



HARDWARE FOR
TOWER
INTERNALS

INTRODUCTION

Hanbal Masstech Limited[HMT] is a leading company which designs and manufactures Tower Trays, Internals, Packings, Reactor Internals, Wire Mesh Demisters, Mist Eliminators, etc. Our company has been providing these products for Chemical Companies, Oil Refineries, Petrochemical Plants, etc., as well as Engineering and Construction Companies since being founded in 1971.

We joined Norton Chemical Process Products Corporation in 1979 as Sales Representatives and worked with them as the manufacturer, Joint Venture Partner[Norton Hanbal Korea Inc.], design/manufacturer and Licensee until April 2002.

We conducted R&D with the Korea Institute of Energy Resource [KIER]. Especially noteworthy has been the R&D undertaken with the KIER, Ruhr University in Germany, and Hanbal, as a Fractional Research Inc, [FRI] member for five years under government assistance. Our R&D with KIER continues every year.

We have learned most of the design fabrication technologies from Norton CPPC, but we have some of our own that will meet our customer's specific requirements.

Since we know what and how Norton has tested, we built an indoor test facility, 12 meter indoor facility, for distribution quality tests. What we have designed is unquestionable, we conduct tests to make sure our products are perfect.

We also design and produce traditional style internals which are good for easy towers and those costs are about 30% less compared to the high performance towers.

We thank you all for your help and concerns rendered to us so far and wish to do the same in the future.

Sincerely, President & CEO



HARDWARE FOR TOWER INTERNALS



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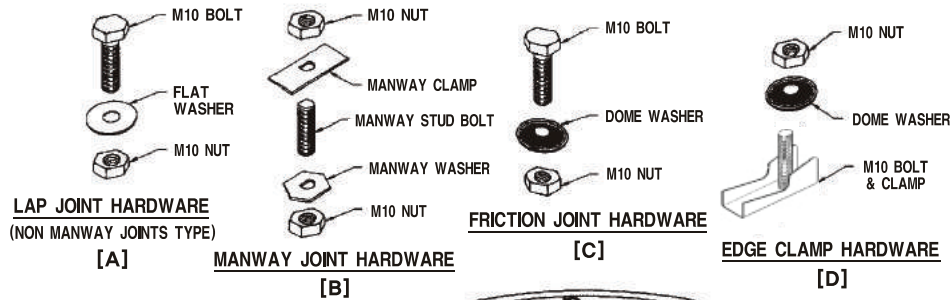


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NOTE

1. Other types of hardware are also available.
2. Available in Carbon steel, Stainless steel of 410, 304[L], 316[L], 317[L], Titanium, Monel, HASTELOY-C, PP, CPVC and other materials on request.

TYPICAL HARDWARE DETAILS FOR TRAYS

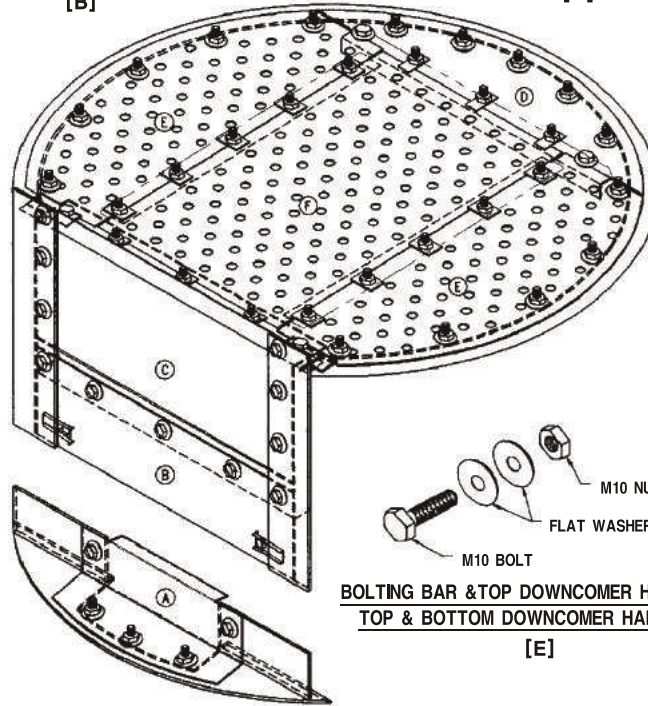


NOTE.
INCH STANDARD
ALSO AVAILABLE

DESCRIPTION
(A) SEAL PAN
(B) BTM. DOWNCOMER
(C) TOP DOWNCOMER
(D) INLET DECK
(E) ACTIVE DECK
(F) MANWAY

INSTALLATION
INSTALLATION FOR THIS DESCRIPTION PATTERN
(A) THRU (F)



