XII. APÉNDICES

A. Distribución

Tabla I

Veinte principios de manejo de materiales

Principio	Descripción
Orientación	Estudiar a fondo las relaciones del sistema antes de la planeación preliminar, para identificar métodos y problemas existentes, restricciones físicas y económicas, y establecer requisitos y metas futuras.
Planificación	Establecer un plan para incluir los requisitos básicos, operaciones deseables y la consideración de contingencias para todo el manejo de material y actividades de almacenamiento.
Sistemas	Integrar el manejo y las actividades de almacenamiento que son económicas viables en un sistema coordenado de operación que incluye recepción, inspección, almacenamiento, producción, ensamble, empaque, embarque y transportación
Carga unitaria	Manejar el producto en una carga unitaria tan grande como sea posible
Aprovechamiento de espacio	Aprovechar todo el espacio cúbico
Estandarización	Estandarizar métodos y equipo de manejo siempre que sea posible
Ergonómico	Reconocer capacidades y limitaciones humanas mediante el diseño de equipo y procedimientos de manejo de material para la interacción efectiva con quienes usan el sistema
Energía	Incluir el consumo de energía de los sistemas y procedimientos de manejo de materiales al comparar o preparar las justificaciones económicas.
Ecológico	Reducir al mínimo los efectos adversos sobre el medio ambiente cuando se seleccionen equipos y los procedimientos de manejo de materiales
Mecanización	Mecanizar los procesos de manejo cuando sea posible incrementar la eficiencia y la economía en el manejo de materiales.
Flexibilidad	Usar métodos y equipo que puedan realizar varias tareas en distintas condiciones de operación
Simplificación	Simplificar el manejo por eliminación, reducción o combinación de movimientos y equipo innecesario
Gravedad	Utilizar la gravedad para mover material siempre que sea posible, mientras se

Principio	Descripción
	respeten las limitaciones respecto a seguridad, daño del producto y pérdida.
Seguridad	Proporcionar equipo y métodos seguros de manejo de materiales que se apeguen a códigos y reglamentos de seguridad existentes además de la experiencia tenida.
Computarización	Considerar la computarización en los sistemas de manejo y almacenamiento de materiales, cuando lo justifiquen las circunstancias, para mejorar el control de material e información
Flujo de sistema	Integrar el flujo de datos con el flujo de material físico en el manejo y el almacenamiento
Distribución de planta	Preparar una distribución de equipo y una secuencia operativa para todas las soluciones viables del sistema, luego, seleccionar el sistema opcional que se integre mejor eficiencia y efectividad
Costo	Comprar la justificación económica de las soluciones opcionales en equipo y métodos con base en la efectividad económica medida por gasto por unidad manejada
Mantenimiento	Preparar un plan para mantenimiento preventivo y preparación programada para todo el equipo de manejo de materiales
Obsolescencia	Prepara una política a largo plazo y económicamente sana para reemplazar equipo y métodos obsoletos, con especial consideración de los costos de ciclo de vida después de impuestos.

Tabla II

Veinte criterios potenciales para la evaluación de distribución

Criterio potencial	Comentario
Facilidad de expansión o contracción futura	Simplicidad para aumentar o reducir el espacio empleado
Adaptabilidad y versatilidad	Facilidad para adaptar cambios y variedad de elementos en la distribución de planta tal como se planeó, sin modificarla
Flexibilidad de la distribución	Facilidad para volver a acomodar físicamente la distribución, para permitir cambios
Efectividad en el flujo de movimiento	Efectividad de las operaciones o pasos del trabajo secuenciado de materiales, papelería o gente
Efectividad de manejo de materiales	Facilidad y simplicidad del sistema de manejo, equipo, y recipientes.

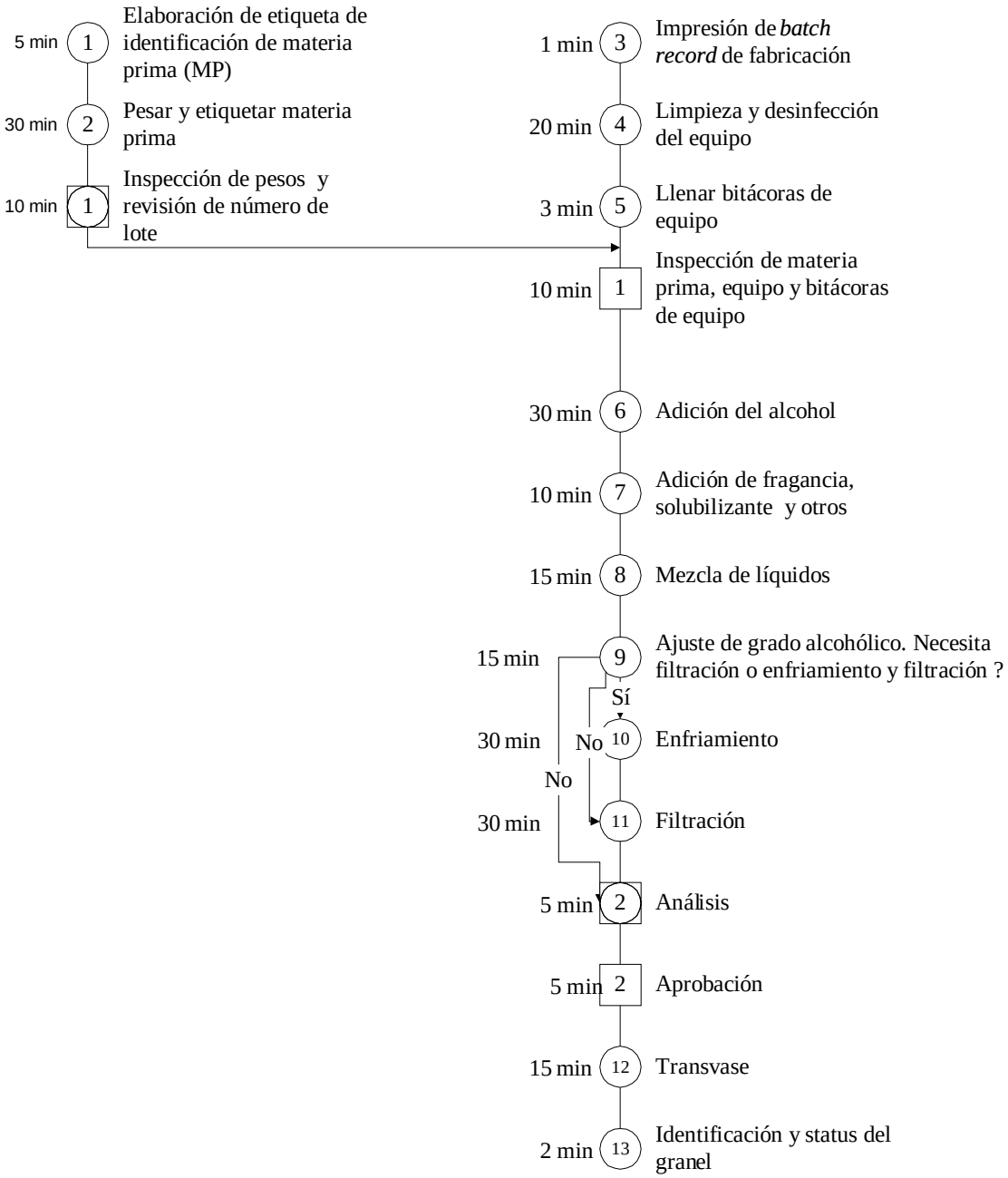
Criterio potencial	Comentario
Efectividad de almacenamiento	Efectividad para mantener las existencias necesarias
Aprovechamiento de espacio	Grado al cual se utilizan el área de piso y el espacio cúbico
Integración del servicio de apoyo	Las áreas de tránsito de apoyo se adaptan para servir a las áreas de operación
Seguridad y limpieza	Efecto de la distribución en los accidentes y la limpieza en general
Condiciones de trabajo y satisfacción del empleado	Grado al cual la distribución contribuye a hacer que el área sea un lugar agradable para trabajar
Facilidad de supervisión y control	Facilidad para que los supervisores dirijan y controlen las operaciones
Apariencia, valor promocional, relaciones públicas o comunitarias	Posibilidad de que la distribución tenga características atractivas que preserven el prestigio de la empresa.
Calidad del producto	Grado al cual la distribución afecta la calidad
Mantenimiento	Grado al cual la distribución ayuda u obstruye el mantenimiento
Ajustes con la estructura organizativa	Grado al cual la distribución se ajusta a la estructura de la organización
Aprovechamiento del equipo	Grado al cual se utiliza el equipo operativo y de servicio
Vigilancia y robo	Facilidad para controlar robos
Aprovechamiento de las condiciones naturales	Grado al cual la distribución aprovecha las ventajas de las condiciones naturales del lugar
Posibilidad de cumplir con la capacidad	Grado al cual la distribución cumple con las necesidades de producción
Compatibilidad con los planes	Capacidad para ajustarse al plan a largo plazo

