

A member of the Koch Chemical Technology Group LLC

KOCH KNIGHT LLC

KNIGHT-WARE[®] NEUTRALIZING SUMPS

Bulletin No.
NS 101G



Disposal of Acids and Corrosive Wastes with KOCH KNIGHT NEUTRALIZING SUMPS

Every laboratory and industrial plant using corrosives has the difficult problem disposing of acidic liquid wastes. The selection of equipment to handle such installations should be carefully considered. Since KNIGHT-WARE® Acid Proof Chemical Stoneware Sumps have been used for over 80 years as premium equipment in the actual manufacture, handling, and storage of highly corrosive acids and chemicals, it is the logical choice for equipment to handle such wastes.

KNIGHT-WARE® provides positive and permanent insurance against acid and chemical attack. KNIGHT-WARE does not depend upon a glaze or coating of any kind for its acid proof qualities - it's in the body itself". While alternative materials are available that may be resistant to some acids and corrosive chemicals, these materials can be readily attacked and destroyed by others. KNIGHT-WARE is universally acid and corrosion proof regardless of the concentration of the acids handled. The only exceptions are hydrofluoric acid and strong caustic solutions.

Sumps constructed of plastics should be avoided because most plastics are attacked by organic solvents which are normally present in laboratory wastes.

KNIGHT-WARE has also demonstrated excellent overall mechanical strength.

FUNCTION: The Knight Neutralizing Sumps illustrated are a simple and effective means of neutralizing laboratory and other dilute acid wastes. Generally, the neutralized waste may be discharged into the regular sanitary sewer systems without further treatment.

OPERATION: When properly sized and maintained, Knight Neutralizing Sumps will raise the pH of the acid waste by the chemical reaction between the calcium and magnesium carbonate content of the sump fill and the entering acid. The pH is normally increased to between 4.5 to 7.0 depending upon both the type and content of the acid in the waste being treated. This range of pH in the neutralized effluent is generally acceptable for discharge to most sanitary sewage collection and disposal systems. Where local regulations or conditions require a higher pH value, a final step may be employed where caustic or soda ash is added automatically, as illustrated on Page 8. This may also be required when mixed acid waste streams contain large amounts of hydrofluoric acid.

NEUTRALIZING FILL: The neutralizing fill is a specially selected, size-graded material. Any deviation from this material may cause malfunction of the sump. The initial fill is provided with the purchase of a sump. Contact Koch Knight LLC for replacement charges. A full charge of neutralizing fill is to the invert of the sump inlet.

MAINTENANCE: Periodically it is necessary to inspect the sump to add neutralizing fill and to remove any accumulated foreign material collected on top of the bed. For the average high school or college laboratory, this inspection should be done every six months unless actual experience indicates that it should be done more often. State, Federal and OSHA regulations and safety requirements for confined work areas should be observed when entering sumps.

VENTING: Normally, the only gas generated by the chemical reaction in the sump is carbon dioxide, which is not toxic, corrosive, or flammable. Also, solvents such as benzene, toluene, ether, etc. may be in the acid waste and will collect in the top of the sump. Venting will allow removal of these volatile materials. A vent connection is provided on sumps 18" and larger. Because of the necessity of compactness, it is not practical to include a vent on the 12" size sump. If required, a vent may be installed on the acid waste inlet line to the 12" sump.

SUMP CONNECTIONS: The sumps are provided with KNIGHT-WARE chemical stoneware hubs for use as a caulked bell and spigot joints. A typical joint is illustrated on Page 6. The materials and instructions for making the joints are available for each sump. Any type of plain end pipe such as silicon cast iron, cast iron, glass, or plastic can be connected to the sump. The standard locations of the single inlet and outlet are on opposite sides.

COLLECTION OF WASTES: The sump is an acid neutralizer and is not intended to function as an acid dilution chamber. It is not advisable to further diminish the acid strength of the dilute acid waste with the other non-acid wastes prior to neutralization. Wherever feasible, these non-acid wastes should bypass the sump.

