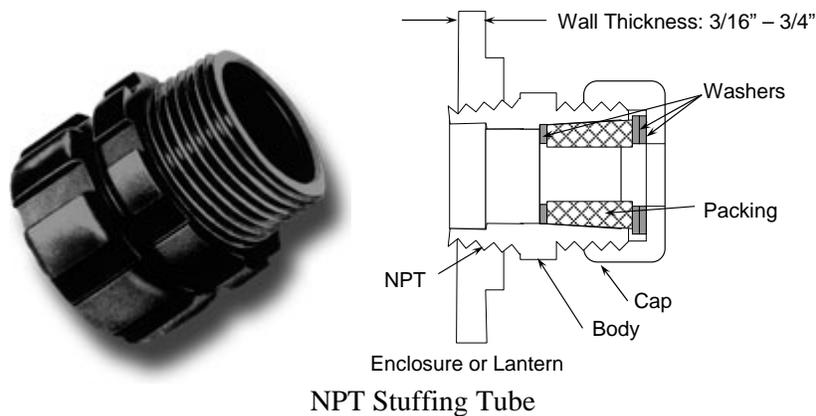


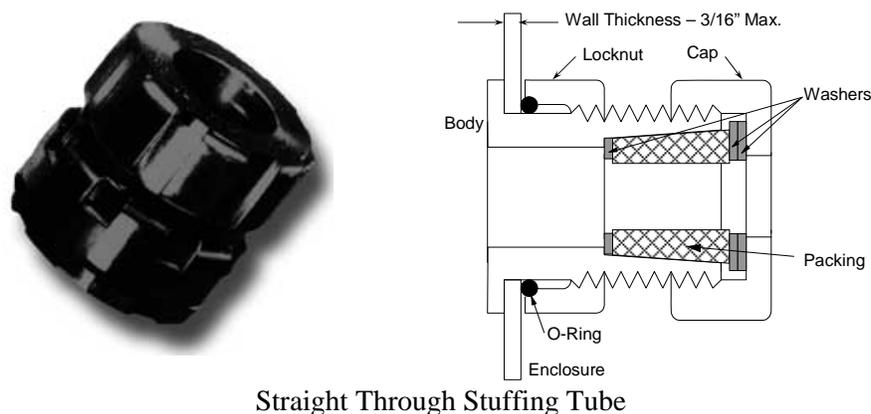
Ocean Engineering Technical Data Sheet Stuffing Tubes

Stuffing tubes are devices used to allow a wire or cable to pass through a wall or bulkhead and protect components from the outside environment. Many units have problems selecting the right stuffing tube or assembling them correctly which leads to component failure due to moisture intrusion. The following is a primer on stuffing tubes.

One of the most important tasks is identifying the type of stuffing tube to use. Thin-wall bulkheads (up to 3/16" thick with through holes) like enclosures or boxes use the straight-through models. Thick wall bulkheads (3/16" or thicker with tapped holes) use the NPT model (NPT stands for American Standard Taper Pipe Threads) like lantern bases, range lights, etc. The correct stuffing tube must be used or it will leak. NPT stuffing tubes can not be used in thin boxes with through holes and a nut to secure them (I have seen this happen). A box using a NPT stuffing tube will always have a threaded hole. The watertight seal is maintained by the interference fit of the tapered pipe threads.



Likewise, a straight-through stuffing tube can not be used in a threaded hole. The watertight seal is maintained by an O-ring sandwiched between the locknut, body and enclosure.



You have to select a stuffing tube that fits the enclosure and can accept the packing assembly for the cable passing through it. Both versions of stuffing tubes come in many sizes; we generally use only use three sizes, as detailed on the next page:

Dorn Equipment Corporation Stuffing Tubes (available via MILSTRIP)

Size	Style	Cable Range (jacket outside diameter)	Hole Size (diameter or NPT)	NSN 5975-00-
1	Straight*	0.077" – 0.296"	0.885"	296-4092
1	NPT	0.077" – 0.296"	½" NPT	808-4063
2	Straight*	0.275" – 0.472"	1.010"	296-4093
2	NPT	0.275" – 0.472"	¾" NPT	808-4064
4	Straight*	0.450" – 0.777"	1.260"	296-4095
4T	Straight*	0.450" – 0.777"	1.385"	989-5046
4T	NPT	0.450" – 0.777"	1" NPT	892-9259

Dorn stuffing tubes have the size imprinted on the cap.

* Straight Stuffing Tubes do not come with an O-Ring; see last page.

