JAEGER

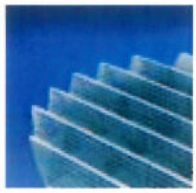
TOWER PACKING · TRAYS · COLUMN INTERNALS

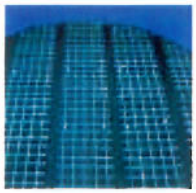
Jaeger Column Internals

Product Bulletin 1100

Superior performance by design™

JAEGER PRODUCTS, INC.





JAEGER COLUMN INTERNALS

FEATURES

The performance of packed columns that use modern high efficiency packings is closely related to the performance of the other internals such as liquid distributors and collectors. Packed towers work as a unit so careful selection and design of the proper internals is crucial.

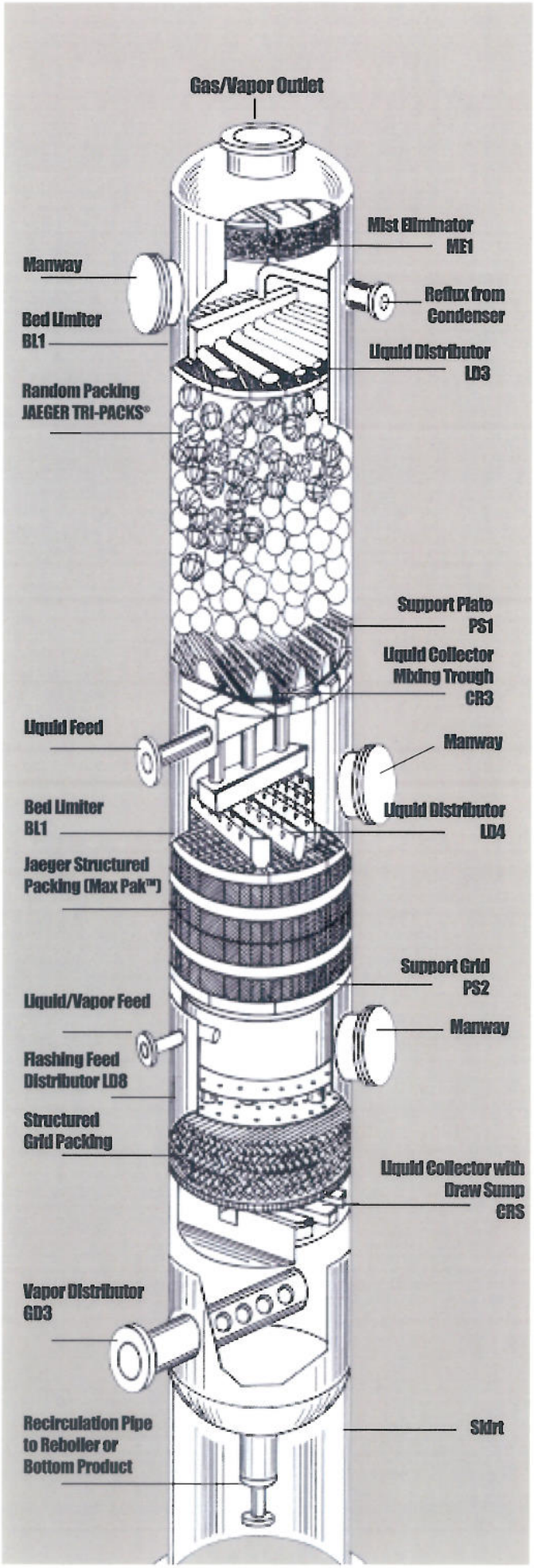
Jaeger Products offers a complete line of tower internals to be used with random or structured packings. These internals are specifically designed and selected to maximize the performance of the packings and can be used effectively in many different combinations. Jaeger internals are available in metal, plastic, ceramic or fiberglass for applications in corrosive, hot, and/or pressurized chemical systems as well as for hydrocarbon applications and ambient air-water systems.

Contents of a Packed Column

The contents of a packed tower will vary based on application and performance requirements. The column at the right illustrates the various components that might be used in typical installations. Generally, the column will contain a gas inlet, a packing support plate, random or structured packing, a bed limiter, a liquid distributor, vapor outlet, and perhaps a mist eliminator. Most column internals are custom designed for the intended application and therefore vary in description and performance. Many process columns utilize multiple liquid feed inlets and draw trays requiring careful and detailed design.

