECTOR

Diameter	>1500 mm
Liquid Range	0.5 - 100 $m^3/h/m^2$



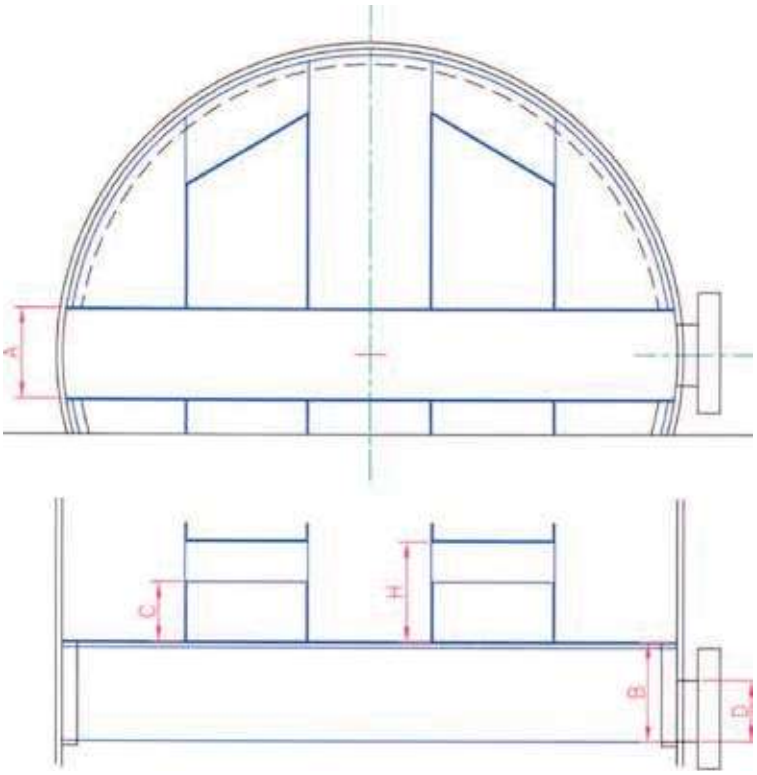


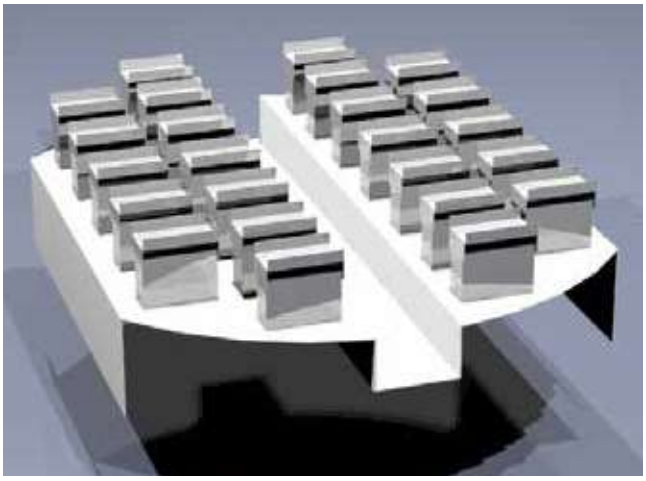
A	> D x 1,5
B standard	75 mm
C standard	200 mm
H	> C + B + 200mm

Type	Channel type liquid collector
Support at Shell	A support ring and bars for the center draw-off trough are required
Construction type	The main trough is in one or more pieces depending on the tower diameter. The side collecting channels bring directly the liquid into the main trough and they are bolted to the main trough and clamped to the support ring
Design	This collector tray can be used in all cases where the welding inside the column has to be minimized. In fact the channels do not need any seal welding. In order to collect the liquid falling on the tower shell a wallwiper device has to be installed. This can be welded to shell (Similar to a support ring) or designed to be expandable without need of welding
Applications	Typical application is below packed beds to collect the liquid coming from the bed

B - 833 LIQUID COLLECTOR TRAY

Diameter	>1000 mm





A =	B > 1.5 x D
C =	RISER HEIGHT
H=	C + 200

Type	Deck type liquid collector
Support Shell	A support ring and bars for the center or side draw-off trough are required
Construction type	The standard design foresees a seal welding of the tray for tightness. It is designed in parts passing through the column manholes and the hats can be used as internal manways.
Design	The open area of these collector can range from 20% for pressure applications, to 40% for vacuum applications. A gasketed design is also available, but it is recommended to seal weld the collector to minimize the leakage.
Applications	Typical application is below packed beds for total draw-off of the liquid coming from the above bed

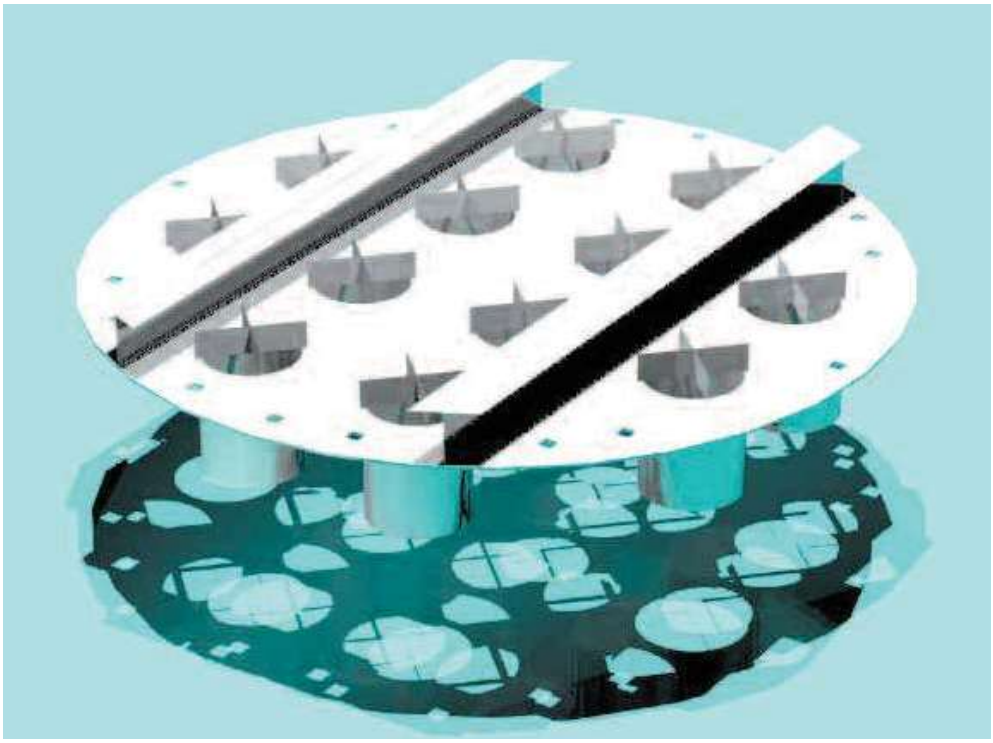
B - 834 DISPERSER AND SUPPORT PLATE

For Liquid /Liquid extractor

Support plate B - 834 has two functions:

- To mechanically support the random packing bed
- To distribute the light phase into the heavy one

Diameter	>300 mm
Resistance to fouling	medium



Type	The device acts as support of a random packing bed and as a disperser of a light phase
Design	The light phase accumulates under the deck and it is dispersed by the holes punched in the tray floor. The heavy phase flowing from the bed is channelled through the down pipes.
Supports	It is supported by a ring welded to the shell and beams, depending on the total load.
Installation	It is supplied in parts to be bolted and clamped to the support ring. Beams can be used for high loads