SELECTING SIZE AND MODEL OF SUMP: It has been observed that each student position or laboratory sink will produce, on the average, about 10 gallons per hour of effluent in normal school, hospital, research, and similar laboratories. This is the basis for sizing sumps for laboratory use. Where two or more students are assigned to a single common sink, the number of students is controlling in the count. For commercial, industrial, and similar acid disposal applications, consult our Engineering Department. Refer to capacity tables for selecting size and model of sump. Multiple units can be connected when necessary to obtain required capacity.

For mixed acid wastes containing sufficient hydrofluoric acid to cause extensive corrosive damage to KNIGHT-WARE ceramic, alternate materials of construction are available on special orders.

SAMPLE SPECIFICATIONS FOR NEUTRALIZING SUMPS

Model 400 and 401 Neutralizing Sumps

Supply and install as shown on drawings Model _____ Style _____ Size _____ x _____ Neutralizing Sump as manufactured by Koch Knight LLC, East Canton, Ohio. The sump body should be formed of a dense acid-proof chemical stoneware vitrified in one piece complete with connections and dip pipe at a minimum of 2100°F with a chemical composition by weight of 63-68% SiO₂, 23-28% Al₂O₃, and an iron content of less than 1.5% as iron in combined form with no free iron. The inlet and outlet waste bell connections are _____ * bore size. The sump shall be supplied and installed with Knight Neutralizing Fill.

OPTIONAL – Use for Extension Piece

Provide and install Extension Piece made of chemical stoneware ceramic to permit ground or floor level entrance of _____ extension piece cover elevation and _____ sump inlet centerline elevation. Cover on Extension Piece shall not end up flush with finish grade.

For Model 506 – 600 Neutralizing Sumps

Supply and install as shown on drawings Model No. _____ Neutralizing Sump with an _____ OD x _____ OH as manufactured by Koch Knight LLC, E Canton, Ohio. The sump shell shall be constructed of 1/4" plate non-code mild carbon steel prepared suitable for rubber type linings with all welds double butt, continuous full welded, non-porous, and ground smooth and having no crevices, offsets or sharp edges. The bottom and side walls shall be lined with 1/4" thermoplastic sheet lining fused directly to white metal sandblasted and primed steel surface and covered with a chemical stoneware acid-proof ceramic lining _____ (a) _____ thick laid in PERMANITE® Acid and Alkali Proof Mortar. The _____ (b) _____ bore inlet and outlet bell sleeves and dip pipe shall be made of chemical grade stoneware ceramic. The exterior of the steel shall be protected with a 45 mil minimum #250 PYROFLEX® Coating applied to a sandblasted steel surface. The sump shall be supplied and installed with Knight Neutralizing Fill.

(a) Model 506 – 600	(b) Model 506 – 520 - 4"
	530 – 550 - 6"
	560 – 580 - 8"
	590 – 600 - 10"

OPTIONAL – Use for Manhole Extension

Provide and install 28" ID manhole extension constructed of carbon steel shell with an interior corrosion-resistant coating and an exterior 45 mil minimum #250 PYROFLEX® Coating to permit either ground or floor level entrance at _____ manhole extension cover elevation and _____ sump inlet centerline elevation (Model 506 only).

OPTIONAL – Use for Entrance Manway

Provide and install a 42" ID Entrance Manway constructed of carbon steel shell with an interior corrosion-resistant coating and an exterior #250 PYROFLEX® Coating complete with grade elevation cast iron frame and lid to permit either ground or floor level entrance at _____ grade elevation and _____ sump inlet centerline elevation. (Models 508-600 only).

Access for Maintenance

Continuing proper operation of a sump requires periodic addition of neutralizing fill material and eventual removal of its unreacted residue. Sufficient spaces should be allowed above and around the sump or extension cover for its removal, visual inspection and for the addition of fill material when required.

A sump cover should NOT be placed at floor level where it is subject to traffic. A separate metal manhole frame and cover is recommended for access to below grade sump installations. See Page 5.