Typical Applications

Absorption	Mixing
Desorption	Demisting
Distillation	Aerating
Rectification	Degassing
Extraction	Desalting
Precipitation	Stripping
Biofiltration	Scrubbing
Humidification	Drying
Condensation	Cooling
Particulate Removing	Oil-Water Separations



JAEGER PRODUCT INTERNALS
STANDARD MODELS

Liquid Distributors	Orifice Pan/Plate	LD1
	Orifice Drip Tube	LD2
	Lateral Pipe Pressurized Flow	LD3
	Trough	LD4
	Weir Riser	LD5
	Spray Nozzle	LD6
	Lateral Pipe Gravity Flow	LD7
	Flashing Liquid	LD8
	Special Design	LDS
Collector/Redistributors	Orifice Pan/Plate	CR1
	Orifice Drip Tube	CR2
	Total Mixing Orifice	CR3
	Total Mixing Trough	CR4
	Weir Riser	CR5
	Special Design	CRS
Packing Supports	Multibeam Gas Injection Plate	PS1
	Grating	PS2
	Expanded Metal/Screen	PS3
	Special Design	PSS
Gas Distributors	Riser Collector	GD1
	Tray	GD2
	Sparger	GD3
	Special Design	GDS
Mist Eliminators	Mesh Pad	ME1
	Chevron	ME2
	Combination	ME3
	Packed Bed	ME4
	Special Design	MES
Bed Limiters	Grating	BL1
	Expanded Metal/Screen	BL2
	Special Design	BLS
Liquid Collectors/ Product Draw	Tray/Vapor Stacks	CT1
	Parallel Troughs	CT2
	Chevron	CT3

DESIGN AND APPLICATION CONSIDERATIONS FOR JAEGER INTERNALS SELECTION

Jaeger Products offers a wide variety of internals for a given function. The selection among different types of internals (i.e., liquid distributors) is made based on the characteristics of the application. Some internals operate better at high loads, some at low. Some exhibit better turn-down than others. The following list summarizes the points to be considered in the selection of the proper internal.

Liquid Distributors

- tower diameter
- pourpoint density
- geometric coverage
- turndown
- presence of solids
- pressure drop
- liquid pressure
- liquid condition
- entrainment
- type and size of packing
- feed inlets
- space to top of packing
- material selection

Packing Supports

- tower diameter
- pressure drop and capacity
- packing type and size
- combinations with collector/redistributors
- load limitations
- material selection

Mist Eliminators

- efficiency/capacity
- presence of solids
- gas velocity and properties
- pressure drop
- liquid load
- mist size and properties

Liquid Collector/Redistributors

- same as for liquid distributors
- total and effective mixing
- gas redistribution

Gas Distributors

- column size
- inlet nozzle design
- available pressure drop
- turndown
- space availability
- material selection

LIQUID DISTRIBUTOR APPLICATION GUIDE

Liquid Distributor Model #	Material*	Diameter Range (Normal)	Liquid Flow Range (Not Turndown)	Driving Force	Typical Turndown
LD1	M, P, C	10" - 20'	2-50 GPM/ft²	Gravity	2-3
LD2	M, P	10" - 20'	0.5-20 GPM/ft²	Gravity & Overflow	2-10
LD3	M, P	10" - 20'	4-20 GPM/ft²	Pressure	2
LD4	M, P, C**	2' - 20'	0.5-50 GPM/ft²	Gravity & Overflow	2-10
LD5	M, P, C**	10" - 20'	2-40 GPM/ft²	Overflow	8
LD6	M, P	6" - 20'	0.5-40 GPM/ft²	Pressure	1-2
LD7	M, P	10" - 20'	2-40 GPM/ft²	Gravity	2-3

COLLECTOR/REDISTRIBUTOR APPLICATION GUIDE

Redistributor Model #	Material*	Diameter Range (Normal)	Liquid Flow Range (Not Turndown)	Driving Force	Typical Turndown
CR1	M, P, C	10" - 20'	2-50 GPM/ft²	Gravity	2-3
CR2	M, P	10" - 20'	0.5-20 GPM/ft²	Gravity	2-10
CR3	M, P	2' - 20'	2-20 GPM/ft²	Overflow	2-10
CR4	M, P	2' - 20'	1-50 GPM/ft²	Gravity	8
CR5	M, P, C	10" - 20'	2-40 GPM/ft²	Overflow	8