B. Fabricación

Tabla III
Datos generales de fabricación

	Descripción	Factores críticos en fabricación	Especificaciones de análisis	Equipo de fabricación	Equipo de análisis
Hidroalcoholes	Soluciones homogéneas, compuestas por la mezcla de líquidos: alcohol etílico (en un mayor porcentaje), perfume (aceites esenciales volátiles) algún solubilizante.	Presencia de sólidos no disueltos (precipitaciones) deben eliminarse por medio de filtración a temperatura de 25° a 5°C según sea necesario.	Apariencia, fragancia Grado alcohólico (50 ° - 92° GL) Presencia de sólidos no disueltos	Tanques de acero inoxidable Agitación neumática o eléctrica contra explosiones. Bomba centrífuga, filtros. Enfriador	Termómetro Alcoholímetro
Emulsiones	Mezcla de líquidos no miscibles o con solubilidad muy limitada, que se unen por agitación fuerte y constante y teniendo todas la fases a igual temperatura.	La temperatura de emulsión depende de las características de las fases (80° a 25° C), las que deben estar a una misma temperatura o un máximo 3°C de diferencia. Se requiere agitación fuerte con homogeneización.	Apariencia, fragancia. Prueba centrífuga Viscosidad (1,000 a 80,000 cps) PH (3.5 a 7.0) Densidad (0.950 a 1.050 g/ml) Prueba microbiológica Identificación de activos	Marmita principal (reactor) para fase acuosa y emulsión, utiliza: homogenizador, agitador de áncora. Marmita auxiliar para fundición de fase oleosa, utiliza, agitador de hélice. Bomba para alta viscosidad Bomba para alta temperatura	Balanza Analítica Centrífuga Potenciómetro Viscosímetro Termómetro (laboratorio microbiológico) Densímetro
Geles	Masa semirígida en la que el medio de dispersión ha sido absorbido por las partículas. El arreglo de las partículas es definido en tres dimensiones por lo que es rígido y elástico (jalea)	Materias primas difíciles de manejar de viscosidades medias y elevadas, algunos mucílagos muy pegajosos y de difícil manejo. Temperatura de operación de 40 a 25 °C, Se requiere de agitación de áncora y homogeneización.	Apariencia, fragancia Viscosidad (46,000 a 180,000 cps) PH (2.5 a 8.0) Densidad (0.9089 a 1.03 g/ml) Prueba microbiológica Identificación de activos	Reactor con homogeneizador y agitador de áncora Bomba para transporte de mucílagos Bomba para alta viscosidad Marmita auxiliar con agitador de hélice	Balanza Analítica Centrífuga Potenciómetro Viscosímetro Termómetro (laboratorio microbiológico Densímetro
Champúes	Mezclas formadas por un alto contenido de materiales detergentes(los más usados los sulfonados), agua, preservantes, activos.	La temperatura de operación depende de las características de los componente (75° a 40° C).	Apariencia, fragancia Viscosidad (1,200 a 4,500 cps) ó (60 a 90 seg) PH (5.0 a 7.0) Densidad (1.00 a 1.05 g/ml) Prueba microbiológica Identificación de activos	Marmita enchaquetada Agitador de hélice de hélice	Balanza Analítica Centrífuga Potenciómetro Viscosímetro Termómetro (laboratorio microbiológico) Densímetro
Mezcla de sólidos (polvos)	Mezcla homogénea de sólidos muy finos (polvos)	Mezcla de sólidos finos, temperatura ambiente. Se requiere de tamizado para garantizar homogeneización.	Apariencia, fragancia Densidad comprimida y sin comprimir Identificación de activos	Mezclador de cintas Tamizador	Balanza Analítica Potenciómetro Densímetro o picnómetro

DIAGRAMA DE OPERACIONES I
Proceso de fabricación de hidroalcoholes

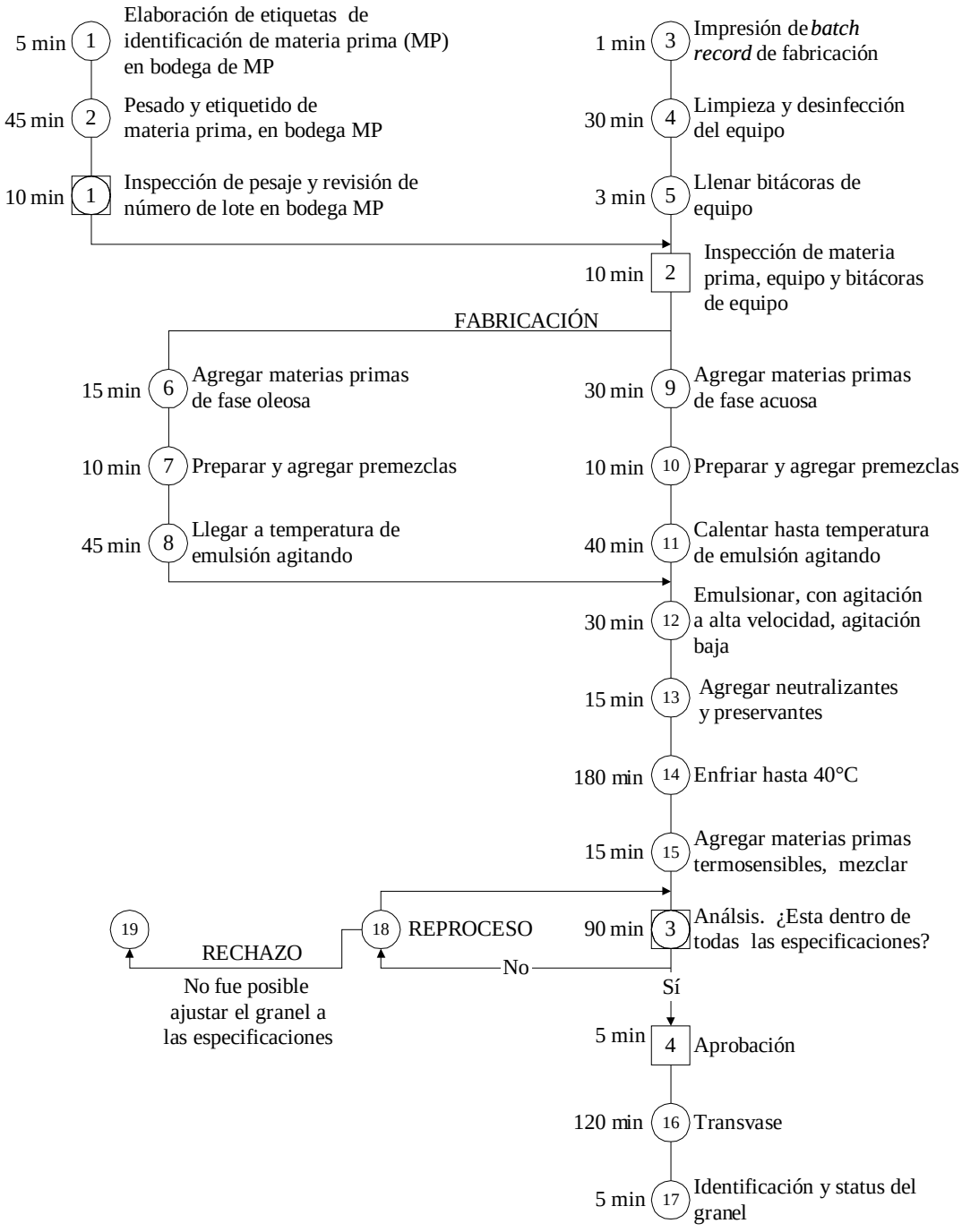


RESUMEN		
Actividad	No.	Tiempo total
Operaciones	13	206 min
Inspecciones	4	30 min