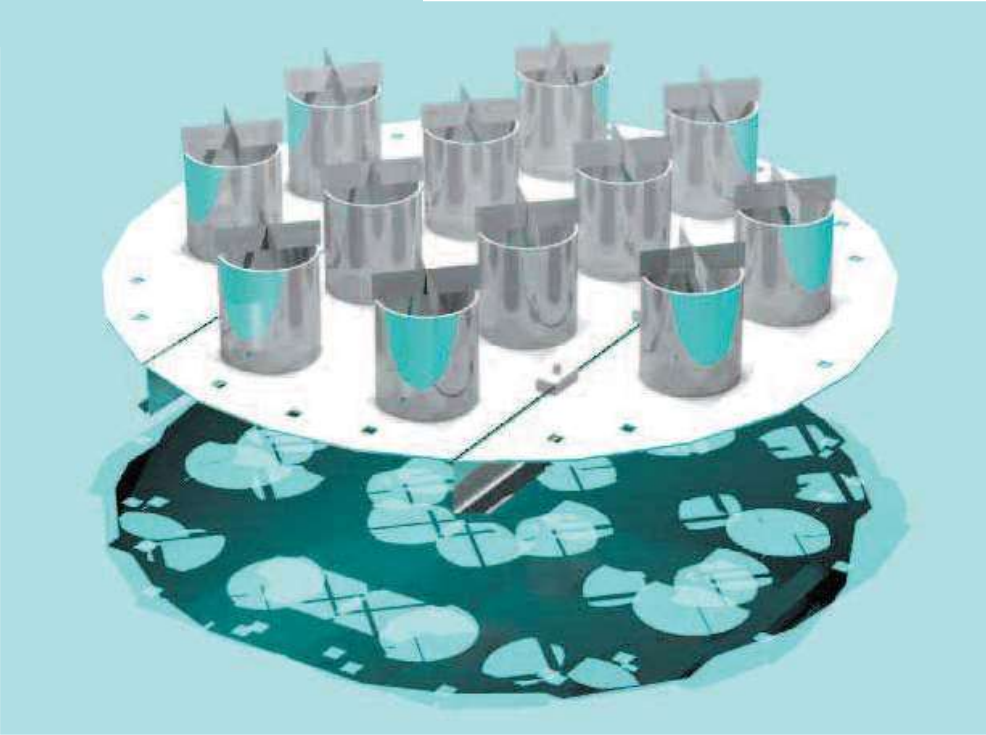
B - 835 DISPERSER AND SUPPORT PLATE

For Liquid / Liquid extractor

Heavy phase Disperser B - 835:

- This has the only function of distributing the heavy phase into the continuous light one and it is located at the top of each bed
- In case of more beds the same B - 835 can be used as support plate of the bed above and redistributor for the lower bed

Diameter	>300 mm
Resistance to fouling	Medium

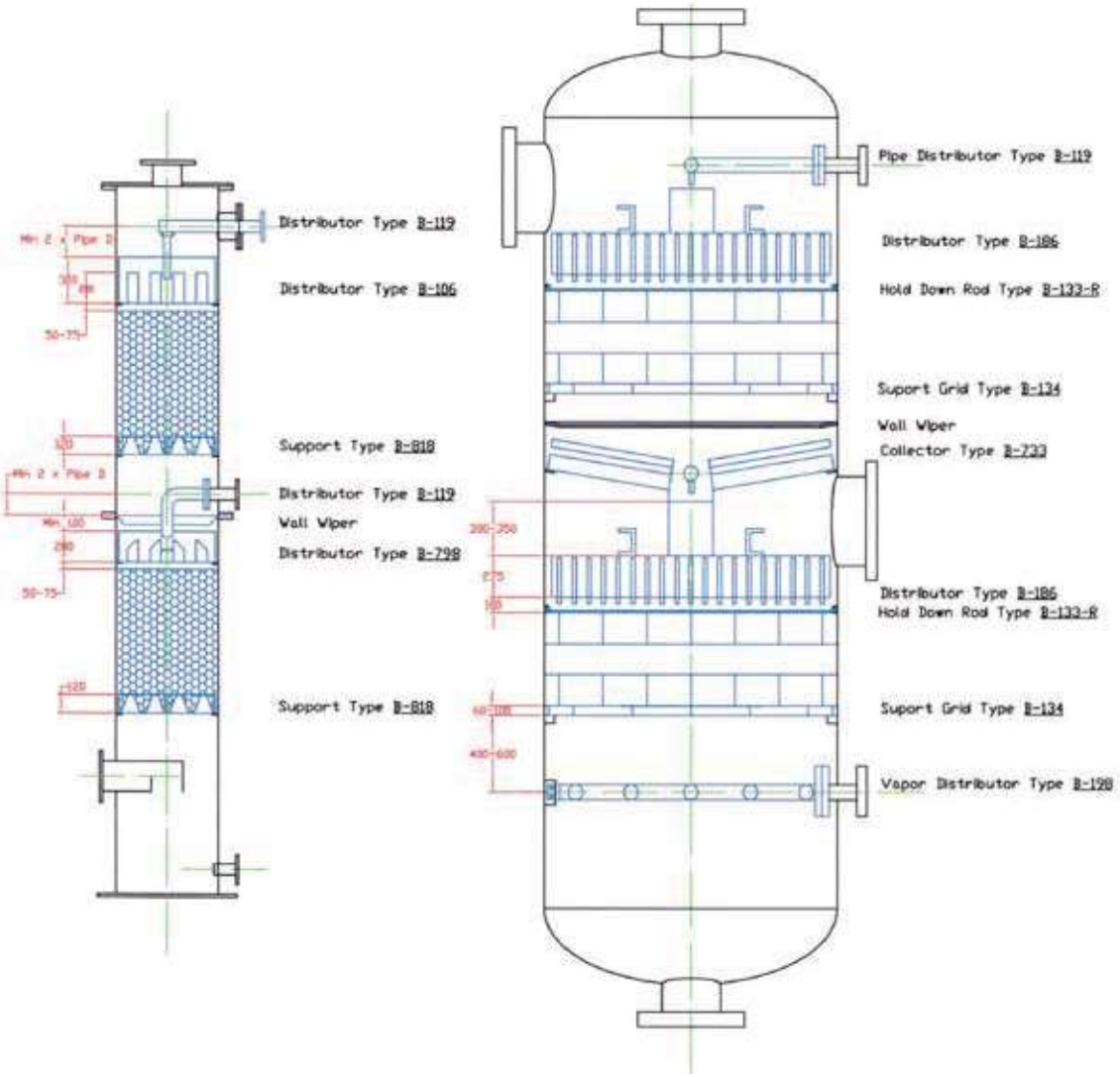


Type	When used on top of a packed bed it can be used as disperser of the heavy phase. When used as support of a random packing bed it can act as disperser of the heavy phase to the lower bed.
Design	The heavy phase accumulates on the deck and it is dispersed by the holes punched in the tray floor. The light phase flowing from the bed below is channelled trugh the upcomers.
Supports	It is supported by a ring welded to the shell and beams, depending on the total load
Installation	It is supplied in parts to be bolted and clamped to the support ring. Beams can be used for high loads

DISTRIBUTOR HYDRAULIC TEST

In light of a complete costumer service Baretti could also perform liquid distribution test.
In our workshop we have a test rig that can manage Distributor ID up to 12 mt with a liquid load more than 500 [m^3/hr].