SOME KOCH KNIGHT NEUTRALIZING SUMP INSTALLATIONS IN ACID WASTE SYSTEMS

Chemical Laboratories

Schools
Universities
Hospitals
Research Institutes
Testing
Industrial
Pharmaceutical

Photoengraving

Newspapers
Publishing Houses

Battery Acid

Auto Service Centers

Metal Cleaning

Electronics
Metal Finishing

Film Processing

Plating wastes may not be discharged to sanitary sewer because the metallic salts of chrome, nickel, copper, etc. are generally toxic and interfere with sewage treatment. Koch Knight LLC designs and manufactures Concentrators for recovery of plating solutions from rinse waters.

ACCESSORIES AND OPTIONS

INTERCEPTORS

It has been observed many times that certain laboratories, especially those in hospitals and medical research, generate lab waste streams often including lighter-than-water solids which settle on top of the neutralizing fill in the sump and accumulate there. If sump inspections are too infrequent, percolation of the waste acid stream through the sump can become very sluggish or, in extreme cases, can be stopped completely!

Other objectionable contaminants in waste acid streams are oils and waxes, both of which tend to coat the individual chunks of neutralizing fill. When this occurs, the stone is protected from acid attack and no further neutralization can take place. The neutralizing fill must then be removed, discarded, and replaced with a fresh neutralizing fill.

Such plugging and fouling of the neutralizing fill can effectively be prevented by installing an acid-proof interceptor upstream. Functionally, it becomes a stilling chamber from whose liquid surface the lighter-than-water contaminants can very easily be removed.

Model 401B (shown) would be considered adequate in volume of precede the 24" x 36" size sump and possibly the 30" x 57" size. As a rough guide to interceptor sizing, each neutralizing fill charged sump should be preceded by the next smaller size interceptor. Of course, the neutralizing fill is omitted from the sump used as an interceptor. Models 506 and 508 are good choices as interceptors to precede the 500 Series sumps.

CAULKING PACK

The sectional view of a KNIGHT-WARE® Bell and Spigot Joint shows the approved connection of pipe to a Knight Neutralizing Sump.

FACTORY-INSTALLED REDUCERS

All sumps 18" x 24" and 24" x 36" are made with nominal 4" size hubs for caulked inlet and outlet connections, and 3" size vent. Similarly, the 30" x 57" sump provides 4" size hubs for inlet, outlet, and vent connections. The 36" x 70" sump provides a 4" vent and 6" inlet and outlet.

When the pipe being used is smaller than the sump hub size, factory-installed reducers can be provided.

NEUTRALIZING FILL

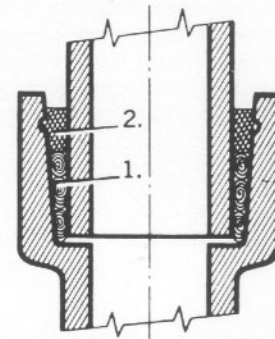
The neutralizing fill is specially selected, size graded material. Any deviation from this material may cause malfunction of the sump. The initial charge is provided with the purchase of the sump. Contact Koch Knight LLC for replacement charges. A full charge of neutralizing fill is to the invert of the sump inlet. Fill is packaged in 50 lb. Bags.