DIAGRAMA DE OPERACIONES II

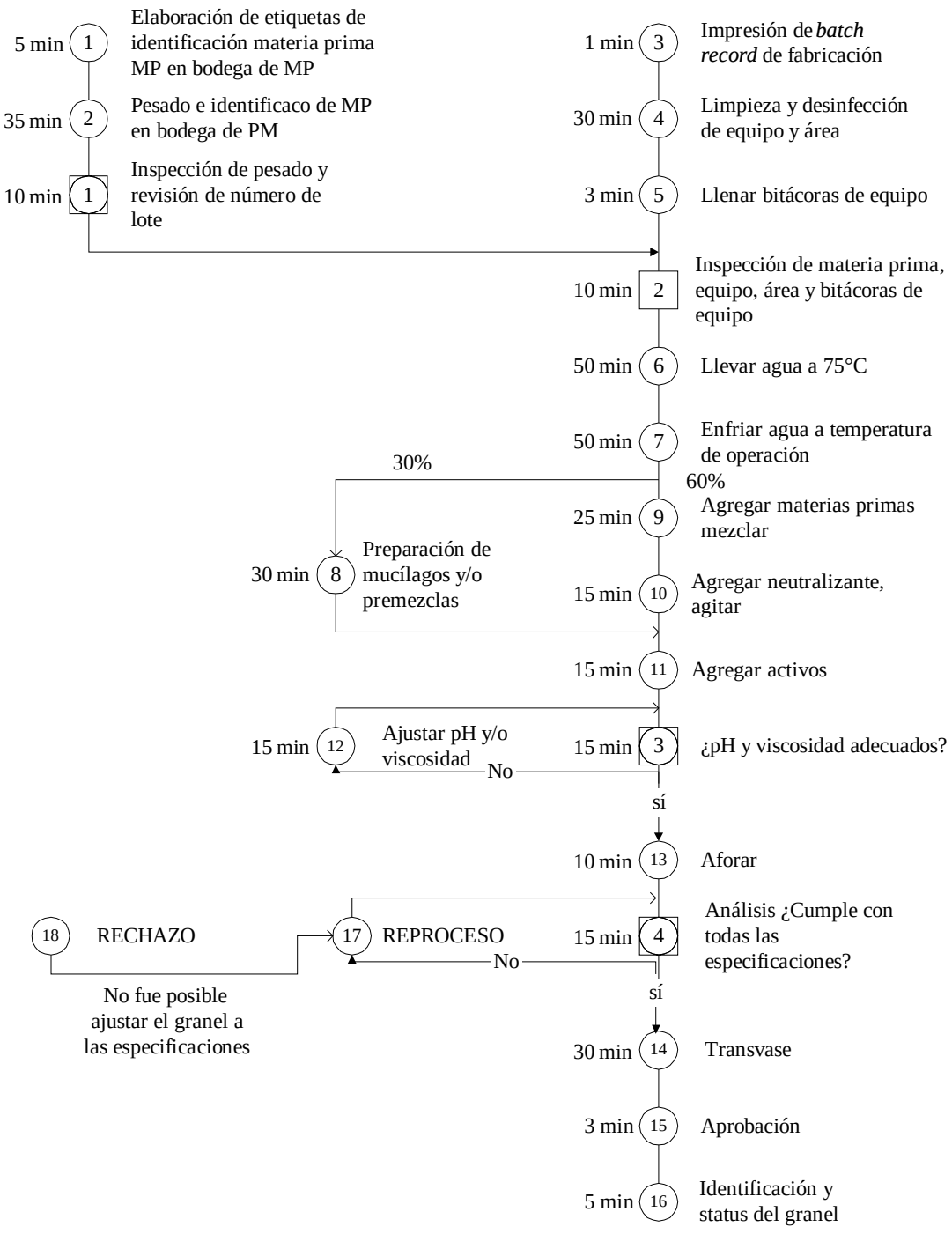
Proceso de fabricación de emulsiones

(cremas, *rinses, rollones*)



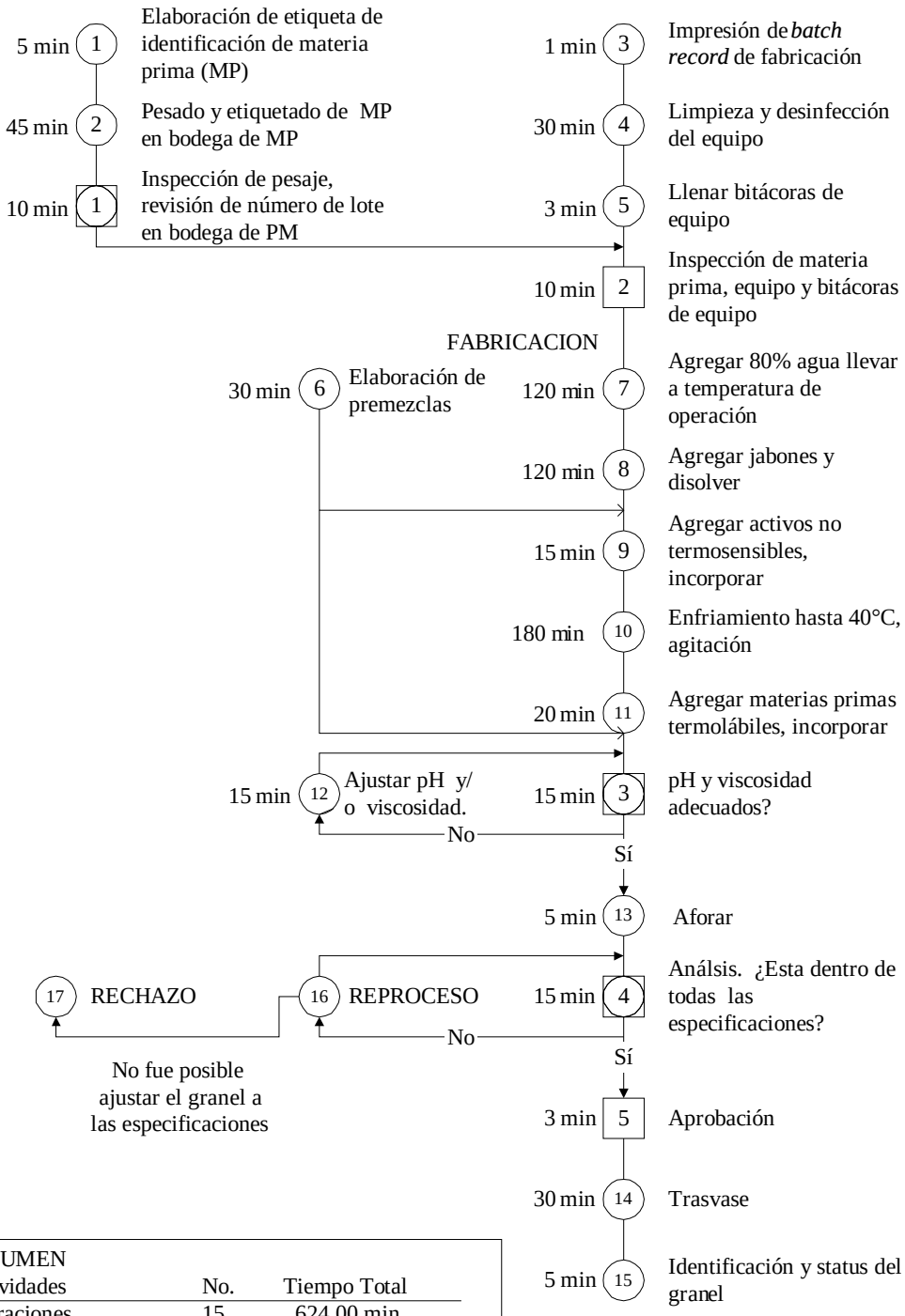
RESUMEN		
Actividad	No.	Tiempo total
Operaciones	17	476 min
Inspecciones	4	115 min

DIAGRAMA DE OPERACIONES III
Proceso de fabricación de geles



RESUMEN		
Actividad	No.	Tiempo total
Operaciones	16	322.00 min
Inspecciones	5	53.00 min