TYPICAL TOWER ELEVATIONS



TOWER I. D < 800

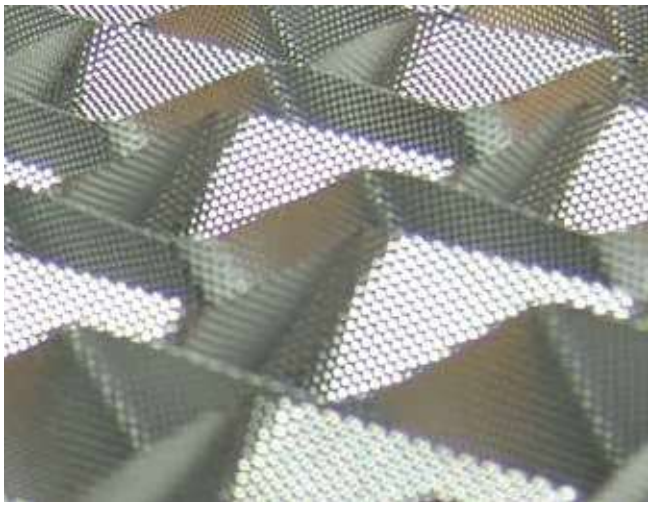
TOWER I. D > 800

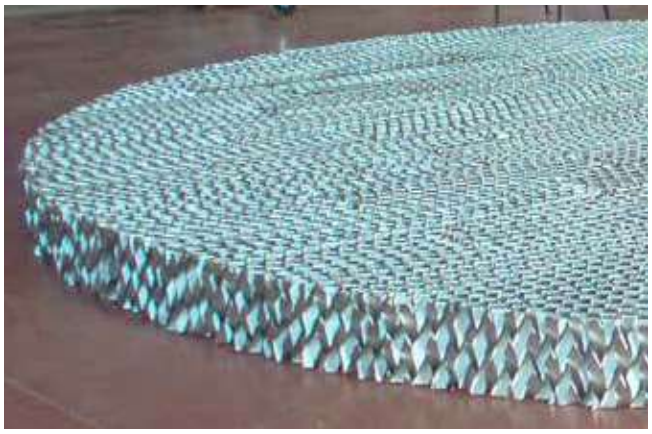
BARETTI STRUCTURED PACKING

Since mid 80' Baretti has successfully designed and installed structured packing and relevant internals in fractionation columns

The main refinery experiences have been in:

- Crude Atmospheric and Vacuum Towers:
  - Overflash / wash section
  - Pump arounds sections
  - Fractionations sections
  - Strippers
- FCC Main Fractionators
- Hydrocracking Main Fractionators
- Coker Main Fractionators
- Amine Absorbers and Regenerators
- Sour Water Strippers





Other areas of experience are:

- TEG Contactors
- Quench Towers
- LAB Alkylation
- Fibers
- Fatty Acids
- Deodorizers
- Air Cooling
- Scrubbers

Characteristics of BARETTI's structured packing is the unique treatment of the packing surface.

This treatment is the result of numerous tests performed by our engineers in the aim to obtain a surface with two main characteristics:

- Maximum surface area
- Maximum surface wettability

These two characteristics are fundamental to enhance the packing performances:

- The surface area determines the packing efficiency expressed in Theortical Stages per meter (TS/m) or Hight Equivalent to Theoretical Plate (HETP)
- Higher wettability improves the spreading of liquid on all available packing surface therefore the packing efficiency is maximized (reduced HETP).
- Superlative mechanical resistance due to a fully welded assembly.

BARETTI STRUCTURED PACKING

Standard Types

Type	Specific Surface (m^2/m^3)	Crimp Angle	Average Efficiency (test/mix) TS/m	Crimp Angle	Average Efficiency (test/mix) TS/m
B-64	64	45°	1.0	60°	0.6
B-100	100	45°	1.2	60°	0.8
B-125	125	45°	1.5	60°	0.9
B-150	150	45°	2.0	60°	1.3
B-170	170	45°	2.2	60°	1.4
B-200	200	45°	2.5	60°	1.6
B-250	250	45°	3.0	60°	2.0
B-300	300	45°	3.5	60°	2.5
B-350	350	45°	4.0	60°	3.0
B-400	400	45°	4.5	60°	3.6
B-500	500	45°	4.8	60°	3.8
B-750	700	45°	5.8	NA	

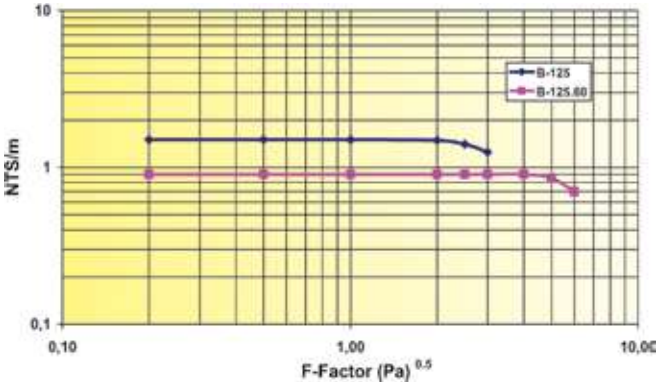
Baretti manufactures structured packing in various thicknesses and materials.

Type	Standard Thick. mm
B-64	0.25
B-100	0.15
B-125	0.15
B-150	0.15
B-170	0.10
B-200	0.10
B-250	0.10
B-300	0.10
B-350	0.10
B-400	0.10
B-500	0.10
B-750	0.10

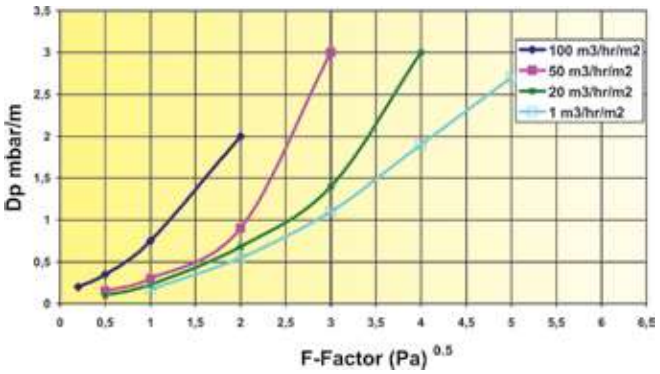
Material Type
AISI 410S
AISI 304/304L
AISI 316/316L
AISI 317
AISI 321
Alloy20
Duplex
Hastelloy
Monel
Titanium

BARETTI STRUCTURED PACKING TECHNICAL DATA

Structured Packing B - 125



Structured Packing B - 125



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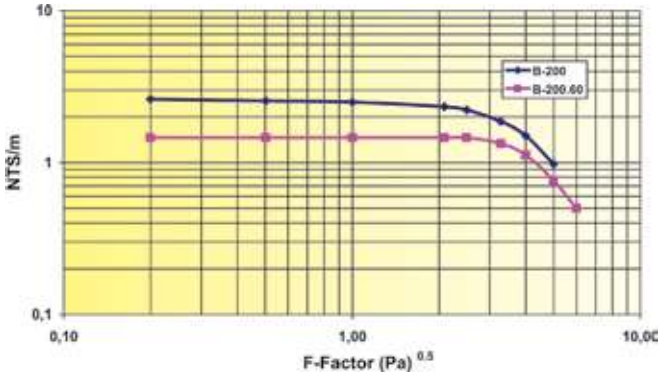