KNIGHT-WARE® Bell and Spigot Joint

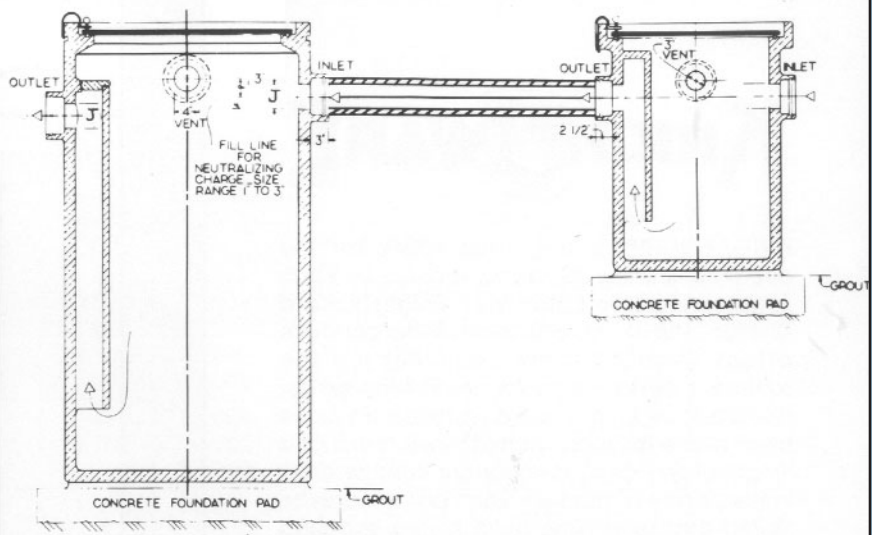
1. Three separate rings of acid-proof rope caulking (supplied by others).
2. Caulk with high quality silicon caulk to rim.

This joint method is used for connecting plain end of pipe of any of the acceptable acid waste line materials to sumps.

KNIGHT-WARE® acid-proof pipe and fittings for waste lines are available in a complete range of 4" through 15" bores.



SUMP INTERCEPTOR COMBINATION



MODEL 400 & 401

KNIGHT-WARE® Monolithic Chemical Stoneware Sumps

GENERAL NOTES:

CONSTRUCTION

Using a very stiff clay mix, these ceramic shells, complete with connections and dip pipe, are formed in one piece, carefully dried, then vitrified at a kiln temperature in excess of 2100°F. The end product is a dense acid-proof stoneware vessel, completely joint-free and inert to all chemicals except hydrofluoric acid and hot concentrated caustic.

FOUNDATION

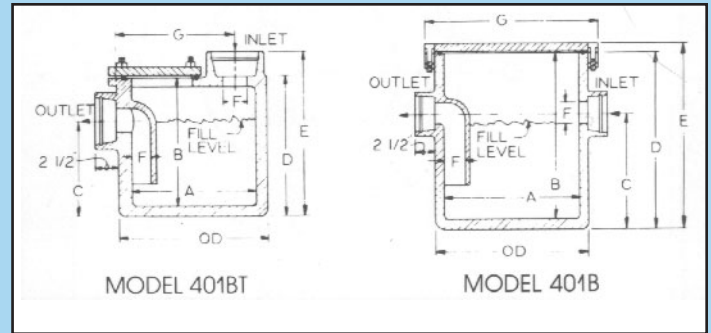
The 400 and 401 Series ceramic sumps should be bedded in a thin layer of sand or fresh stone-free grout on firm base. Avoid possibility of point bearings such as pebbles, rocks, or hard debris under bottom. When filled with neutralizing fill and water, the larger sumps involve considerable weight. Provide even load bearing when using beam supports; possibly using thin grout or roofing paper insulation.

MODEL 401 LOW CAPACITY

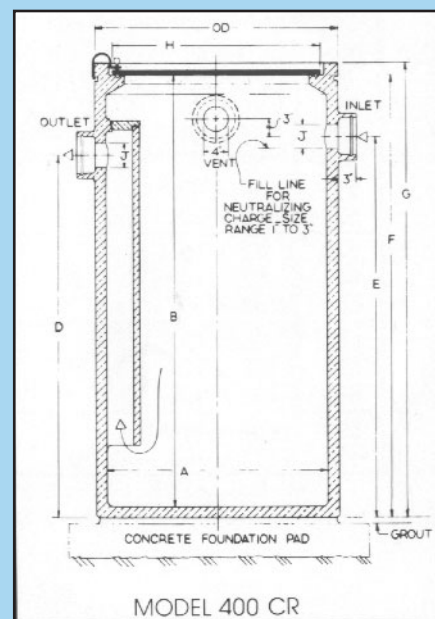
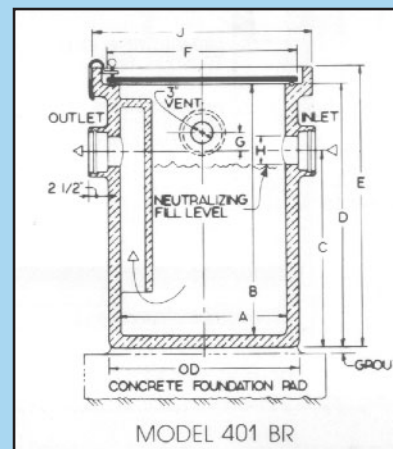
1-20 Student Stations