VARIOUS INTERNALS APPLICATION GUIDE

Packing Support Model #	Material	Type of Packing	Free Area Range
PS1*	M, P, C	Random	70-120%
PS2	M, P, C	Structured or Random	70-95 %
PS3**	M	Random	70-85%
Gas Distributors Model #	**Material**	**Typical Pressure Drop**	**Tower Diameter Range**
GD1	M, P, C	0.5-5" water	10"-20'
GD2	M, P, C	0.5-5" water	10"-20'
GD3	M, P	0.5-30' water	10"-20'
Bed Limiters Model #	**Material**	**Type of Packing**	**Free Area Range**
BL1	M, P	Random	70-95 %
BL2	M	Random	50-85%

*Normally for 8" to 20' diameter units. **Light Duty

MIST ELIMINATOR APPLICATION GUIDE

Mist Eliminator** Model #	Material	Minimum Droplet Size	Typical Pressure Drop
ME1	M, P	1 *	0.5"-5" water
ME2	M, P	10 *	0.5"-1.0" water
ME3	M, P	1 *	1"-5" water
ME4	M, P, C	5 *	0.2"-0.5" water

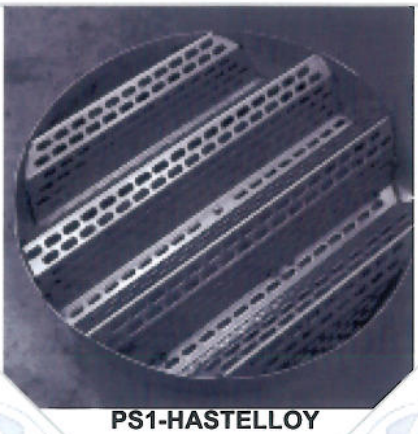
*1 droplet removal is possible but requires special design considerations. Consult Jaeger Products for more details.

**Diameters may range from 2' to 20'.

*M= Metal P = Plastic C = Ceramic **Ceramic internals have a maximum diameter of 3'.

JAEGER INTERNALS

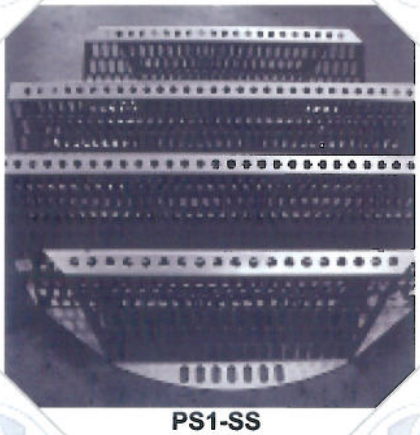
PS1-CERAMIC



PS1-HASTELLOY

PS1-PLASTIC

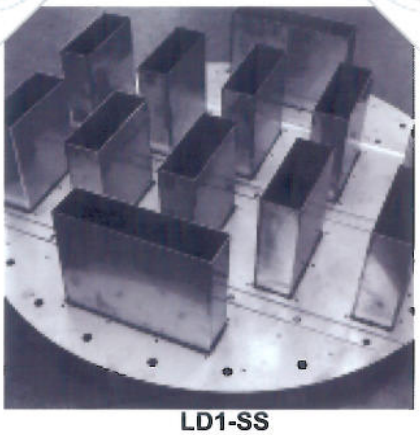
PS1-SS



PS1-SS

PS1-FRP

CR1-SS



LD1-SS

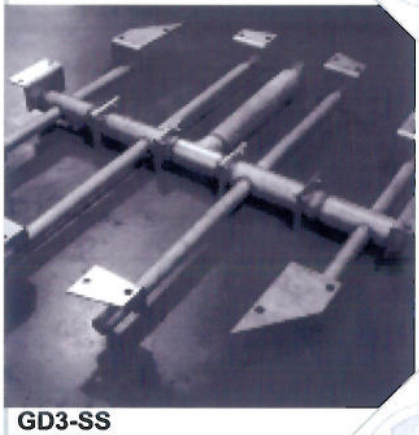
LD1-SS (Flange Mount)