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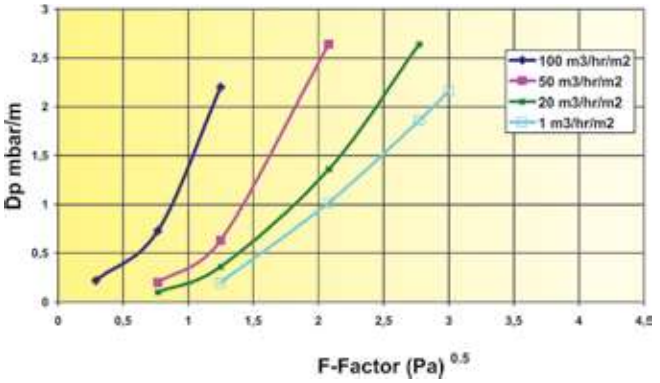
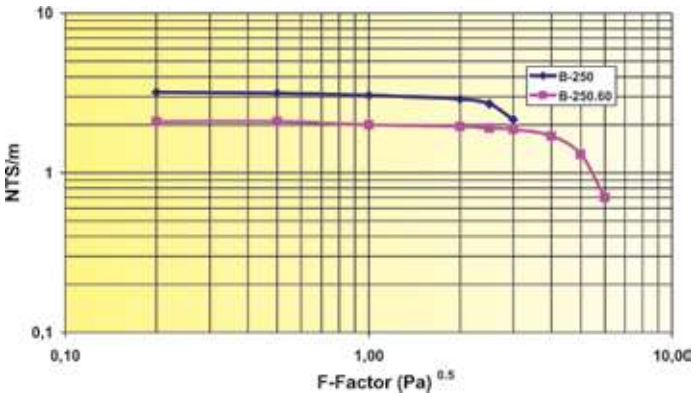
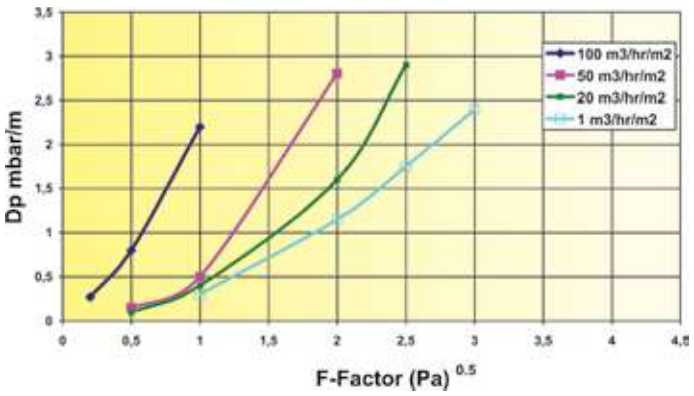


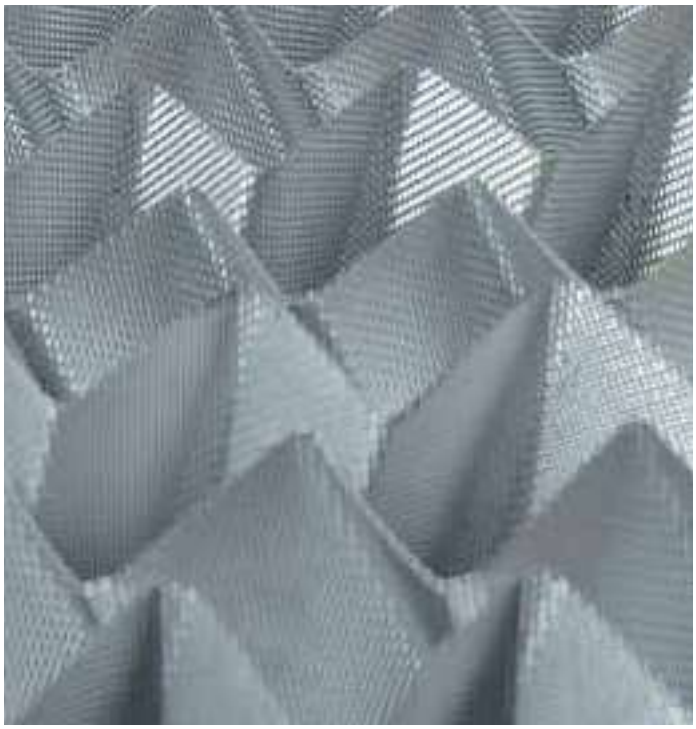
BARETTI STRUCTURED PACKING TECHNICAL DATA

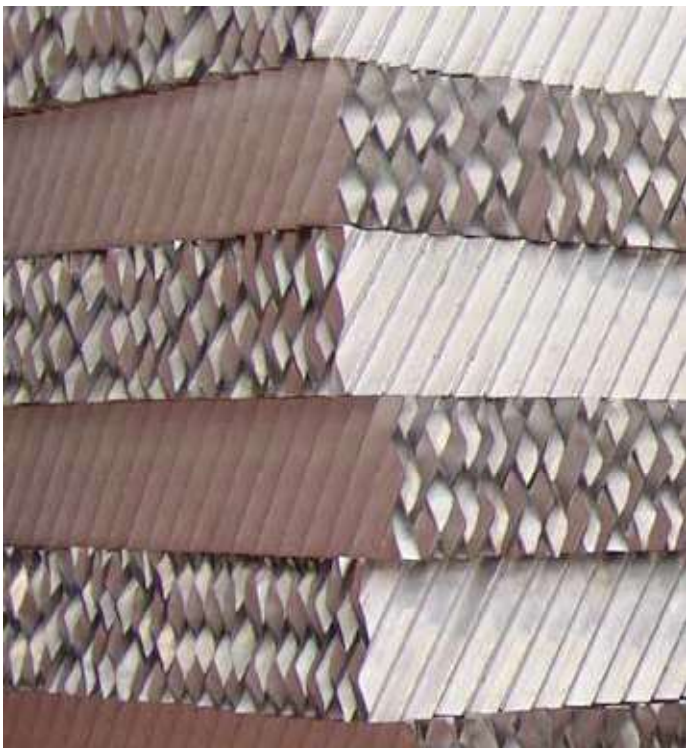
Structured Packing B - 250



Structured Packing B - 250







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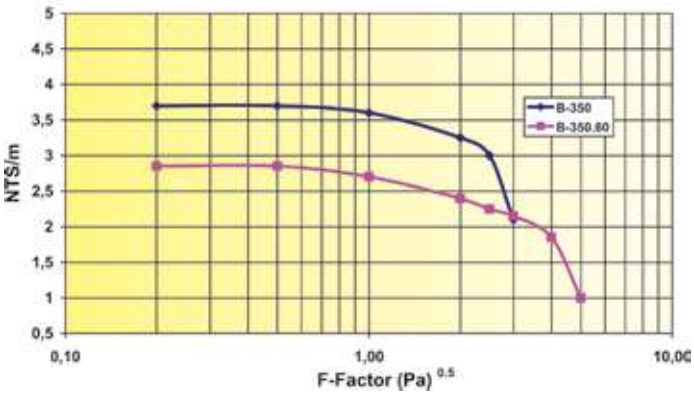