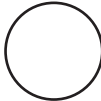
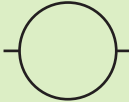



REMOVAL
REMOVAL FOR THIS DESCRIPTION PATTERN
(F) THRU (A)



BOLTING BAR & TOP DOWNCOMER HARDWARE
TOP & BOTTOM DOWNCOMER HARDWARE
[E]

ASSEMBLIES	COMPONENTS	PAGE NO.
[A]	M10 HEX BOLT	8
	FLAT WASHER	11
	M10 NUT	10
[B]	M10 NUTS	10
	MANWAY CLAMP	7
	MANWAY STUD BOLT	8
	MANWAY WASHER	11
[C]	M10 HEX BOLT	8
	DOME WASHER	11
	M10 NUT	10
[D]	M10 NUT	10
	DOME WASHER	11
	CLAMP	6
[E]	M10 HEX BOLT	8
	FLAT WASHERS	11
	M10 NUT	10

MATERIAL SYMBOLS AND DESIGNATIONS

MATERIAL	STAMPED SYMBOL
304 SS	
304L SS	
316 SS	
316L SS	
410 SS	
410S SS	
321 SS	
MONEL	M
TITANIUM	T

CLAMPS

ITEM NO.	ITEM DESCRIPTION	
<p>HW-C01</p>	<p>CLAMP</p>	
<p>HW-C02 (NORTON TYPE K-74452)</p>	<p>CLAMP</p>	
<p>HW-C03</p>	<p>CLAMP</p>	
<p>HW-C04</p>	<p>CLAMP</p>	

CLAMPS

ITEM NO.	ITEM DESCRIPTION	
HW-C05	CLAMP	
HW-C06	J-CLAMP	
HW-C07 (NORTON TYPE G-32)	MANWAY CLAMP	

BOLTS (METRIC)

ITEM NO.		ITEM DESCRIPTION
HW-B01	M6 HEX BOLT	
HW-B02	M8 HEX BOLT	
HW-B03	M10 HEX BOLT	
HW-B04	M12 HEX BOLT	
HW-B05	M16 HEX BOLT	
HW-B06	M20 HEX BOLT	
HW-B07	M6 J-BOLT	
HW-B08	M10 J-BOLT	
HW-B09	M12 J-BOLT	
HW-B10	M16 J-BOLT	
HW-B11 (NORTON TYPE G-31)	M10 MANWAY STUD BOLT	
HW-B12	M10 STUD BOLT	
HW-B13	M12 STUD BOLT	
HW-B14	M6 U-BOLT	
HW-B15	M8 U-BOLT	
HW-B16	M10 U-BOLT	
HW-B17	M12 U-BOLT	
HW-B18	M16 U-BOLT	
HW-B19	M20 U-BOLT	

BOLTS (UNIFIED)

ITEM NO.	ITEM DESCRIPTION	
HW-B01U	1/4"-20UNC BOLT	
HW-B02U	5/16"-18UNC BOLT	
HW-B03U	3/8"-16UNC BOLT	
HW-B04U	1/2"-13UNC BOLT	
HW-B05U	5/8"-11UNC BOLT	
HW-B06U	3/4"-10UNC BOLT	
HW-B07U	1/4"-20UNC J-BLOT	
HW-B08U	3/8"-16UNC J-BLOT	
HW-B09U	1/2"-13UNC J-BLOT	
HW-B10U	5/8"-11UNC J-BLOT	
HW-B11U (NORTON TYPE G-31)	3/8"-16UNC MANWAY STUD BOLT	
HW-B12U	3/8"-16UNC STUD BOLT	
HW-B13U	1/2"-13UNC STUD BOLT	
HW-B14U	1/4"-20UNC U-BOLT	
HW-B15U	5/16"-18UNC U-BOLT	
HW-B16U	3/8"-16UNC U-BOLT	
HW-B17U	1/2"-13UNC U-BOLT	
HW-B18U	5/8"-11UNC U-BOLT	
HW-B19U	3/4"-10UNC U-BOLT	

NUTS (METRIC)

ITEM NO.		ITEM DESCRIPTION
HW-N01	M6 HEX NUT	
HW-N02	M8 HEX NUT	
HW-N03	M10 HEX NUT	
HW-N04	M12 HEX NUT	
HW-N05	M16 HEX NUT	
HW-N06	M20 HEX NUT	
HW-N07	M10 WELD NUT	