JAEGER INTERNALS

BLS-HASTELLOY

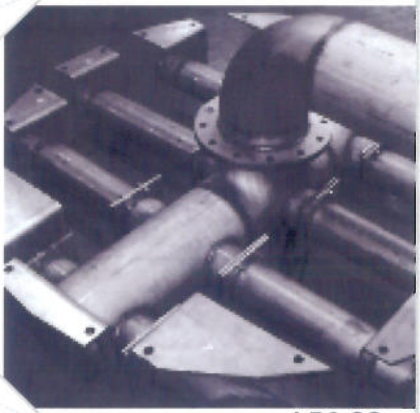
ME1-SS

BL2-SS

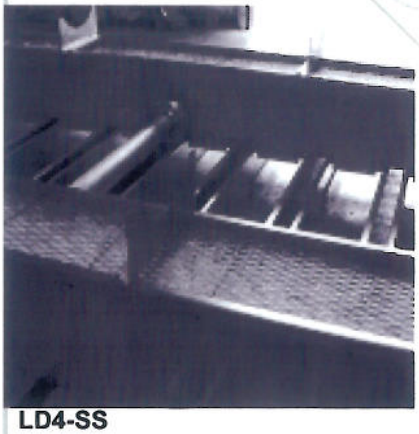


GD3-SS

LD3-SS

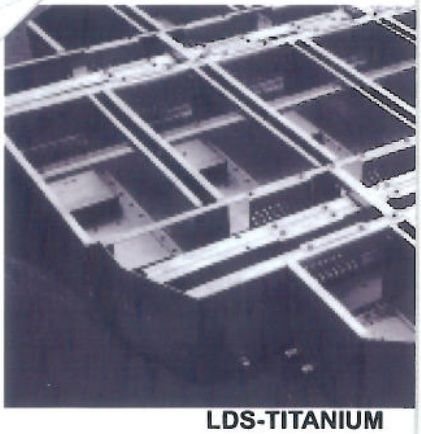


LD3-SS



LD4-SS

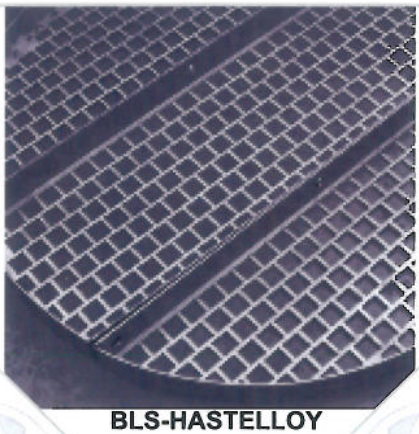
LD4-SS



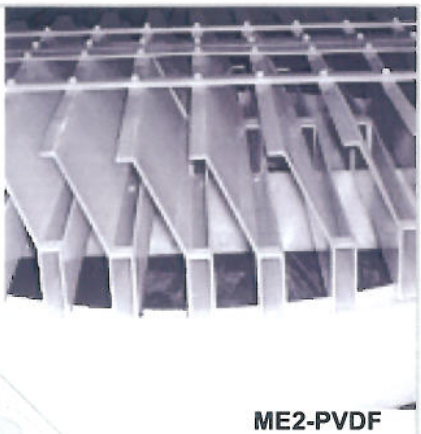
LDS-TITANIUM

JAEGER INTERNALS

ME1-SS

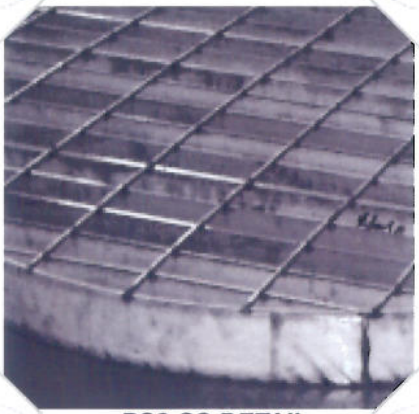


BLS-HASTELLOY



ME2-PVDF

LDS-TITANIUM



PS2-SS DETAIL

FEED GALLERY-TITANIUM

LD2-SS

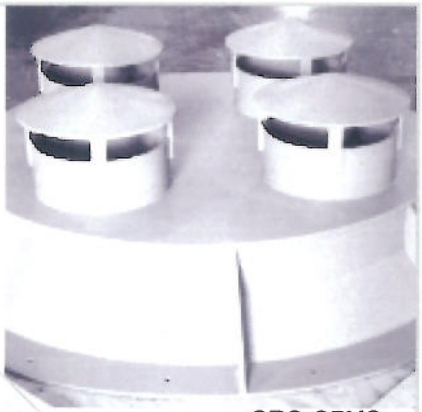
CR1-SS

PSS-PTFE

JAEGER INTERNALS

PS2-SS

LDS-TITANIUM

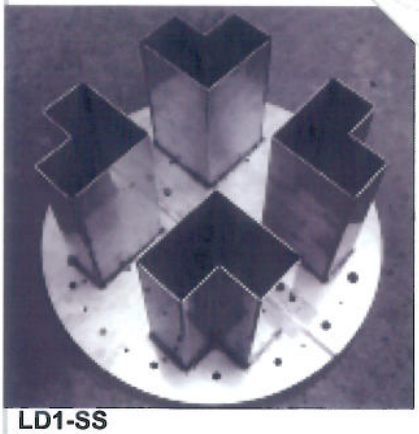


CRS-CPVC

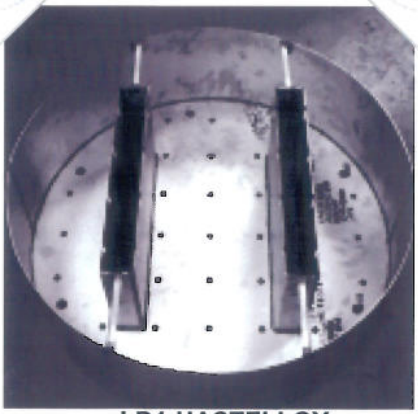
LD4-SS

LD4-TITANIUM

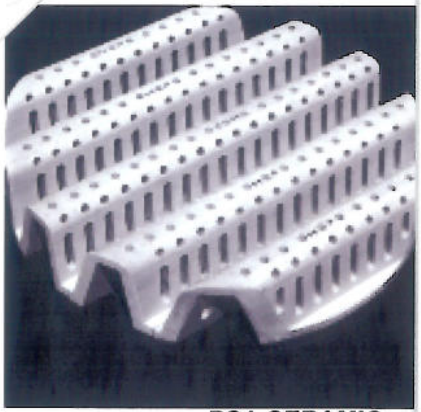
LD4-SS



LD1-SS

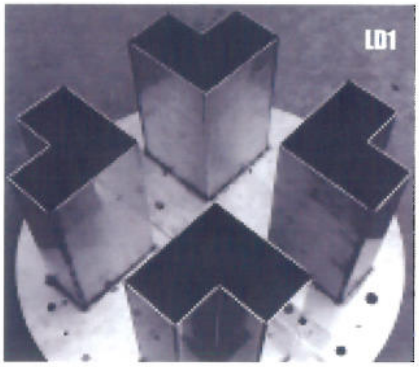


LD1-HASTELLOY



PS1-CERAMIC

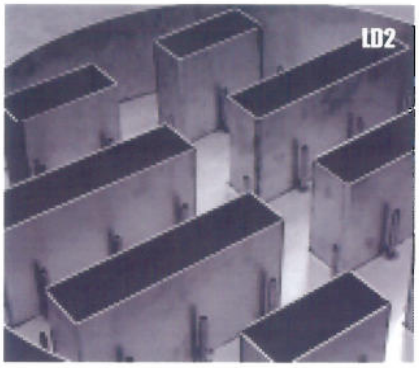
JAEGER INTERNALS



ORIFICE PAN/PLATE LIQUID DISTRIBUTORS
LD1

Orifice pan liquid distributors by Jaeger Products are made in various sizes and designs. Typically all sizes have round or rectangular chimneys with a flat floor sealed to the vessel support ring. These distributors can also act as bed limiters by having anti-migration bars/rods in the open areas. These devices can sometimes be used as redistributors with the addition of covers over the vapor risers; with a perimeter wall, it can be used like a pan .

Orifice pan/plate liquid distributors can be made in plastics, metals or ceramics. Depending on the size, material and thickness of the plate, proper support beams (by others) are required to provide full structural strength. Larger units are usually sectioned to pass through a manway.