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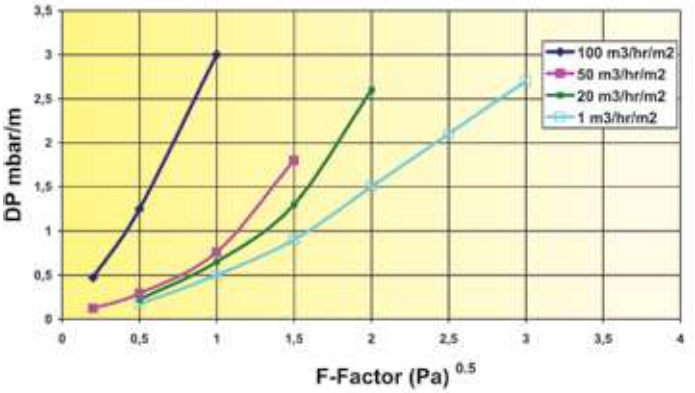
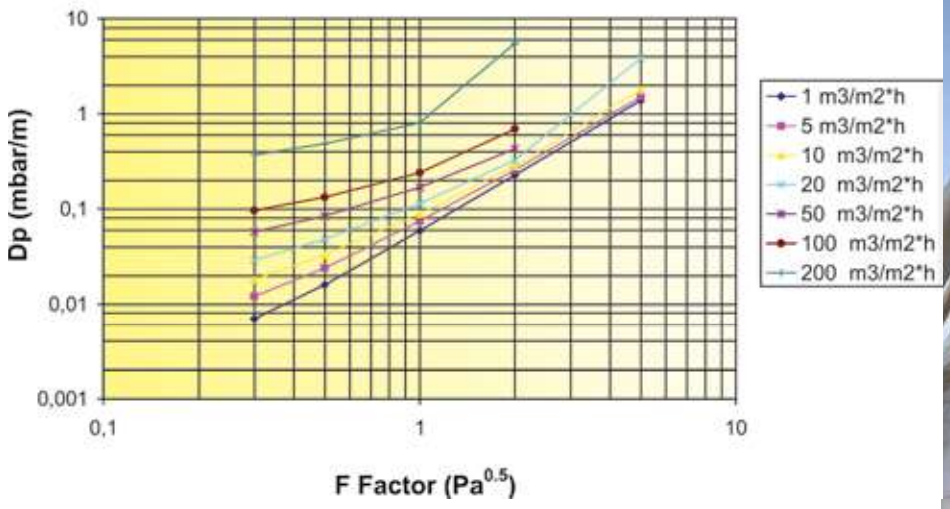
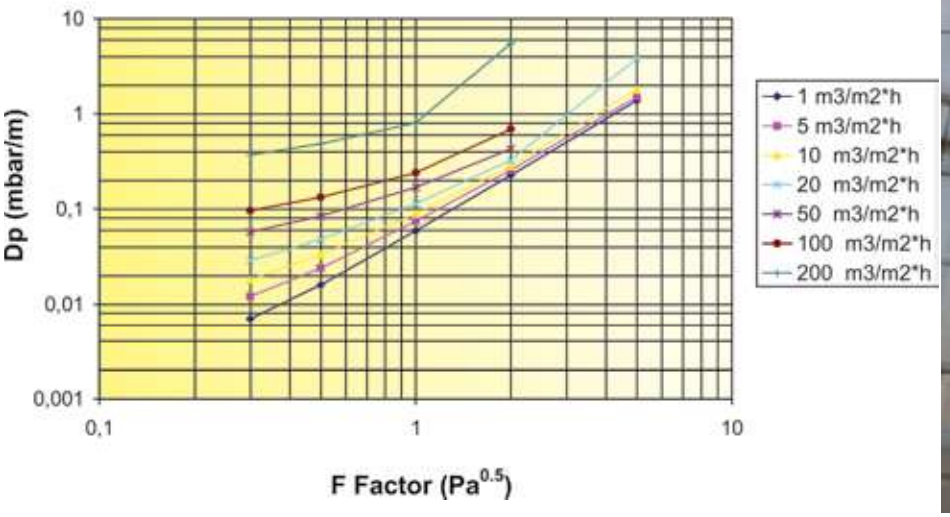


BARETTI STRUCTURED PACKING TECHNICAL DATA

Structured Packing B - 64.45



Structured Packing B - 64.60

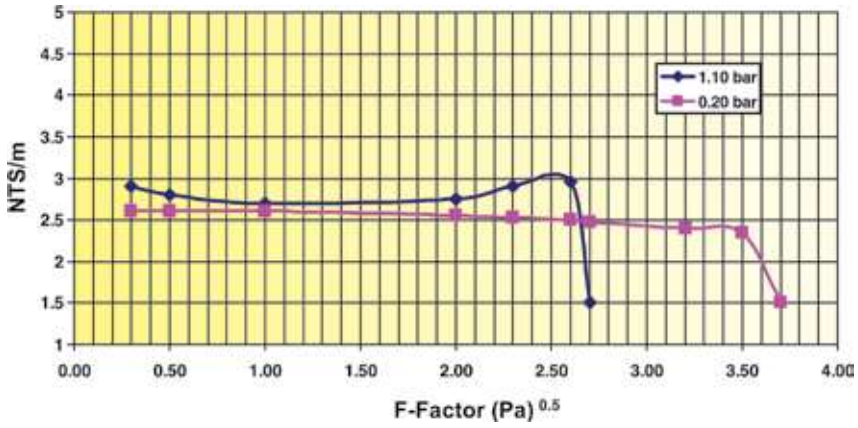


BARETTI STRUCTURED PACKING HIGH PERFORMANCE

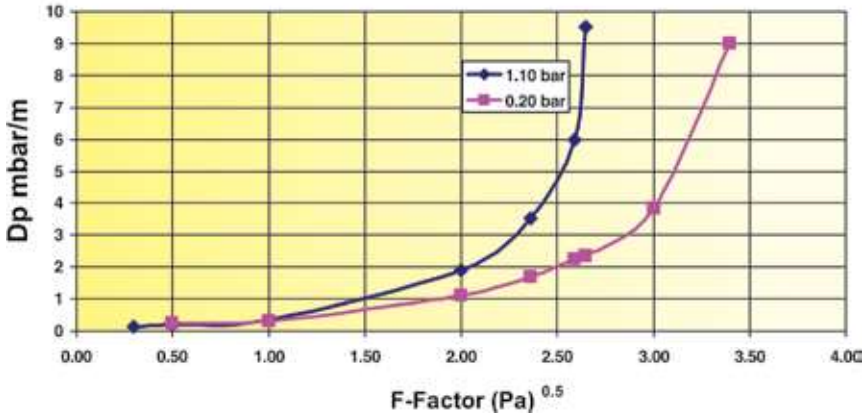
BARETTI has developed a proprietary high performance structured packing since 2007:

- The conventional structured packing, installed with each layer rotated in respect to the previous one, suffers a premature flooding where the two layers touch each other.
- This phenomena is caused by the sudden change in direction of the flow who creates a localized pressure drop.
- The end of each diagonal channel of the BARETTI High Performance Structured Packing is formed to avoid, almost totally, the sudden change in direction of the flow.
- This result in a vey significant improvement. The Baretti High Performance Structured Packing has gained more than 30% in capacity, lower pressure drop at same efficency of conventional structured packing at similar condition.
- The BARETTI High Performance structured packing is an excellent opportunity for increasing further the capacity of towers already packed with conventional Structured Packing