NUTS (UNIFIED)

ITEM NO.		ITEM DESCRIPTION
HW-N01U	1/4" -20UNC NUT	
HW-N02U	5/16" -18UNC NUT	
HW-N03U	3/8" -16UNC NUT	
HW-N04U	1/2" -13UNC NUT	
HW-N05U	5/8" -11UNC NUT	
HW-N06U	3/4" -10UNC NUT	

WASHERS

ITEM NO.	ITEM DESCRIPTION	
HW-W01	ID11 X OD25 FLAT WASHER	
HW-W02	ID13 X OD25 FLAT WASHER	
HW-W03	ID11 X OD30 FLAT WASHER	
HW-W04	ID13 X OD30 FLAT WASHER	
HW-W05	ID11 X OD39 FLAT WASHER	
HW-W06	ID13 X OD39 FLAT WASHER	
HW-W07	M10 SPRING WASHER	
HW-W08	M12 SPRING WASHER	
HW-W09	M16 SPRING WASHER	
HW-W10	M20 SPRING WASHER	
HW-W11	DOME WASHER (ROUND)	
HW-W12 (NORTON TYPE G-42)	MANWAY WASHER	
HW-W13	SHIM WASHER	

VALVES AND CAPS

ITEM NO.	ITEM DESCRIPTION	
HW-V01	NHP(STD) VALVE	
HW-V02	NHP(LTD) VALVE	
HW-V03	MR2 HEAVY VALVE	
HW-V04	MR2 LIGHT VALVE	
HW-V05	MR2L HEAVY VALVE	
HW-V06	MR2L LIGHT VALVE	

VALVES AND CAPS

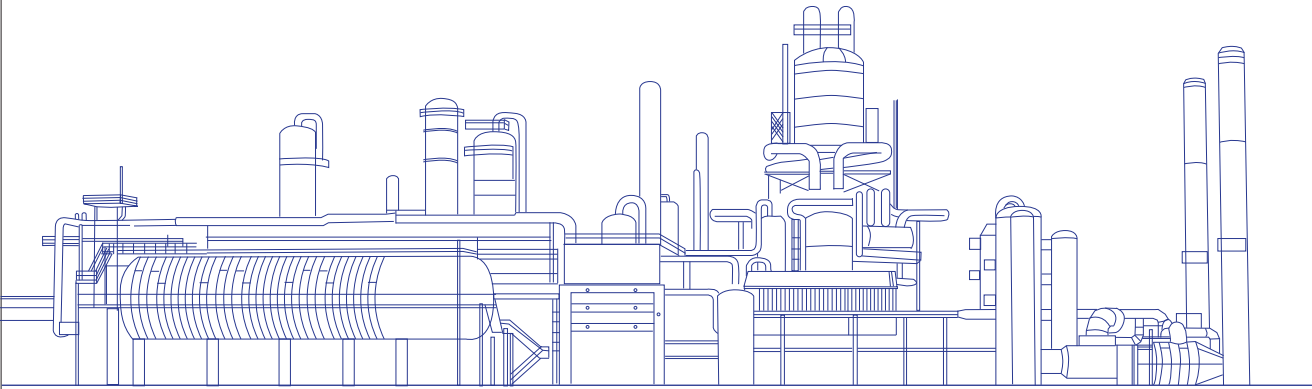
ITEM NO.	ITEM DESCRIPTION	
HW-V07	MR2 CAGE HEAVY VALVE	
HW-V08	MR2 CAGE LIGHT VALVE	
HW-V09	MR7 CAGE HEAVY VALVE (VENTURI HOLE)	
HW-V10	MR7 CAGE LIGHT VALVE (VENTURI HOLE)	
HW-V11	3" BUBBLE CAP	
HW-V12	4" BUBBLE CAP	
HW-V13	6 " BUBBLE CAP	

GASKETS

ITEM NO.	ITEM DESCRIPTION	
HW-G01	FIBER GLASS GASKET	
HW-G02	TEFLON GASKET	
HW-G03	NON-ASBESTOS GASKET	
HW-G04	CERAMIC FIBER ROPE GASKET	

OTHERS

ITEM NO.	ITEM DESCRIPTION	
HW-T01	BLANKING WEDGE	 A metal blanking wedge, which is a long, thin, slightly curved tool with a small notch at one end, used for cutting or blanking metal sheets.
HW-T02	SPLIT KEY	 A metal split key, which is a long, thin, slightly curved tool with a split end, used for locking and unlocking mechanisms.



HANBAL MASSTECH LIMITED

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