DIAGRAMA DE OPERACIONES IV
Proceso de fabricación de champúes

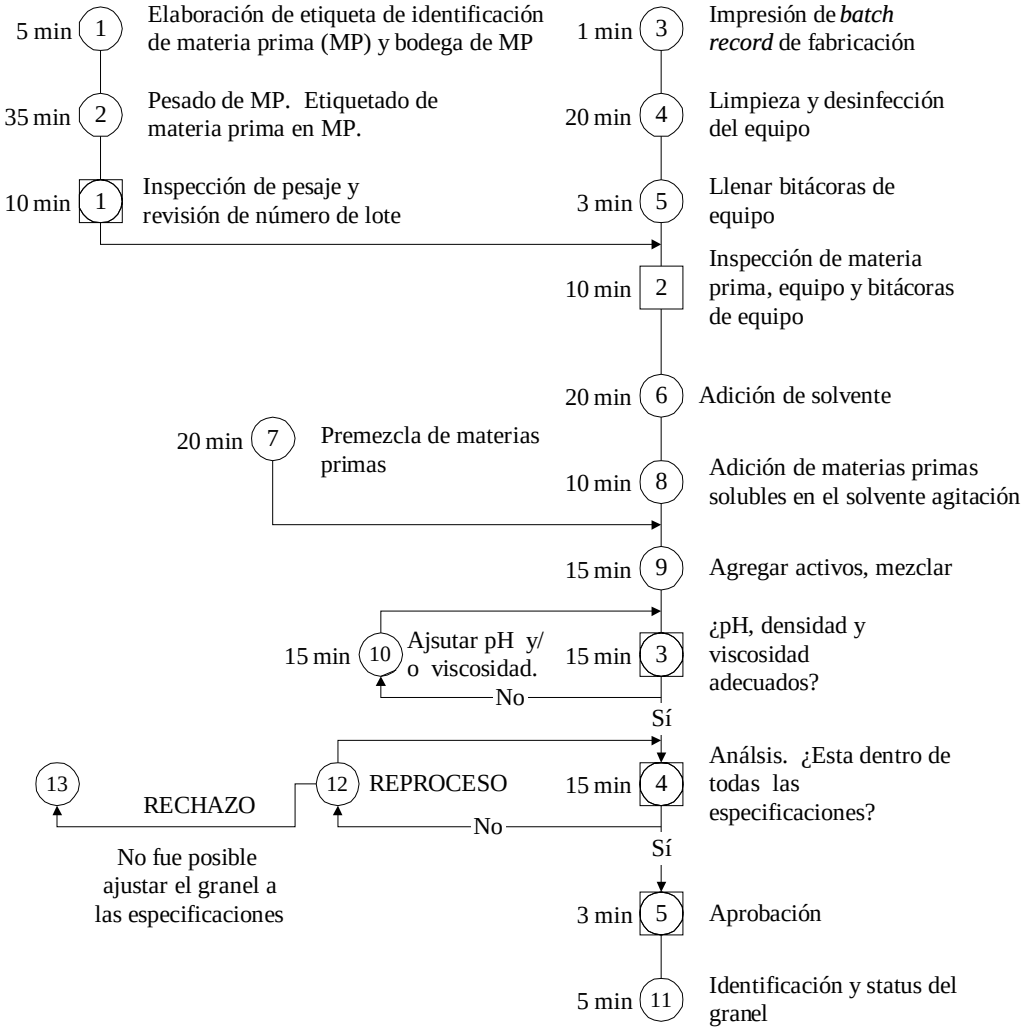


RESUMEN		
Actividades	No.	Tiempo Total
Operaciones	15	624.00 min
Inspecciones	5	53.00 min

DIAGRAMA DE OPERACIONES V
Proceso de mezcla de sólidos (Fabricación de talcos)

RESUMEN		
Actividad	No.	Tiempo Total
Operaciones	10	219.00 min
Inspecciones	4	38.00 min

DIAGRAMA DE OPERACIONES VI
Fabricaciones varias, mezclas de líquidos

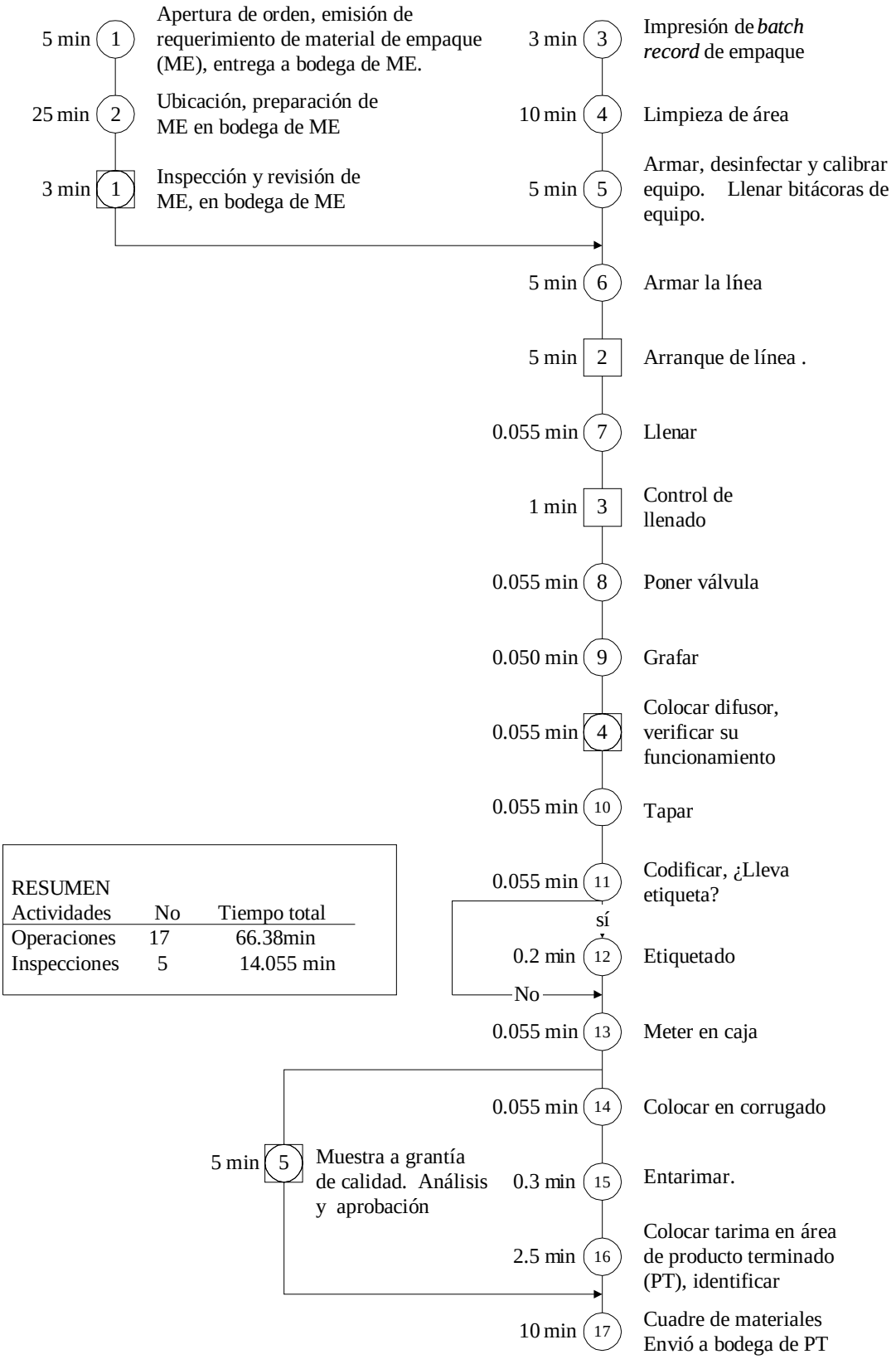


RESUMEN		
Actividades	No.	Tiempo total
Operaciones	11	149.00 min
Inspecciones	5	53.00 min