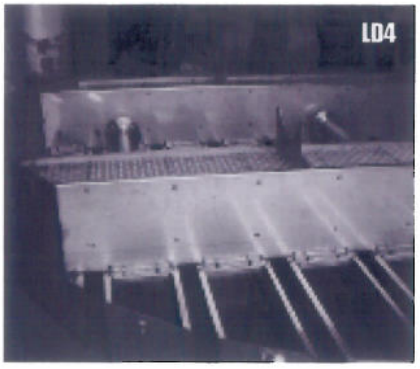


ORIFICE PAN/PLATE DISTRIBUTORS WITH DRIP TUBES
LD2

This Model is similar to Model LD1 except drip tubes are used in place of some or all of the plate orifices. The LD2 is used to increase the turn-down ratio or to accommodate a fouling service. Turn-down ratios of 10:1 are practical without increasing riser height. When used for fouling service, solids settle out on the deck and clear liquid flows through the drip tubes.

LATERAL PIPE DISTRIBUTORS WITH PRESSURIZED FLOW
LD3

The LD3 model distributor is a pipe-ladder type which can be designed for a wide variety of applications. It is a pressure driven distributor where the liquid is delivered through metering orifices in the branch pipes. Typical pressure drop is 1-5 psi. LD3 distributors are commonly utilized in scrubber and stripper services with moderate-to-high liquid rates. The LD3 is not recommended for low liquid rates or fouling systems or ones with suspended solids due to the potential for plugging of the metering orifices. Conditions which favor the use of an LD3 include high vapor velocities and limited space availability. LD3 distributors can be made in a variety of plastics and alloys.



TROUGH DISTRIBUTORS
LD4

LD4 Trough Distributors are Jaeger's most versatile model. Their applications range from low liquid rate and high purity distillation systems to high liquid rate and fouling services, depending on specific design features. Turndown characteristics are very good (at least 2:1 for single orifice design and up to 10:1 for multiple orifice and/or slot, v-notch design).

Liquid is introduced into the parting box, which properly distributes the liquid into the troughs. Generally, one parting box is required for smaller towers. Multiple parting boxes are used for large diameters or high liquid rates. Proper support beams (by others) are required for larger towers to provide structural strength. LD4 distributors can be made in plastics, FRP or metals and ceramics.

WEIR/RISER DISTRIBUTOR/REDISTRIBUTOR
LD5/CR5

This type of liquid distributor/redistributor is used when great variations of liquid flow need to be handled. They are suited for diameters up to 48". The plate is constructed with a perimeter wall and has circular chimneys with V-notches. The liquid flows over the V-notches down through the chimneys. The gas rises upwards through the same chimneys. The plate is smaller than the tower ID and is supported on clips so that additional gas flow is allowed along the annular space reducing the pressure drop. The plate floor needs to be periodically cleaned when used in dirty service. The chimneys are provided with caps with a space for gas flow in the redistributor. Redistributors are made without the outside wall and are clamped to the support ring to seal the liquid. The picture shows a special design involving multiple V-notches/riser and orifices on floor.

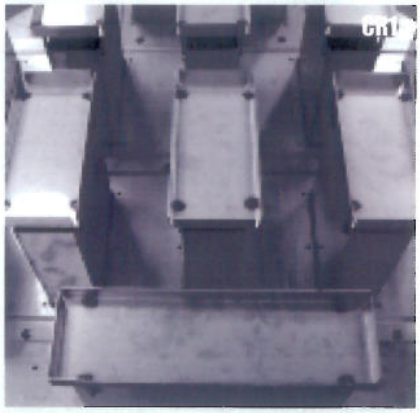
SPRAY NOZZLE DISTRIBUTOR
LD6

Model LD6 liquid distributors are similar to the pipe-ladder LD3 design except that the liquid is delivered to the packing through pressure driven spray nozzles. Typical pressure drop for this design is 5-20 psi and turndown is typically limited to 2:1. The piping and spray nozzle layout depends upon parameters such as tower size, liquid flow rates, fouling potential, and available space. The preferred application for the LD6 is direct contact heat transfer; however, they have been successfully employed in many scrubbing and stripping applications as well. They are not recommended for most distillation services. LD6 distributors can be made in a variety of plastics and alloys.