- Cover Style B – KNIGHT-WARE Flat-bolted Cover (12 x 12 only)
- BR– RESIBOND® Clamped Cover
Cover for top inlet-side outlet (12x12 only)

APPLICATION: Size 12" x 12" is suitable for installing in a laboratory cabinet under a sink. The Style BT may be connected to the sink drain without the need of an elbow. The sump may also serve as a trap when used with a single or two adjacent sinks. Sizes 18" x 24" and 24" x 36" sumps are installed to receive the waste from a collection system from a series of laboratory sinks. They are generally located in the building basement area or underground outside the building. If an extension is required to reach grade level for entrance to sump see Page 5.



	Size								Approximate Ship Weight	Neutralizing Fill	Student Stations
	A	B	C	D	E	F	G	Od			
401BT	12	X 12	8	13	15 1/2	2	11 1/4	14	80 lbs.	50 lbs.	1
401B	12	X 12	8	13	14 1/4	2	16	14	80 lbs.	50 lbs.	1



Size										Approximate Ship Weight	Neutralizing Fill	Student Stations
A	B	C	D	E	F	G	H	J	Od			
18	X 24	17	25 1/2	27 1/2	20 3/4	2 1/4	4	23 3/4	21	300 lbs.	200 lbs.	2 to 6
24	X 36	28	37 1/2	39 1/2	28 1/2	2 1/2	4	31 3/4	27			

MODEL 400 MEDIUM CAPACITY

21 – 70 Student Stations

Cover Style CR – RESIBOND® Clamped Cover

APPLICATION

These sumps are installed to receive the dilute acid wastes from a collection system from a series of laboratory sinks. They are generally located in a building basement area or underground outside the building. If an extension is required to reach grade level for entrance to sump, see Page 5.

Size										Approximate Ship Weight	Neutralizing Fill	Student Stations
A	B	C	D	E	F	G	H	J	Od			
30	X 57	24	46 1/2	49 1/2	58 1/2	60 1/4	27 3/4	4	33	1,200 lbs.	1,700 lbs.	21 to 40
36	X 70	30	59	62	71 3/4	74	33 1/2	6	39 1/2	2,300 lbs.	3,200 lbs.	41 to 70