ANEXO C. EMPAQUE

DIAGRAMA DE OPERACIONES VIII

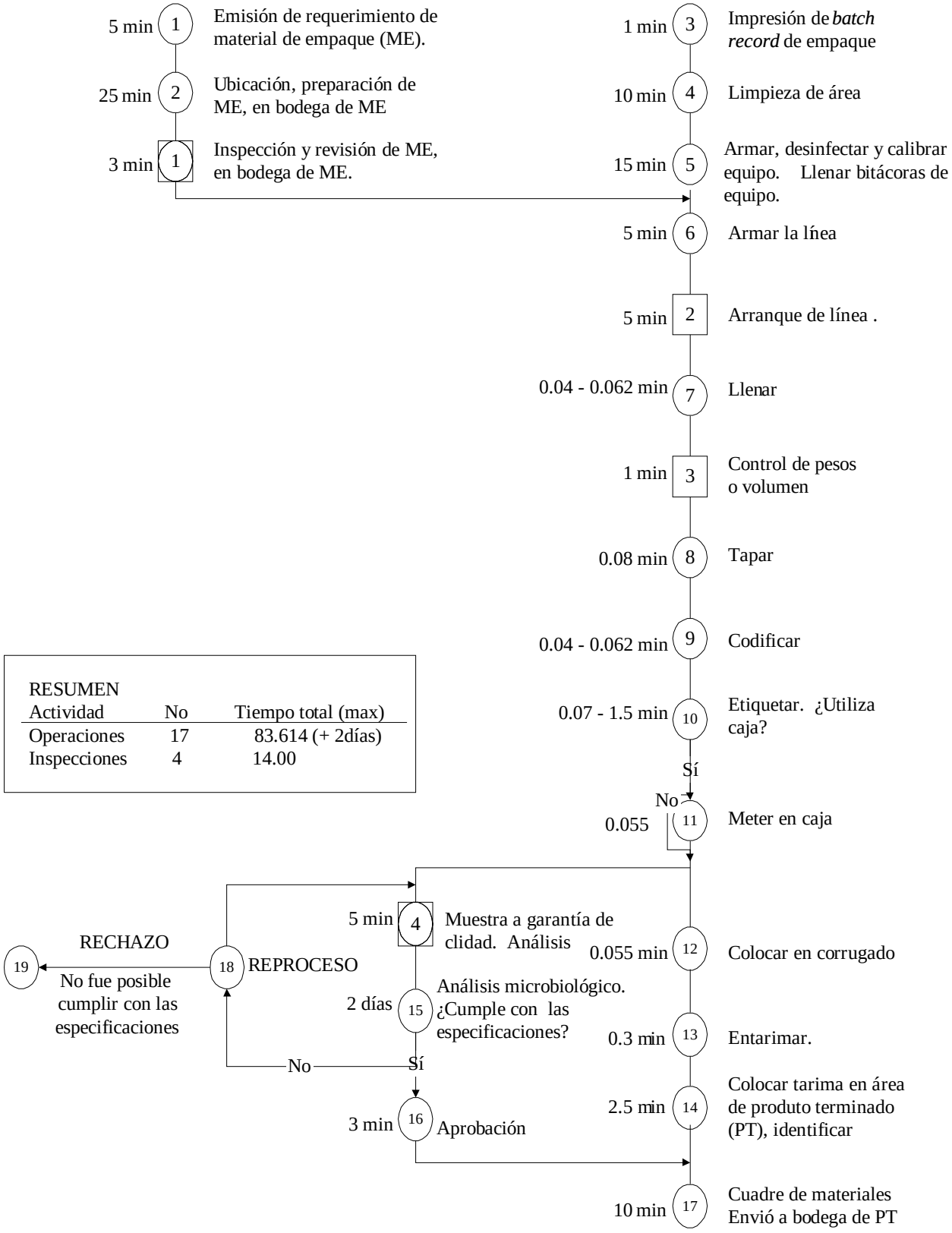
Proceso de empaque de hidroalcoholes



RESUMEN		
Actividades	No	Tiempo total
Operaciones	17	66.38min
Inspecciones	5	14.055 min

DIAGRAMA DE OPERACIONES VIII

Proceso de empaque de cremas, geles, *rollones, rinses*, champúes y varios



RESUMEN

Actividad	No	Tiempo total (max)
Operaciones	17	83.614 (+ 2días)
Inspecciones	4	14.00

DIAGRAMA DE OPERACIONES IX
Empaque de talcos

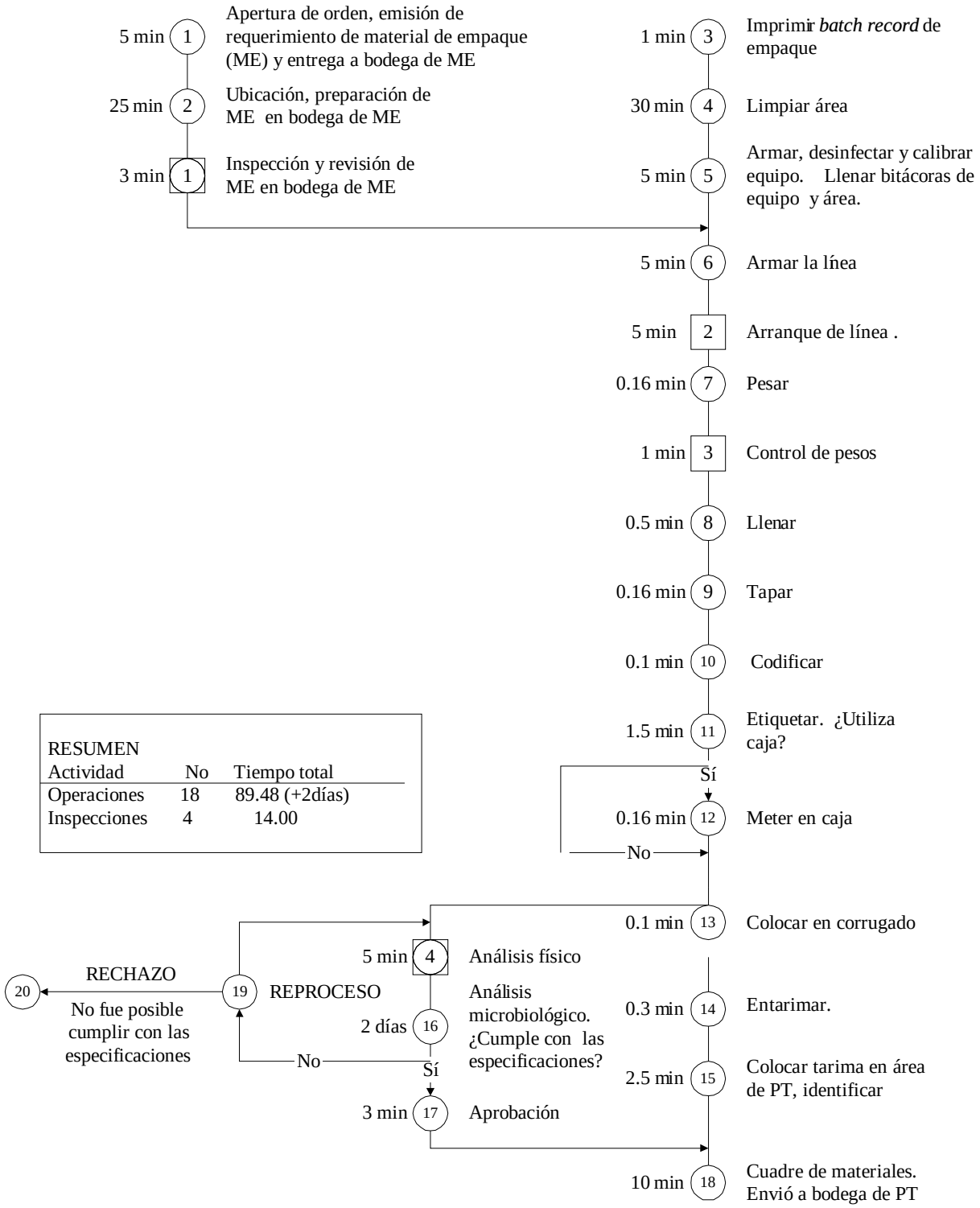
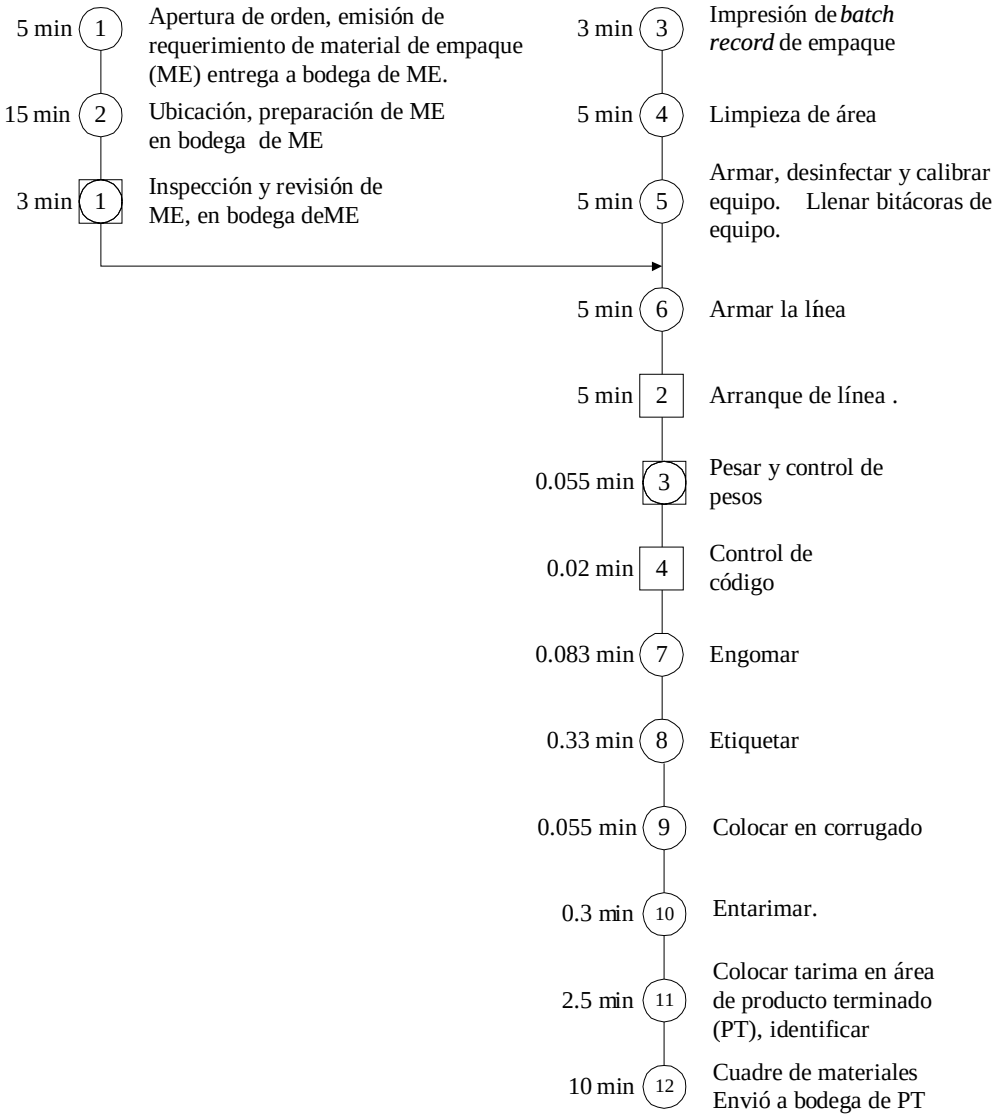