COLLECTOR/REDISTRIBUTORS
CR1

Redistributors by Jaeger Products are similar to the orifice pan/plate liquid distributors with risers. CR1 collectors are composed of a flat perforated plate with round or rectangular chimneys. The risers or chimneys have caps on them to prevent falling liquid from bypassing. Anti-migration bars/rods are sometimes placed in the risers to make the CR1 work as a bed limiter. Redistributors are normally used when a long packed bed section has to be split up into smaller sections or when an intermediate feed is inserted in the column.

Redistributors are made in one piece or multiple sections depending on the application and column. Proper support beams (by others) are sometimes required to provide structural strength.



GAS INJECTION SUPPORT PLATES
PS1

Gas injection support plates or multibeam supports, as they are also called, are supplied by Jaeger Products in various sizes and designs. They are composed of corrugated sheets perforated with slots/holes to separate gas and liquid flow paths maximizing total throughput. The slots/holes are laid out in an uniform pattern where the open area approaches or exceeds the cross-sectional area of the tower. Normally the holes on the top and sides are allocated for gas flow while those on the floor/valleys are designated for liquid flow. The slots/holes sizes are such that the packings do not fall through them. When a tall packed bed is split into two or more beds, the plate is installed with a matching redistributor below it. The angle of corrugation, height and width of each beam varies with design and material used.

The multibeam support plates are available in various metals, plastics and ceramics. Sometimes in larger diameter towers proper gussets inside the beams as well as support beams (which are usually supplied by the vessel fabricator) are required for greater loads. In plastics, properly encapsulated FRP or steel rods are sometimes provided to add to the structural strength of the beams. Units are normally made either in one piece or sections depending on ease of installation and manway opening size.

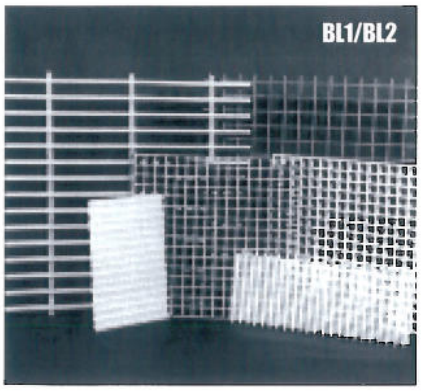
SUPPORT GRATINGS
PS2

Support Gratings by Jaeger Products are the simplest and least expensive type of packing supports. They also utilize the least vertical space. They are designed for low to medium gas loading when used for dumped packing and typically have 50 to 90% open areas depending on the material used.

The support grids are available in various materials such as plastic, FRP and metals. They can also be used as bed limiters. Sometimes support beams are required for structural reasons depending on the material and size of the support grate.

All molded plastic and FRP supports are bi-directional and are generally manufactured without outside bands since this feature adds little strength to the finished product. Bar gratings, which are unidirectional in either FRP or metal, are generally banded.

BED LIMITERS
BL1/BL2



Bed limiters or holddowns, as they are also called, are to limit the packing bed from moving or lifting up and getting packing pieces entrained away from the bed. A grating is placed over the packed bed to eliminate this problem. They are secured to the wall or loosely placed on the packing in which case their own weight is adequate to prevent any lifting of packings. They are made of rods and bars or in combination with screens or expanded metal depending on the application. Jaeger Products has a variety of materials and designs to fit your specific requirements.

For economy, gratings in metal, plastic and FRP, may be sold in rectangular sheets which can be cut to the required size and shape in the field.

MESH PAD MIST ELIMINATORS
ME1

Jaeger Products offers high efficiency wire mesh mist eliminators. These highly reliable and efficient mist eliminators consist of coils or layers of knitted wire mesh. They are usually held together by top and bottom support grids. The complete unit is secured, either from the top or the bottom, to a support ring welded into the column. The mesh and grid material can be metal or plastic depending on the application. Proper support beams are sometimes required to provide structural strength.

The mist is carried upward by the gas flow, impinges on the wire mesh and separates from the gas flow. At the point of separation, the mist starts to flow downward through the wire mesh and unites to form large droplets which then fall down into the vessel. The separation performance is influenced by the wire diameter and specific surface area of the wire mesh and increases with gas flow velocity. A maximum flow velocity is not to be exceeded, however, since it would cause the drops to blow through. Flow velocity, pressure drop and fractional separation efficiency for different droplets' diameters can be calculated in accordance with the gas and liquid operating conditions and properties and the type of mist eliminator selected.