MODELS 506 thru 600

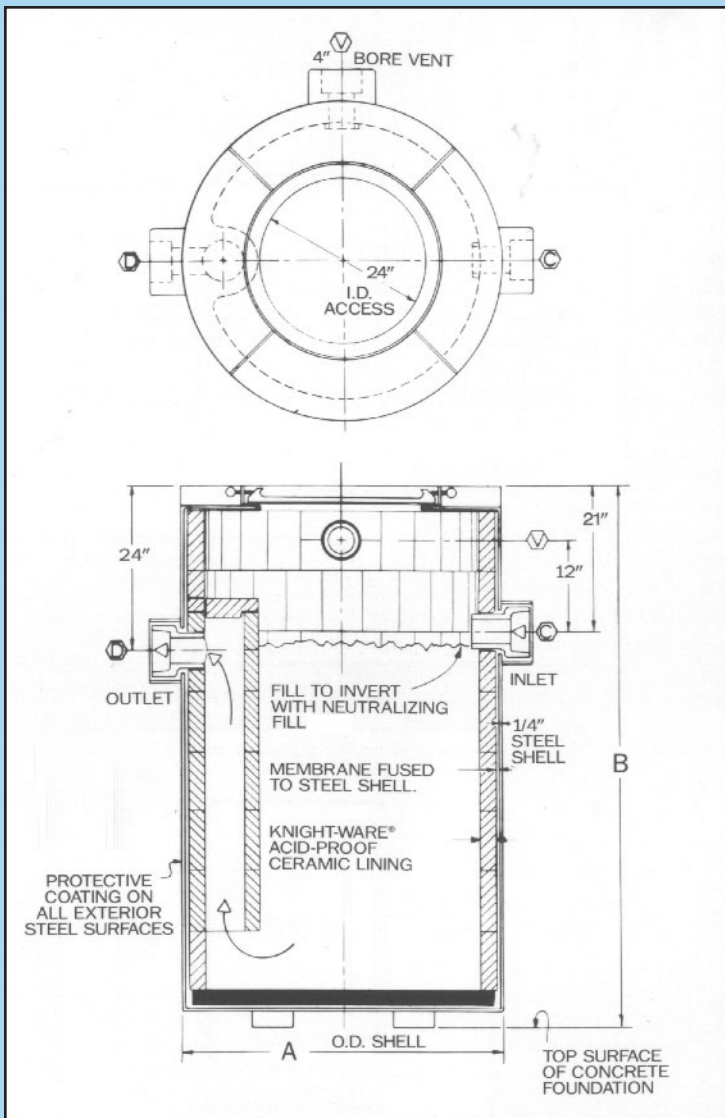
LARGE CAPACITY 60 – 1000 Student Stations

CONSTRUCTION OF SHELL is 1/4" mild carbon steel, factory lined with a 1/4" thick thermoplastic sheet lining fused directly to the sandblasted and primed steel surface, covered with a factory-installed KNIGHT-WARE® stoneware lining.

COVER: RESIBOND® removable cover (except Model 506 MX).

APPLICATION: These sumps are installed to receive the dilute acid wastes from a collection system or a series of laboratory sinks. They are generally located in the building basement or outside buried underground. If an extension is required to reach grade level, see Page 5.

FOUNDATION: The 506 – 600 Series steel shell ceramic lined sumps may be installed directly on a concrete pad. It should be large enough and adequately reinforced to support sump and contents without settling.



Sump Model No.	DIMMENSIONS-Inches		Shipping Weight lbs.	CAPACITIES (to invert of inlet)				
	A x B O.D x Height	C D Inlet & Outlet		Neutralizing Fill lbs	Cu.Ft.	Gallons	Maximum Effluent gal./hr.	Maximum Student Station
506	40 x 81		31,00	2,700	27	200	600	60
508	46 x 81		3,500	3,600	36	270	800	80
510	48 x 87	4	3,900	4,500	45	335	1,000	100
515	54 x 99		5,100	7,000	70	525	1,500	150
520	60 x 99		5,900	9,000	90	675	2,000	200
530	72 x 99		7,400	13,500	135	1,020	3,000	300
540	82 x 102	6	9,100	18,000	180	1,350	4,000	400
550	92 x 102		10,600	23,000	230	1,720	5,000	500
560	96 x 107		11,900	27,000	270	2,020	6,000	600
570	102 x 108	8	12,700	32,000	320	2,400	7,000	700
580	108 x 109		14,200	36,000	360	2,700	8,000	800
590	114 x 111	10	15,400	40,000	400	3,000	9,000	900
600	114 x 119		17,600	45,000	450	3,370	10,000	1,000

EXTENSIONS

Extension pieces provide access when a sump is installed below grade. When an extension is added, the RESIBOND® Cover is omitted and a cast iron frame and cover will be required.

For Models 400 and 401, the extension pieces are constructed of KNIGHT-WARE®. The extension is connected to the sump with a caulked bell and spigot joint. Standard one-piece extensions are limited to a minimum of 12" and a maximum of 36". Multiple extensions may be used when required. Single extensions are illustrated on this page.