DIAGRAMA DE OPERACIONES X
Proceso de etiquetado de productos varios



RESUMEN

Actividades	No	Tiempo total
Operaciones	12	51.268 min
Inspecciones	4	8.075 min

D. Equipo

Tabla IV
Inventario del equipo actual de área de fabricación

Equipo	Cantidad (unidad)	Capacidad (lt o kg)	Diámetro (cm.)	Alto (cm.)	Área (cm2)	Volumen (cm3)	Observaciones
Balanza *Morse*	1	120 kg		193	62*110 = 6,820		
Balanza *Morse*	1	150 kg		115	80*94 = 7,520		
Tanque acero inox	1	1200 lt	116	178	10,568	1,881,105	Tapadera, válvula de paso para descarga.
Tanque acero inox	1	200 lt	61	132.5	2,922	387,215	Tiene válvula de paso para descarga
Tanque acero inox	2	1750 lt	134	194	14,102	2,735,826	Tapadera, llave de paso para descarga
Tanque acero inox	2	900 lt	102	186	8,171	1,519,814	Llave de paso para descarga
Tanque acero inox	2	500 lt	92	151	6,647	1,003,760	Llave de paso para descarga
Tanque acero inox	3	1000 lt	112.5	185	9,940	1,838,882	Tiene llave de paso para descarga
Tanque acero inox	1	1000 lt	113.5	171	10,117	1,730,075	Tiene llave de paso para descarga
Marmita acero inox	1	250 kg	84	121	5,542	670,534	Medido P (0 a100 psia), chaqueta llave de paso para descarga
Marmita acero inox	1	400 kg	95	135	7,088	956,881	Medidor de P (0 a 75 psia), chaqueta Llave de paso para descarga
Marmita acero inox	1	1700 lt	144	149	16,286	2,426,545	Medidor de P (0 a100 psia), chaqueta Llave de paso para descarga
Marmita acero inox	1	400 kg	100	163	7,854	1,280,161	Tiene tapadera, chaqueta Llave de paso para descarga
Reactor acero inox	1	1200 kg	125	247	12,271	3,031,057	Medidor de P (0 a 160 psia), Medidor de temperatura (0 a120°C), Agitador de ancora, turbina, chaqueta
Homogenizador	1	300 kg		214	154*55 = 8,470		La estructura se puede introducir bajo la estructura de la marmita
Agitador neumático	1			44			
Agitador eléctrico	1	1300 rpm		50	65*40 = 2,600		
Enfriador	1			209	89*54 = 4,806		La manguera se despliega hasta 1 metro
Bomba centrífuga	1			71	61*61 = 3,721		Filtradora de hidroalcoholes
Bomba diafragma	1				87*90 = 7,830		
Mezclador de cinta	1	100 kg					
Tamizador	1						

El equipo se encuentra en buenas condiciones.

Tabla V
Inventario de equipo del área de empaque

NOMBRE	CANTIDAD (unidad)	CAPACIDAD (lt o kg)
Crimpeadora/gasif coster	1	Semiautomática, 20 unidades/minuto (depende de la velocidad la da el operador)
Llenador coster	2	De pistón, una boquilla, volumen 30 - 400 ml
Bombas neumáticas	1	Viscosidad de baja a moderada.
Bomba Graco	1	Viscosidad de moderada a alta.
Balanza Ohaus	3	0 - 300 g
Llenadora Vefben	1	De pistón intercambiable, una boquilla. Chaqueta de calentamiento.
Llenadora Calish	1	De pistón intercambiable, una boquilla.
Crimpeadora Coster	1	Semiautomática, 20 unidades/minuto (la velocidad la da el operador)
Taponadora Swan Matic	1	Manual, la velocidad la da el operador.
Engrapadora de pedal	2	
Extinguidor ABC	4	
Faja	6	4.34 X 61 m2
Máquina de sopleteo	1	
Ventiladores de pie	4	
Troquet	2	

E. Cotizaciones

En las hojas siguientes se muestran cotizaciones del equipo que se presentó en la sección Equipo, capítulo IV.

Se utilizó la regla de William, para determinar el costo de un equipo partiendo de cotizaciones de equipo similar de costo conocido, por ejemplo: se tiene la cotización para el tanque cónico de volumen funcional de 500 litros, fabricado de lámina de acero inoxidable calidad 304 e 1/16, con soldaduras y acabados sanitarios, tapadera abatible a 1/3, con entrada para agitador , patas de acero inoxidable, rodos giratorios acorde a la carga, ***niple*** y llave de descarga en la parte interior de acero inoxidable, se cotizó en Talleres Hernández a un precio de Q7,200.00. Se desea el precio de un tanque parecido pero de 1000 litros de volumen funcional.

El factor reportado por la literatura para tanques cilíndricos es de 0.48, utilizando la fórmula:

$C2 = C1(T2/T1)xIp$

(14)

En donde

C2= costo desconocido

C1= costo del equipo conocido

X = factor de Williams

T2= tamaño del equipo cuyo costo se desea estimar

T1= tamaño del equipo de costo conocido

Ip= Relación de índices de precios

Tenemos

$$IP = \frac{\text{índice del año en curso o futuro}}{\text{índice del año en que se compró el equipo conocido}}$$

Como las cotizaciones son del año actual, Ip = 1

$C2 = Q7{,}200.00\ (1000\ lt/500lt)0.48*1$

$C2 = Q10{,}042.00$

También se presentan algunas cotizaciones del manual *Grainger Industrial Supply*, tomar en cuenta que a cada costo se le debe recargar el 25% por cuestiones envió.