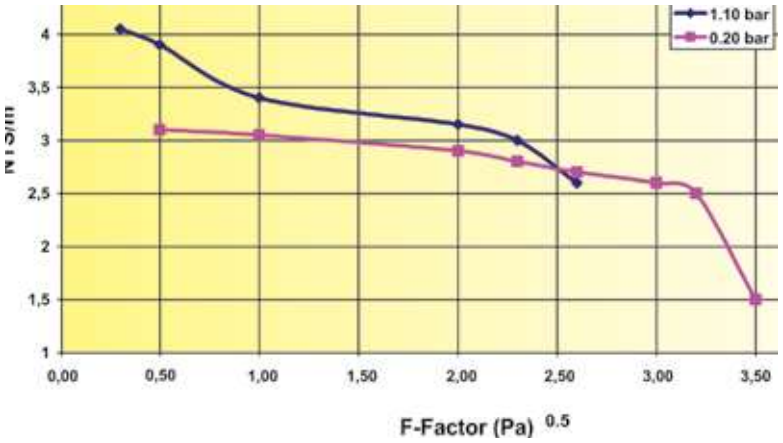
Structured Packing B - 250 - HC



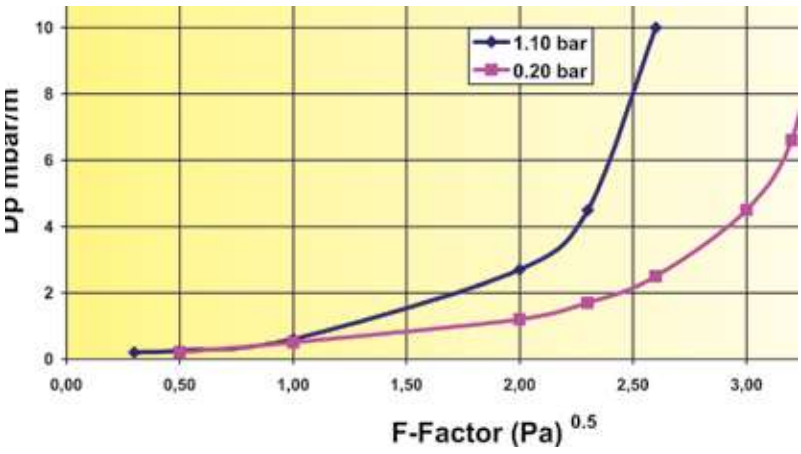
Structured Packing B - 250 - HC

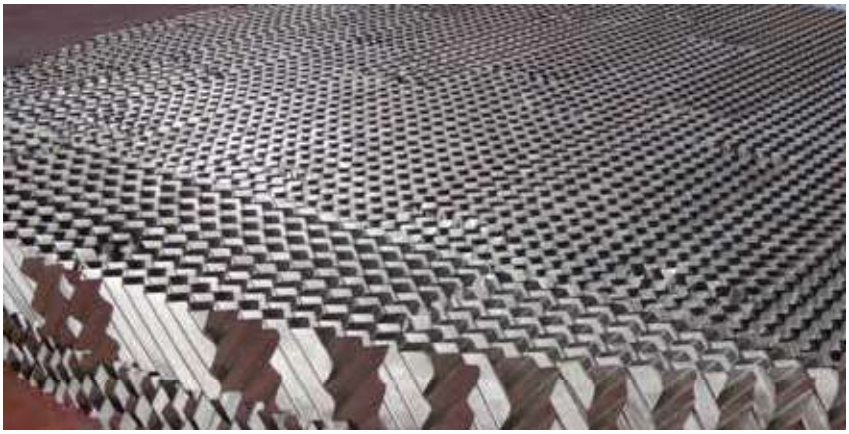


Structured Packing B - 350 - HC



Structured Packing B - 350 - HC





BARETTI RANDOM PACKING

Baretti design and manufactures the most advanced random packing types:

Pall type rings

Pall Rings have replaced the Raschig Rings since long time due to their excellent results in many applications like:
Absorbers, Regenerators, Strippers and Scrubbers.

Baretti Metal Random Packing (BMRP)

BRMP replaced both Pall and Rashig Ring due to enhanced performances in terms of capacity, pressure drop and efficency.

Random packing has been used since early 40's as an alternative to tower trays. The main improvements achieved with modern packing are:

- Contrary to trays there is no need to split the column area in active area (bubbling zone) and the downcomer one. The vapour and liquid occupy the required section determined by the volumes and pressure drop.
- The capacity of the traditional packing is close to the one of the trays at atmospheric and high pressures. In vacuum systems the random packing is preferred for its lower pressure drop.
- As mentioned above the main characteristic of the random packing is a much lower pressure drop as compared to trays.
- The efficiency is quite constant across the full operating range.

Some possible problems that can be encountered with packings are:

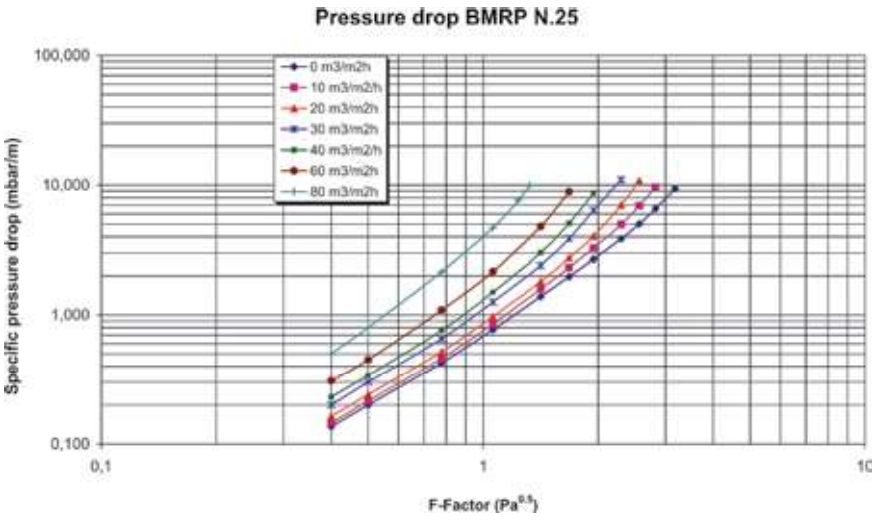
- A packed bed requires always an optimum liquid and gas distribution, the trays are much less sensitive at this point
- In fouling services the packing could plug and could be difficult to clear. If packing needs to be replaced it implies a substantial cost
- In case the tower shell needs inspection, the only possibility for inspection is to remove the packing
- In case of corrosive service the minor thickness of ring with respect to trays can be a problem

BARETTI RANDOM PACKING

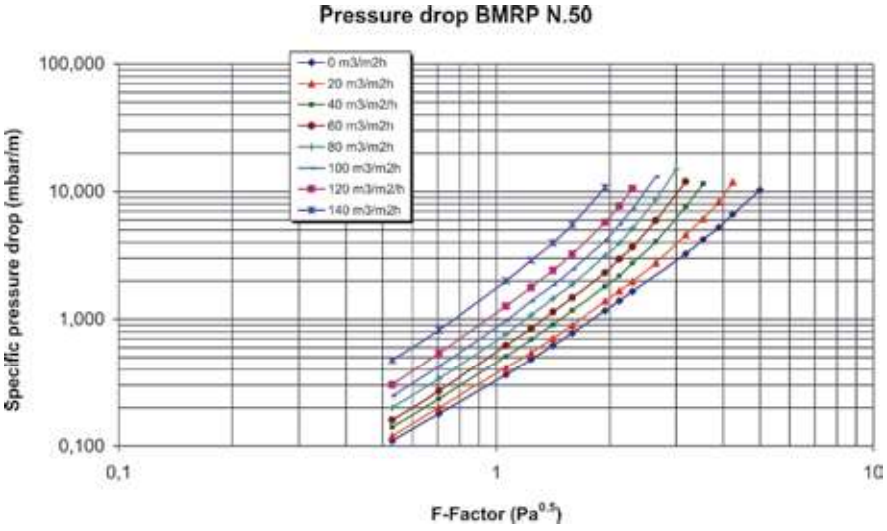
BMRP data chart

Dimensions	# 25	#40	#50	#60	#70
Specific Surface m²/m³	230	150	110	82	60
Number Pieces/ m³	130000	46000	14600	10500	4900
Packing Factor	440	250	195	170	130