CHEVRON MIST ELIMINATORS
ME2

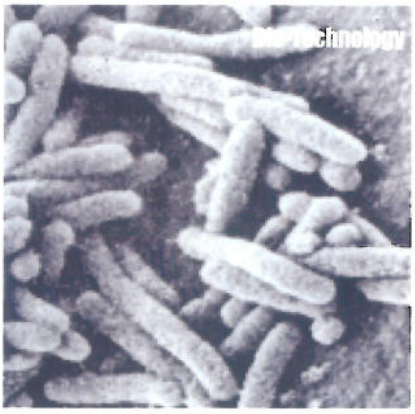
Jaeger Products can supply chevron or plate type mist eliminators. They are suitable for high liquid load, dirty services and high capacities. They can be applied in horizontal flow or used in vertical up-flow. The chevron units can also be supplied with proper housings. They can be made in sections to be installed through a man-way. Droplet sizes down to 10 microns can be removed. Most specs can be met when these are combined with mesh pad mist eliminators (ME1). The chevron units can be made in plastics or metals. Please consult Jaeger Products for your specific requirements.

OTHER PRODUCTS AND SERVICES

JP-7

Jaeger is the only packing supplier to offer products to enhance the longevity and use of your packing. Fouling can be detrimental to any system and Jaeger has options for many applications. Our pretreatment product, called JP-7 is a proven technology using inorganic polyphosphates. The non-toxic formulation specifically sequesters soluble iron, manganese, calcium, magnesium, and silica in the process water. JP-7 also acts as a corrosion inhibitor, laying down a microscopic film to lower the corrosion rates of iron, copper, lead, stainless steel, and other piping components.

JP-7 is introduced to the process stream through a common chemical feed pump. It can be supplied in 5, 15, 30, and 55-gallon drums, or delivered in bulk form. JP-7 is thermally stabilized which offers enhanced shelf life and use. Call Jaeger with your water analysis for prompt dosage calculations and quotation. For additional information on this product, request Brochure 900.



Bio-Technology Products

Through a national distribution agreement with Bio-Systems Corporation, Jaeger now offers a broad range of bio-augmentation products for municipal, industrial, and commercial applications. Our products are used worldwide to reduce wastewater treatment, spill cleanup, soil remediation and solid waste disposal problems. Our products enhance and stabilize the existing biomass by making available a selected range of high performance microbial strains leading to higher efficiency and fewer plant management problems. Produced in and ISO 9002 certified facility, each biological product is formulated and packaged for your specific need. Our microorganisms are blended with potent nutrients and stimulants to assure optimal performance under the toughest of conditions.

Technical services include consultation, product recommendation, assistance with toxicity testing, treatability studies, chemical and bacterial analysis, and microscopic photography. For additional information on Jaeger's bio-technology products, call our corporate office or request Brochure 900.

Getting The Most From Your Packing

Fouling problems can cause packed towers to perform below expectations and design. Fouling is caused by solids in the process liquid, precipitation of minerals during the process, or bacterial deposition that eventually build up on internal surfaces of the tower and packing elements. Problems associated with fouling are generally not present immediately after startup, but typically will build and degrade performance over a period of time. The result is a loss in efficiency, capacity, and increased pressure drop. The added weight of entrapped solids can also have detrimental effects on other internals as well as the structural integrity of the tower shell.

Claims have been made that a particular shape of packing element is more resistant to plugging than others. These claims are based on "tests" in the field where variables are anything but controlled. Unfortunately, there is no single "truly non-plugging" packing type.

Over the years, Jaeger Tri-Packs® have become the standard by which plastic random packings are measured. In the laboratory, as well as in the field, Jaeger has accumulated a wealth of knowledge on how to deal with fouling problems while optimizing your stripping and absorption efficiencies. Additional information is available in Brochure 600–FP.

For More Information:

General Brochure
Series 100

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-- Complete Technical Catolog includes all of the above along with other technical and performance information.

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Manufactured and Marketed by:

Jaeger Products, Inc.
1611 Peachleaf Street
Houston, TX 77039
Phone: 281.449.9500 • Fax: 281.449.9400
800.678.0345 www.jaeger.com

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