TALLERES HERNANDEZ

Toda Clase de Trabajos para la Industria Farmacéutica y Alimenticia, Especialidad en Trabajos de Acero Inoxidable.

Guatemala, 17 de noviembre de 2000.

Señores
Lancasco
Tel. 256-2111
Km. 5.5 Carretera al Atlántico Zona 18
Guatemala, Ciudad.

Atención
Ingeniera Luz Esther Toledo

Estimado Ingeniera Toledo:

Para nosotros es un gusto poderle cotizar equipo el cual le detallamos a continuación:

Por tanque de fondo cónico, con volumen funcional de 500 litros, fabricado de lamina de acero inoxidable calidad 304 de 1/16", con soldadura y acabados sanitarios, tapadera abatible a 1/3", con entrada para agitador, patas de acero inoxidable, rodos giratorios acorde a la carga, niple y llave de descarga en la parte interior.

PRECIO.....Q.10,880.00

Por fabricación de agitador neumático para tanque de 500 litros, descrito en la parte superior, base desmontable fabricada de acero inoxidable con graduación de ángulo, propela tipo barco.

PRECIO.....Q. 7,200.00

Por agitador tipo ancla para productos viscosos, diseñado para trabajar en tanque de 500 litros, base fija a tanque, raspadores de teflón, eje central apoyado en balines de acero inoxidable, motor-reductor de 1.5 HP trifásico, variador electrónico de velocidad ancla de rotación simple.

PRECIO.....Q.38,500.00

TALLERES HERNANDEZ

Por tanque enchaquetado para vapor con fondo semiesférico con capacidad útil de 1,200 litros, fabricado de lamina de acero inoxidable calidad 304 de 1/8", refuerzos interiores de acero inoxidable para evitar colapso del sistema, niples de entrada y salida para vapor, válvula de seguridad e indicador de presión, patas de acero inoxidable con flange para atornillar a piso, sistema de agitación de ancla para productos viscosos, ancla con bordes de teflón, base de agitador apoyado en balines de acero inoxidable, caja reductora de 7.5 HP , caja de control de velocidad electrónico, niple y llave de descarga en la parte interior de 2".

PRECIO.....Q.155,000.00

Con sistema de doble ancla con rotaciones contrarias.

PRECIO.....Q.173,000.00

La forma de pago al recibir su ORDEN DE COMPRA, es de 60% de anticipo y 40% a la entrega de lo solicitado. Los precios están sujetos a cambio después de 08 días.

Los motores y motor-reductores que se utilizaran son US Motor, Bauer, Kolbach o Weg, y en sistema electronico Siemens, Watlow o Allen Bradley o marcas de prestigio, dependiendo de la existencia de nuestros proveedores.

Esperando que la presente satisfaga su necesidad de inversión y en espera de una respuesta favorable, me despido de usted.

Atentamente,

archivo
DGHA/alhvddlr

Daniel Guillermo Hernández A.
TALLERES HERNANDEZ

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(502) 230-3403 - (502) 230-3387 • Guatemala, Guatemala, C.A.
e:mail: Thernan@intelnet.net.gt

October 3, 2000

Sr. Manolo Rodriguez
Centropack SA
12 calle 1-25 Zona 10 Edificio Géminis
10 Torre Sur Oficina 912
Guatemala, C.A. 01001
Guatemala

Ph: (502) 335-3490
Fx: (502) 335-3491

AUTOMATIC LABELING SYSTEM
"Scentia Perfumeria, S.A."
Quotation by Mark Tarnow

Container Diameters:	45mm to 70mm
Label Type:	Full wrap
Label Height:	50mm to 130mm
Speeds:	25bpm

LABELING SYSTEM

Pressure Sensitive Stepper Drive Labeler: Single head labeler for applying pressure sensitive (self adhesive) labels. Includes heavy duty stainless steel frame equipped with a power height adjustable labeling module, user-friendly microprocessor controlled stepper drive speed control for high accuracy and repeatability, power wrap capability for round bottles, belt style bottle separator for labeling ease, and a 10' (3.04m) stainless steel, variable speed DC drive power conveyor.

SUBTOTAL. US$ 26,660.00

MISCELLANEOUS

International crating for ocean shipment..... 350.00

SUBTOTAL. US$ 350.00

TOTAL PRICE EX-WORKS LAPORTE, INDIANA USA US$ 27,010.00

50% Within one week prior to shipment.

Regardless of which mode of payment is made, all banking fees, charges, commissions and associated charges in the U.S. and country of origin are for the account of the opener. Prices do not include duty or destination country land freight. C.I.F. pricing is available upon request. EXIMBank Financing available upon request. All prices are in U.S. dollars and are subject to inspection and testing of bottle, cap and label samples. Prices effective for ninety (30) days.

Delivery

Delivery date will be determined at the time of purchase and is dependent on receipt of:

- *** signed ELF Pro Forma Invoice,**
- *** signed ELF Project Summary document**
- *** signed ELF Project Specification document**
- *** receipt of requested container, cap, label and product samples**
- *** receipt of down payment**

Note: All speeds and pricing dependant on container & product sample review.

Delays in receipt of above will impact final delivery date

Only functions and features specifically identified in this quotation are included in the prices quoted. If additional functions or features are required, they will be quoted separately. Changes may incur additional charges and impact delivery.

ELF is not responsible for hard plumbing or electrical work in a customer's facility. (sp)

Simplex 640-A Airpark Road, Napa, CA 94558 (707) 265-6801 FAX (707) 265-6868

Centropack
Trevino S.A.
20 calle 26-30 zona 10 Oficina 13
Guatemala 01010

October 12, 2000

00-0283

Mr. Manold Rodriguez
Phone: (502) 3668972
Fax: (502) 3675358
REF: Scentia Perfumeria, S.A.

THIS QUOTATION IS FOR BUDGET PURPOSES ONLY
SIMPLEX MUST HAVE SAMPLES OF PRODUCT AND CONTAINERS PRIOR TO ACCEPTANCE OF ORDERS

SIMPLEX TABLE MODEL "AS"

Complete with:

* Stainless steel contacts (rotating valve core of Waukesha "88" alloy)
* Waterproof switch
* 110/220 volt, single phase, 1/3 HP
* Variable speed drive
* 8 ft power cord
* Hand level shut-off

HOPPER - 304 STAINLESS STEEL - 10 GALLON CONE SHAPED

PRICE **$4,700.00**

OPTIONAL ACCESSORIES:

INTERCHANGEABLE STRAIGHT SPOUT **$ 110.00**

INTERCHANGEABLE PRODUCT CYLINDERS COMPLETE WITH STANDARD PISTON AND SEALS

1-1/8" dia (1.1 to 2.5 fl oz)
1-7/8" dia (3 to 8.891 fl oz)
2-7/8" dia (7.18 to 20.9 fl oz) **$ 515.00 ea**

Simplex 640-A Airpark Road, Napa, CA 94558 (707) 265-6801 FAX (707) 265-6868

MEMBER PMMI

ALL PRICES ARE F.O.B. NAPA, CALIFORNIA
(Sales tax if applicable is not included)

TERMS OF SALE:
50% deposit with order, 50% upon completion and prior to shipment.(Subject to credit approval)

SHIPMENT:
2 - 3 weeks after the order is entered into our production schedule only upon receipt of the order, deposit & samples.

Thank you for asking us to quote!

Definite Purpose Motors
3-Phase Hazardous Location

Order today! phone | fax | visit | www.grainger.com

- UL Listed (E62643) for use in Class I Group C, D and Class II Group E, F, & G hazardous locations
- T-frame models have built-in temperature-sensing switch with leads brought out. When properly wired to the external control circuit, maximum frame temperature is limited as required by UL and the NEC
- Hazardous location conduit box is supplied with T-frame models; conduit box (No. 4K788) is sold separately for NEMA 56 models
- NEMA Design B

Typical Uses: To power fans, blowers, pumps, and air compressors in locations such as dry cleaning plants, paint and varnish factories, flour and feed mills, coal or coke plants, grain elevators, and other locations that require a motor to meet the National Electrical Code for hazardous locations.

Type: 3-Phase
Bearings: Double-shielded ball
Enclosure: Hazardous location, TEFC
Windings: Copper
Insulation Class: B
Ambient: 40°C
Duty: Continuous
Rotation: CW/CCW
Thermal Protection: Auto or Thermostat (T-Stat)
Temperature Code: T3B
Finish: Gray
Brand: Dayton

Dayton

No. 3N864

No. 3N857

E62643

Replacement Parts Available 1-800-323-0620

Caution: Not for fans in unattended areas. Refer to pages 207-212 for UL 507 Standard, proper thermal protection, and other motor selection information.