The packing assembly is the heart of the stuffing tube. They are not included with stuffing tubes and must be ordered separately. The packing must be correctly sized to tightly grip the cable. Determine the outside diameter of the cable using a set of dial calipers. If none are available, use a ruler to approximate the diameter to a 32nd of an inch. Convert to decimal using the chart below and find a packing assembly to fit the stuffing tube.

Decimal Equivalents

1/4"	0.250"	3/8"	0.375	1/2"	0.500	5/8"	0.625
9/32"	0.281"	13/32"	0.406	17/32"	0.531	21/32"	0.656
5/16"	0.313"	7/16"	0.438	9/16"	0.563	11/16"	0.688
11/32"	0.344"	15/32"	0.469	19/32"	0.594	23/32"	0.719

Each stuffing tube assembly uses a range of packings to accommodate the different cable sizes*. The correct packing must be used because if it's too large it will not seal around the cable and if it's too small it will be difficult to slide over the jacket.

Packing Assemblies for Size 1 Stuffing Tubes

Packing No.	Cable Range (jacket outside diameter)	NSN 5330-00-
1A	0.137" - 0.187"	202-2580
1A1	0.077" - 0.127"	202-2581
1A2	0.100" - 0.150"	202-2582
1B	0.184" - 0.234"	202-2583
1B1	0.228" - 0.278"	202-2594
1C	0.244" - 0.296"	202-2585

Packing Assemblies for Size 2 Stuffing Tubes

Packing No.	Cable Range (jacket outside diameter)	NSN 5330-00-
2A	0.275" - 0.325"	202-2586
2B	0.317" - 0.367"	202-2587
2C	0.340" - 0.390"	202-2588
2D	0.375" - 0.425"	202-2589
2E	0.422" - 0.472"	202-2590



* Size 3 stuffing tubes are not used because they have a very limited range. Many of our enclosures contain Size 2 stuffing tubes, and our lanterns are tapped for 3/4" NPT threads which require a Size 2 stuffing tube. However, our standard solar panel wire is smaller (0.240") than the range specified for a 2A packing assembly, but the packing will compress and seal around this wire. Continue to use Size 2 stuffing tubes in marine lanterns and Size 1 for new

bulkhead enclosures and apparatus with a 1/2" NPT threads when sealing solar panel cable. An alternative for NPT applications is to use the Tideland NavGrip cable gland, discussed below.

Packing Assemblies for Size 4 & 4T Stuffing Tubes

Packing No.	Cable Range (jacket outside diameter)	NSN 5330-00-
4A	0.450" - 0.500"	202-2591
4B	0.497" - 0.547"	202-2592
4C	0.534" - 0.584"	202-2593
4D	0.559" - 0.609"	202-2594
4E	0.610" - 0.665"	202-2595
4E1	0.650" - 0.700"	202-2596
4F	0.669" - 0.719"	202-2597
4F	0.710" - 0.760"	202-2598
4G	0.727" - 0.777"	202-2599

Other Sources.

Tideland Signal Corporation manufactures its own line of stuffing tubes called NavGrip/GMU Cable Glands. They are only available in the NPT version for 3/16" or thicker threaded enclosures/lanterns. Glands and replacement grommets (packing) may be purchased via Tideland's GSA schedule: GS-07F-6104P, phone: 337-269-9113, website: www.tidelandsignal.com.



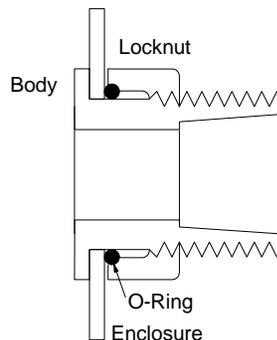
Tideland NavGrip/GMU Cable Glands

Cable Gland Size	Cable Range	Cable Gland & Grommet Assy	Replacement Grommet Assy
3/4" NPT	0.250" – 0.375"	620.1004-04	303.1071-04
3/4" NPT	0.375" – 0.500"	620.1004-02	303.1071-02
3/4" NPT	0.500" – 0.625"	620.1004-01	303.1071-01
3/4" NPT	0.625" – 0.750"	620.1004-03	303.1071-03

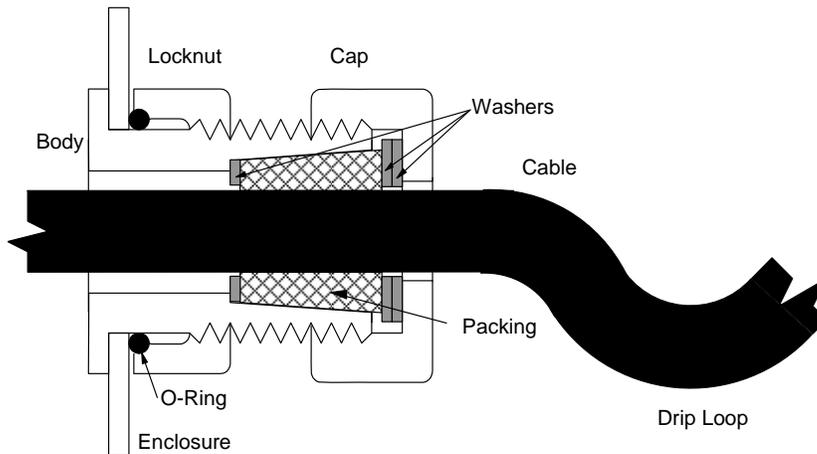
(1/2" NPT sizes are also available)

Assembly.