For Model 506, a "Manhole Extension" is available. It is constructed of mild carbon steel lined with a corrosion-resistant coating. This style extension piece is joined to the sump with a caulked connection. Entrance to both the sump and extension is through a conventional cast iron frame and cover. The maximum length of the "manhole extension" is 24".

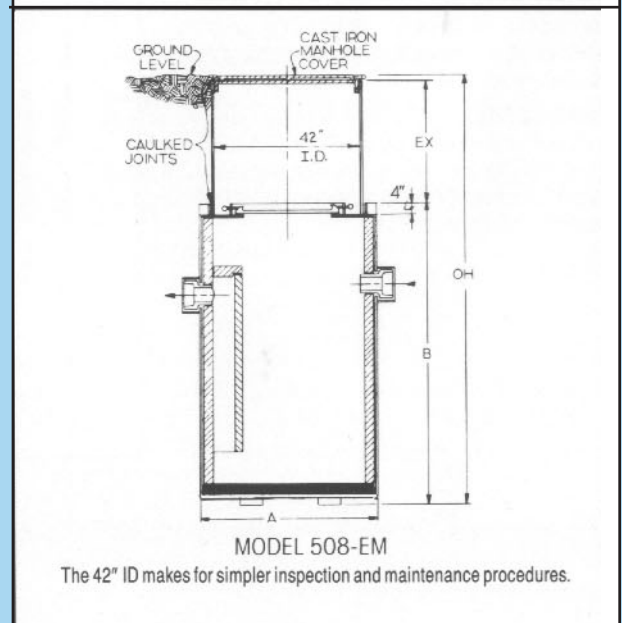
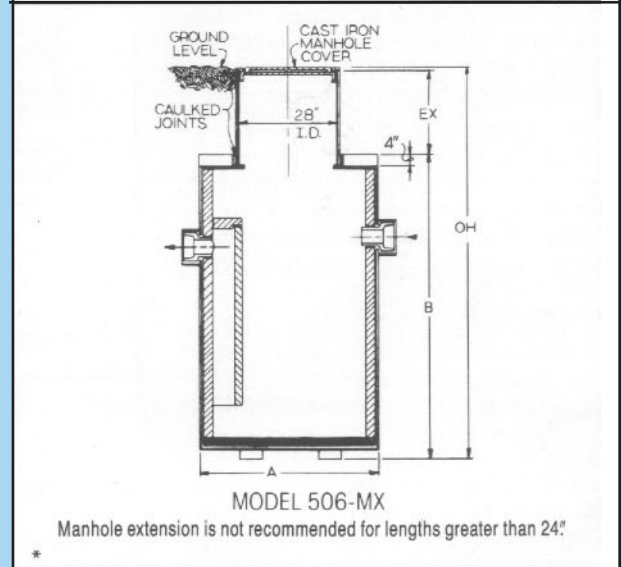
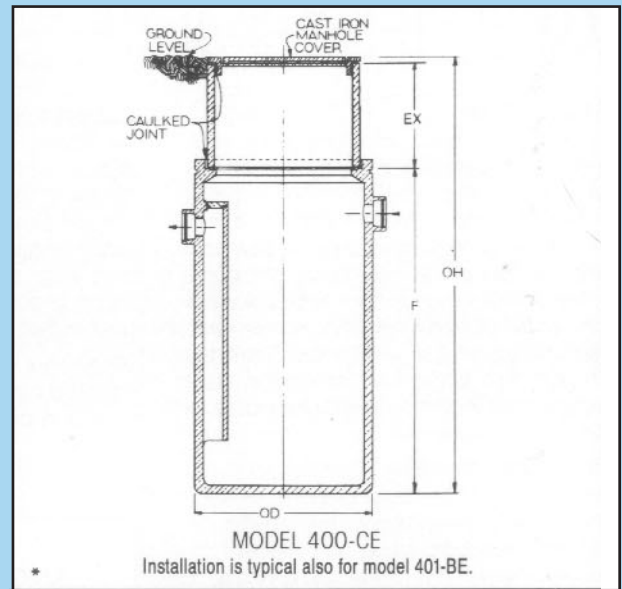
For Models 508 through 600, service access can be provided via the "Entrance Manway", regardless of depth. It is also constructed of mild carbon steel and coated with corrosion-resistant coating on the interior. This style extension is caulked to the sump top to provide a groundwater-tight joint. It is available in 42" ID and length as required. Entrance to the sump is through the standard 24" round manhole in the sump cover and entrance to the extension is through a conventional cast iron frame and cover.