Pressure Drop BRMP # 25



Pressure Drop BRMP # 50

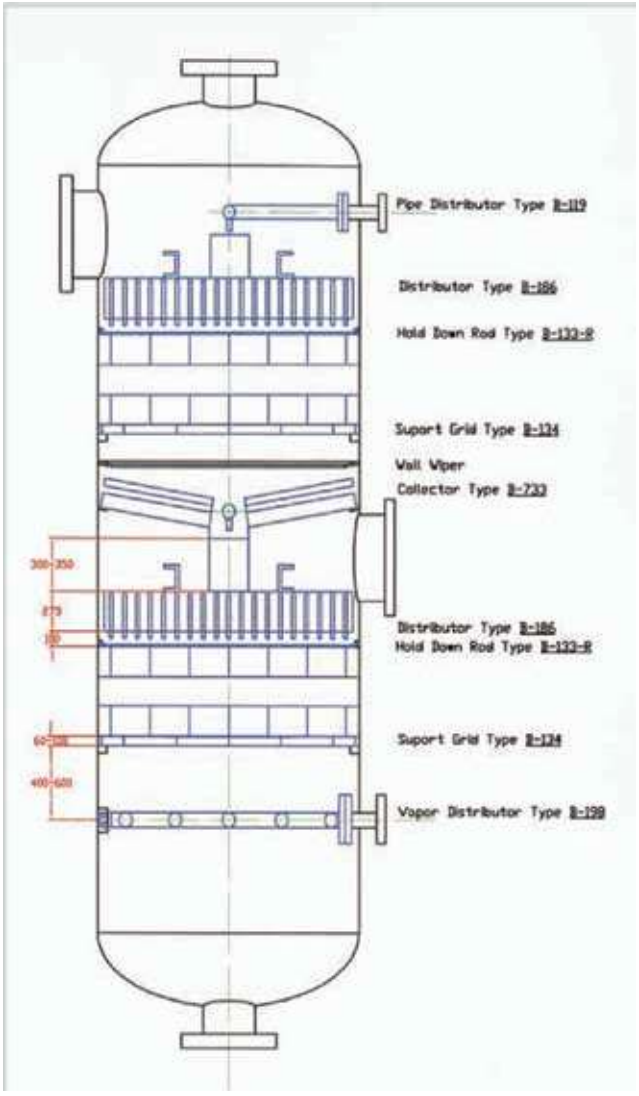


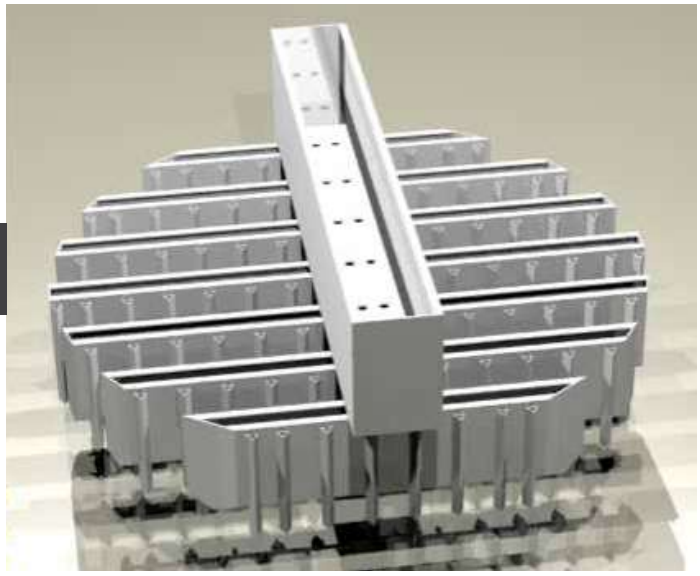
Baretti can supply **metal, plastic, ceramic and carbon rings** as requested by the project.
Other types of rings are available on request

TOWER INTERNALS FOR COLUMNS WITH PACKING

The performances of the packed beds strongly depends on:

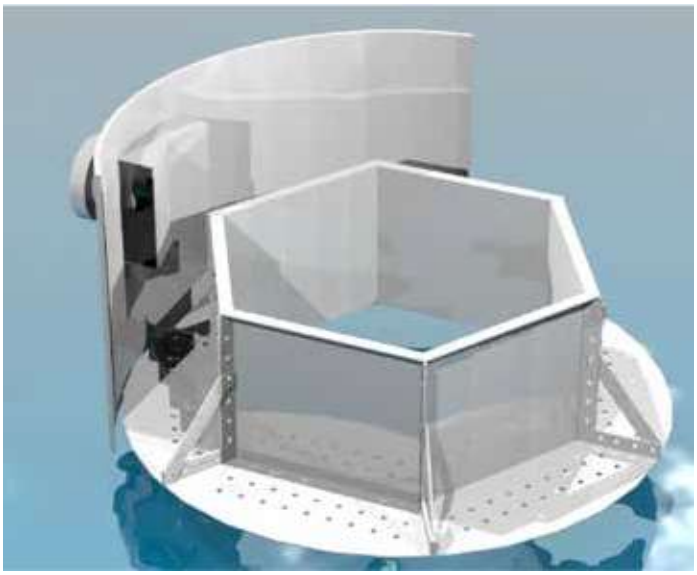
Typical Packed Column Arrangement





Liquid distribution

- Baretti B - 186 liquid distributor can be used For low liquid rates (< 30 - 50 m³/hr/m²)
- The maldistributoion (measured drip point to drip point)is less than 3% up to 8 meters column diameter



Gas distribution

- Baretti manufactored and design many type of Gas/Vapor distibutors
- The selection of appropriate distribution depends on capacity and services (full gas, mix, ore flashing

LARGE DIAMETER VACUUM TOWERS

DESIGN, STANDARD AND ENGINEERING

Design & Standard

The Baretti MLA design is developed according some basic principles:

- Operating Safety
- Environment Protection > Zero emission
- Lean Technology > Perfect equilibrium between simplicity and precision
- Easy to operate
- Low maintenance
- Easy to ship and erect on site

Our design fully comply with international codes and standards:

- OCIMF (Oil Companies International Marine Forum)
- PED 97/23/CE (Pressure Equipment Directive)
- ATEX Directive 94/9/EC
- ASME Codes
- EN/ISO Codes

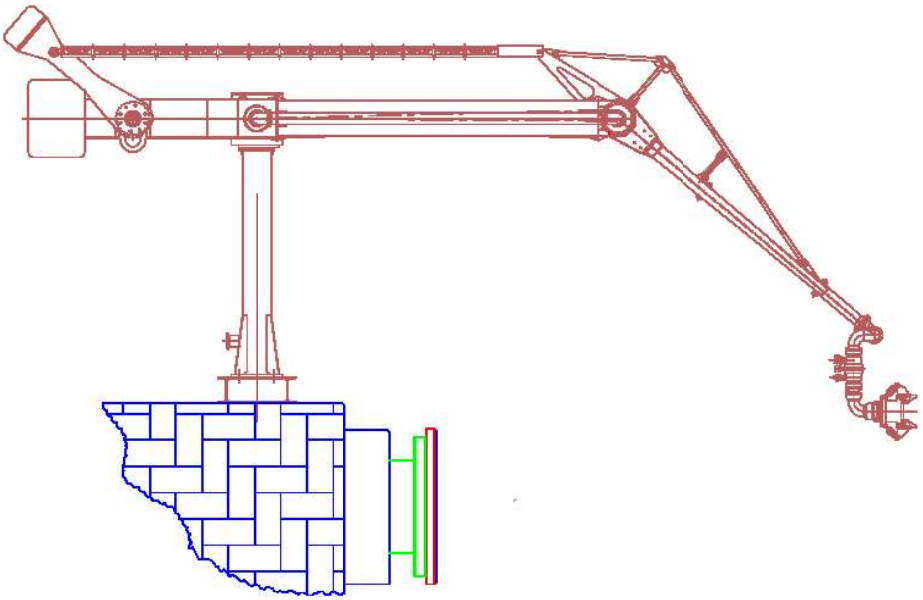
Engineering

Baretti is directly involved in all phases of supply of MLA for the transfer ship-to-shore and shore-to-ship of hydrocarbons, LNG and Chemicals:

- Design of the structure, joints, kinematic mechanism, safety devices etc;
- Structural Pier and connected piping verification and design;
- Mooring point, dolphin, hook up design and verification;
- Firefighting prevention and protection system design and verification;
- Construction in the workshop of the loading arms components and relative assembly;
- Hydraulic test and FAT (Factory Acceptance Test);
- Installation of the pier;
- Site Acceptance Test and start up assistance;

Baretti also provides specialised engineering services that identify an industrial Project. Particularly:

- Feasibility Study Estimated Costs
- Process Study
- Operating manual execution
- Basic engineering Design
- FEED - Front end Engineering Desing



MAIN STRUCTURE

Riser

The Riser is fixed to the jetty and is connected to the terminal piping system.
At the upper end of the riser is secured a cubic structure supporting the inboard arm. Inside this cubic structure are installed two bearings, two swivel joints concentric to the bearings and one 90° elbow flanged to the joints.
Disassembling only the 90° elbow there is the possibility to replace immediately joints and gaskets.
During maintenance operation even without the 90° elbow and joints, the marine loading arm can operate in each position without limitations.