Body. Correct assembly of the stuffing tube is very important to ensure a leak-free seal. For NPT stuffing tubes, Teflon tape or pipe joint compound should be used to seal the threads between the stuffing tube and housing. Tapered pipe threads will tighten as the stuffing tube is inserted, so tighten gradually, but firmly to seat the threads. Likewise, the straight-through stuffing tube must be installed properly. First, remove the cap and then the locknut. Slide the O-ring off the body of the tube and insert it through the hole from inside the enclosure. The hole in the enclosure must be sized properly and free of burrs. Slide the O-ring over the body against the outside of the enclosure, screw on the locknut and tighten using a spanner wrench (McMaster-Carr is a good source for spanner wrenches), as shown below:



Packing. The packing assembly is the most important component of the stuffing tube, and often installed incorrectly. First, determine the wire size, then which size stuffing tube is being used (size 1, 2, 4) and then choose the correct packing/gland assembly. Dorn assemblies come packaged in a small envelope and contain the rubber packing and three plastic washers (Tideland glands only have one washer). Two of the washers are the same size, one may be smaller. The smaller washer is inserted into the stuffing tube first to prevent the packing from being squeezed through the body. The two same-sized washers are installed on top of the packing beneath the cap. For Tideland's NavGrip glands, only one washer is used between the cap and grommet (packing). The washers are very important because as the cap is tightened, they slip and prevent the packing from twisting. If the packing twists, voids will be made along the wire allowing water to wick into the enclosure. The packing is installed the same for both the straight-through and NPT stuffing tubes, as shown below:



The cap should be tightened so that the cable can not be forcibly pulled or pushed through the packing. A drip loop will prevent water from traveling down the outside of the cable and gathering on the stuffing tube. Additionally, water can travel inside the cable into the enclosure if the jacket is cut or the opposite end is not terminated properly.

Unique problems. If you have unused Dorn stuffing tubes in an enclosure, a neoprene plug can be inserted in place of the packing. Washers are not required (nor supplied) when using the plug. Popular sizes are listed below:



Plugs for Dorn Stuffing Tubes

Plug Size	NSN
1	5975-00-296-3863
2	5975-00-296-3862
4 & 4T	5975-00-296-3861

Angled Stuffing Tubes. Wire connections that require a 90 degree angle to enter the enclosure can use the Dorn angled stuffing tubes. However, they are only available in the straight-through design and are not suitable for enclosures with NPT threaded holes.



Dorn 90 Degree Stuffing Tube Sizes

Size	Cable Range (jacket outside diameter)	Hole Size (diameter)	NSN
1	0.077" – 0.296"	0.885"	5975-00-503-4694
2	0.275" – 0.472"	0.885"	5975-00-503-4693
4T	0.450" – 0.777"	1.260"	5975-00-989-5045

“Y” Stuffing Tubes. Trying to stuff two wires into a box with only one stuffing tube? Instead of drilling another hole, use the “Y” stuffing tube. They are available from Dorn, but only in the straight-through design and are not suitable for enclosures with NPT threaded holes.



Dorn “Y” Stuffing Tube Sizes

	Cable Range	Hole Size	
Size	(jacket outside diameter)	(diameter)	NSN 5975-00-
1	0.077” – 0.296”	0.885”	782-6139
2	0.275” – 0.472”	1.010”	782-6140
4T	0.450” – 0.777”	1.260”	782-6142

O-Rings for Straight-Through Stuffing Tubes. O-Rings for straight-through stuffing tubes ordered via MILSTRIP must be ordered separately.

O-Rings for Straight-Through Stuffing Tubes

Size	NSN 5331-
1	00-640-9161
2	00-580-5056
3	00-641-0231
4 & 4T	01-121-0192

Spanner Wrench. An adjustable spanner wrench for tightening the cap and lock nut without marring it is available from McMaster-Carr (<http://www.mcmaster.com>) for use with 1 through 4T stuffing tubes, part number 5471A11.



Additional information is available on the Dorn website: www.dornequipment.com.