KNIGHT-WARE is the trade-name for the chemical stoneware manufactured by Koch Knight LLC. This material is resistant to corrosive attack throughout the body, not just the surface, making it ideal for neutralizing sumps. Hundreds of Knight sump installations have been online for years without major repair. This length of service is an important consideration in the choice of product. Each unit is made by skilled craftsmen who build to the exacting specifications of Koch Knight engineers. This combination of specialized engineering and quality workmanship assures that each Knight sump will provide the desired durability.

Knight Neutralizing Sumps are designed to last the life of the building.

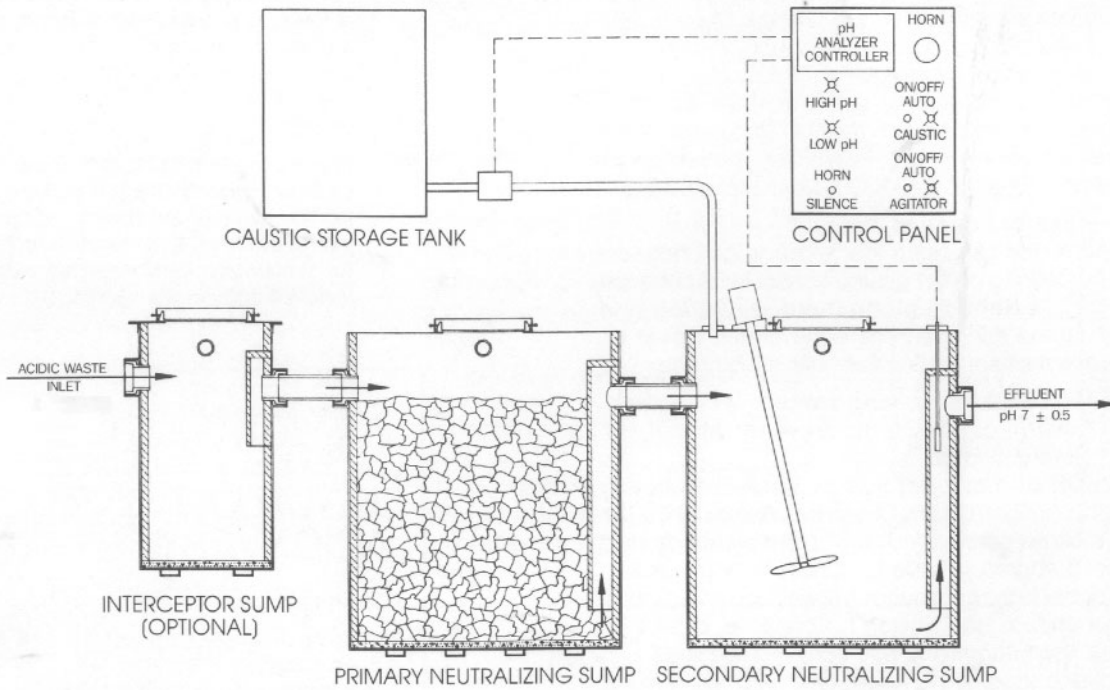
INSTALLATIONS



* NOTE: Cast iron manhole cover can be furnished by Koch Knight at an additional charge.

KOCH-KNIGHT TWO-STAGE ACID WASTE NEUTRALIZATION SYSTEM

For those applications where it is necessary to have an effluent stream in the range of 7.0, a two-stage neutralizing system is used. The bulk of the acidity is neutralized in the conventional sump containing a neutralizing fill. This is followed by a final neutralization in which either caustic or soda ash is added automatically. A typical system is illustrated.



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