Outboard Arm

The Outboard arm has a tubular section equal to the nominal diameter of the Marine Loading Arm.
At the end section of the outboard arm is connected an auto-levelling system composed by triple swivel and flanged elbow, this system allow the perfect coupling of the manifold to the vessel.

Inboard Arm

It is built by a self-supported structure anchored to the cubic structure by a thrust bearing.

At the front end of the inboard loading arm is placed a connection bearing for the main part of outboard arm and its joint, complete with a 90° flanged elbow.

Excluding the 90° elbow there is the possibility to replace quickly the joint and gaskets of the outboard arm.

During maintenance operation even without the 90° elbow and joints, the marine loading arm can operate in each position without limitations.

The thrust bearing and the joint give to the outboard loading arm a vertical rotation controlled and counterbalanced by a pantograph system with double counterweights .

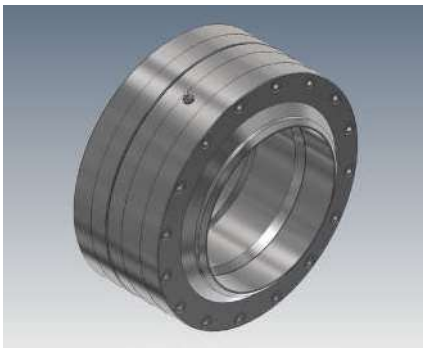
The back end of inboard loading arm is composed by a fixed counter weight support system ,all part of the main structure.

By request it is possible to equip the loading arm with a hydraulic motor and by means of an endless screws the hydraulic motor can be regulated to assure balancing of the loading arm in full and empty conditions.

MAIN STRUCTURE

Swivel Joints

The swivel joints, thanks to the thrust bearings application, are released from all the static and dynamic actions; they are merely subject to those stresses due to the pressure of the liquid loaded into the Marine Loading Arm.
The swivel joints are manufactured in high resistant alloy (steel), provided with sealing devices suitable to stand mechanical actions and pressure together with chemical products attacks. Baretti produce swivel joint with single race ball bearings or with dual race ball bearings.

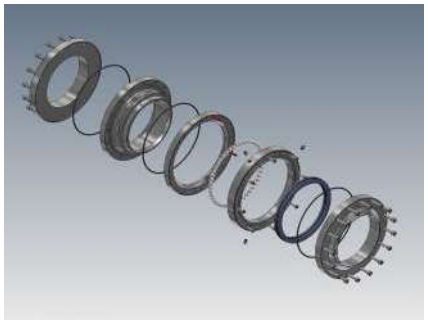


single race ball bearings

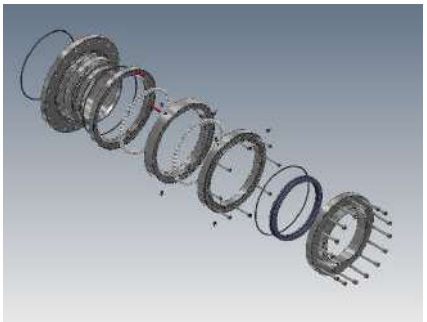
Each joint is designed to be disassembled without disassembling the main element to the loading arm, for maintenance purpose.
The lubrication of the joints is made by normal lubricating plant. The lubrication plant is equipped of a special gasket that stops any water and dust infiltration.

double race ball bearings

The swivels are pre-lubricated at the factory.
All Baretti Swivel Joint are high precision engineered and manufactured to realize a product with minimal possibility of leakage, reduced maintenance.



single race ball bearings



double race ball bearings

FEATURES

ERC (by MIB)

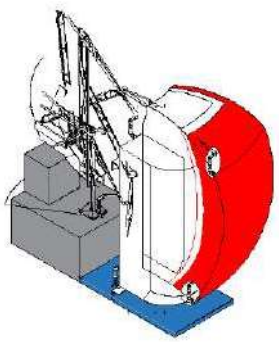
ERC (Emergency Release Coupler) is a security device that allows arm release if condition is dangerous (e.g. strong wind, sea storm, or other causes).
Before the arm release the two ball valve must be closed by an actuator, so that the leakage of product will be minimum. ERC is always expected in liquefied natural gas (LNG) service.

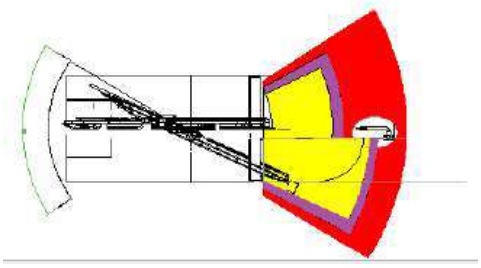
Hydraulic and Manual QCDC (by MIB)

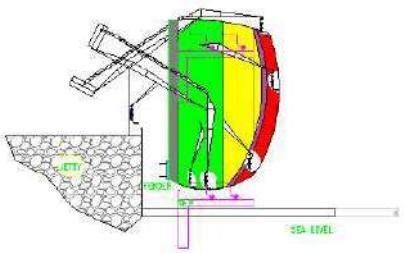
MIB QCDC (Quick Connect Disconnect Coupling) is the quick and easy method to connect and disconnect a rigid marine arm or jetty hose to and from the vessel manifold.
Available for ambient, low temperature, cryogenic and CNG service conditions. QCDC coupling is hydraulically operated and can be adaptable to various sizes of manifold flange. Customised designs available on request from 2" to 24" diameter.
Sometimes is used the manual QCDC, a simple but effective method of achieving quick connection and disconnection to and from flanges. A series of cam locking units on the periphery of the coupler flange are clamped or unclamped by a hand held wrench.

Monitoring System

A MONITORING SYSTEM is available for monitoring the actual position of the Loading Arm at a remote location, for Central control of Power Pack & Jetty head console.







NEW INNOVATION

Baretti, in addition to manufacture Marine loading arms (with cylinder and motors hydraulic) has recently patented an MLA fully operated with electrical motors.

The electrical motors combined with slew ring bearing allow a 360 degree rotation and an optimal speed control resulting in smooth movements avoiding the accelerations while starting or stopping and the resulting oscillations of the structures, resulting by the use of oleodynamic cylinders.

Moreover, the continuous reading of the angular position of each moving part of the arm are the bases for a remote electronic control allowing an automatic coupling to the manifold without the need of jetty staff.

Another immediate advantage of this design is to avoid any crane, scaffolding and pontoons for the maintenance drastically reducing shut-down period and costs.

Compared to standard's design of marine loading arms, Baretti's electric loading arms achieve a remarkable (extraordinary) improvement in functional performance, reduce the possibility of pollution and guarantee greater safety for jetty's staff manoeuvring operations.

SITE SERVICE AND SPARE PARTS

Baretti offers supervision services covering the installation, commissioning or decommissioning / refurbishment and handover.
Baretti supplies all types of arms, refurbished or overhauled and follows all processes during the installation, respecting all safety and environmental standards thanks to the fact that all activities are always followed and managed by one specialized referent.

Our Service Engineers carry out the following activities:

- Survey
- Supervision
- Periodical inspection (half yearly, annual and biennial)
- Maintenance, Modification & Repair
- Training for operators and maintenance staff

"All Our products are designed by Our In-House Engineering Department"

Our technical team is available 24 hours a day to assist our client.
For any enquiry and clarification please contact us at info@baretti.it