HP	Nameplate RPM	NEMA Frame	Thermal Protection	Volts 60 Hz	Full-Load Amps At 60Hz Volts	Service Factor	Efficiency	Stock No.	List	Each	Ship Wt.
RIGID WELDED BASE											
1/3	1725/1425	56C	Auto	230/460†	1.7/0.8	1.00	66.0	3N863	$409.00	$313.00	25.0
1/2	3450	56C	Auto	208-230/460	2.6-2.3/1.3	1.15	64.0	3GC60	403.00	295.00	28.0
	1725/1425	56C	Auto	230/460†	2.0/1.0	1.00	76.0	3N864	430.00	329.50	28.0
3/4	3450	56C	Auto	208-230/460	2.8-2.7/1.3	1.15	81.5	3GC61	416.00	304.75	32.0
	1725/1425	56C	Auto	230/460†	2.5/1.3	1.00	77.0	3N865	439.00	335.75	32.0
	1725	145TC	T-Stat	208-230/460	2.6-2.5/1.3	1.15	77.0	3GC62	446.00	326.00	32.0
1	3450	56C	Auto	208-230/460	3.4-3.2/1.6	1.15	77.0	3GC63	436.00	319.25	34.0
	1725	56C	Auto	230/460	3.6/1.8	1.00	78.5	3N856	465.00	356.00	34.0
	1725	145TC	T-Stat	208-230/460	3.3-3.7/1.6	1.15	84.0	3GC60	474.00	347.50	39.0
1½	3450	56C	Auto	208-230/460	4.6-4.3/2.1	1.15	82.5	3GC64	496.00	362.00	37.0
	1725	56HC	Auto	230/460	4.8/2.4	1.00	80.0	3N857	507.00	383.50	37.0
	1725	145TC	T-Stat	208-230/460	4.7-4.4/2.2	1.15	84.0	4WX96	507.00	371.00	37.0
2	3450	56C	Auto	208-230/460	6.0-5.5/2.8	1.15	84.0	3GC66	490.00	358.75	42.0
	1725	56HC	T-Stat	230/460	6.3/3.1	1.00	82.5	3N858	582.00	407.50	42.0
	1725	145TC	T-Stat	208-230/460	6.2-6.9/2.9	1.15	84.0	3GC67	547.00	400.75	42.0
3	3450	145TC	T-Stat	230/460	6.7/3.4	1.00	85.5	3GC68	615.00	449.75	42.0
NO BASE											
1/3	1725/1425	56C	Auto	230/460†	1.7/0.8	1.00	66.0	3N857	406.00	311.00	24.0
1/2	3450	56C	Auto	208-230/460	2.6-2.3/1.3	1.15	64.0	3GC49	400.00	292.25	27.0
	1725/1425	56C	Auto	230/460†	2.0/1.0	1.00	77.0	3N858	428.00	328.00	27.0
	1140	56C	Auto	208-230/460	2.4-2.2/1.2	1.15	75.5	3GC50	508.00	370.75	27.0
3/4	3450	56C	Auto	208-230/460	2.8-2.7/1.3	1.15	81.5	3GC51	413.00	302.25	31.0
	1725/1425	56C	Auto	230/460†	2.5/1.3	1.00	77.0	3N859	437.00	334.25	31.0
	1140	56C	Auto	208-230/460	3.5-3.2/1.7	1.15	77.0	3GC52	532.00	388.75	31.0
1	3450	56C	Auto	208-230/460	3.4-3.2/1.6	1.15	77.0	3GC53	431.00	315.75	33.0
	1725	56C	Auto	230/460	3.6/1.8	1.00	78.5	3N860	462.00	356.00	33.0
	1725	143TC	T-Stat	208-230/460	3.3-3.2/1.6	1.15	84.0	3GC70	466.00	341.00	37.0
	1140	56C	Auto	208-230/460	4.1-4.0/2.1	1.15	80.0	3GC54	564.00	410.00	33.0
1½	3450	143TC	T-Stat	208-230/460	4.6-4.3/2.1	1.15	82.5	3GC55	491.00	338.75	36.0
	1725	56C	Auto	230/460	4.8/2.4	1.00	80.0	3N861	501.00	383.50	36.0
	1725	143TC	T-Stat	208-230/460	4.9-4.7/2.3	1.15	84.0	3GC56	502.00	367.00	36.0
2	3450	56C	Auto	208-230/460	6.0-5.5/2.8	1.15	84.0	3GC57	485.00	355.50	41.0
	1725	56C	T-Stat	230/460	6.3/3.1	1.00	82.5	3N862	532.00	407.50	41.0
	1725	145TC	T-Stat	208-230/460	6.2-6.9/2.9	1.15	84.0	3GC58	532.00	397.00	41.0
3	3450	145TC	T-Stat	230/460	6.7/3.4	1.00	85.5	3GC59	611.00	446.25	41.0

† Operable on 50 Hz, 230/460V at 5/6 rated speed

Commercial Duty
Capacitor-Start OPDP

Order today! phone | fax | visit | www.grainger.com

Typical Uses: Fans, blowers, pumps, and commercial machinery

Type: Capacitor-start

Bearings: Sleeve or ball

Insulation Class: B

Ambient: 40°C

Duty: Continuous

Rotation: CW/CCW

Finish: Gray

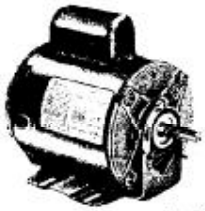
Brand: GE

E47088

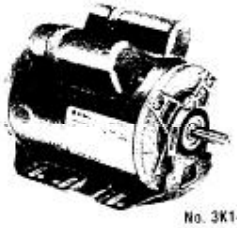
LR56189

Replacement Parts Available
1-800-323-0620

No.3K143
48 Frame
Rigid Welded Base



No. 3K142
56 Frame
Cradle Base



No. 3K147
56H Frame
Cradle Base

SINGLE SPEED

HP	Nameplate RPM	NEMA Frame	Thermal Protector	Volts 60 Hz	Full-Load Amps 60 Hz Volts	Service Factor	Bearings	Mounting	GE Stock No.	Stock No.	List	Each	Ship Wt
1/4	1725	48	Auto	115/230	5.2/2.6	1.35	Sleeve	Cradle	C203	3K148	$166.00	$97.15	15.0
	1725	48	None	115/230	5.2/2.6	1.35	Sleeve	Cradle	C202	2K505	180.00	94.70	17.0
	1140	56	Auto	115/230	6.8/3.4	1.35	Ball	Cradle	C544	2K507	261.00	163.50	25.0
1/3	3450	48	Auto	115/230	6.8/3.4	1.35	Ball	Cradle	C208	1D065	148.00	92.45	15.0
	1725	48	Auto	115/230	5.6/3.3	1.00	Sleeve	Cradle	C129	3K854	166.00	94.20	15.0
	1725/1425	48	Auto	115/230	5.6/3.3	1.35	Ball	Cradle	C210	1D067	179.00	111.00	18.0
	1725/1425	48	None	115/208-230	5.6/3.3	1.35	Ball	Cradle	C209	1D066	170.00	105.40	18.0
	1725	56	Manual	115/208-230	5.6/3.3	1.00	Ball	Rigid	C105	2K484	203.00	126.35	15.0
	1725/1425	56	Auto	115/208-230	5.6/3.3	1.35	Ball	Cradle	C216	2K511	210.00	125.60	18.0
	1725/1425	56	None	115/208-230	5.6/3.3	1.35	Ball	Cradle	C215	2K510	191.00	117.95	18.0
	1140	56	Auto	115/230	8.6/4.3	1.35	Ball	Cradle	C548	2K514	265.00	165.00	35.0
	1140	56	None	115/230	8.6/4.3	1.35	Ball	Cradle	C1259	2K513	257.00	159.75	33.0
1/2	3450	48	None	115/230	7.6/3.8	1.25	Ball	Cradle	C219	1D068	154.00	95.50	15.0
	1725	48	Auto	115/230	8.6/4.3	1.00	Ball	Cradle	C139	1D057	223.00	125.95	19.0
	1725	56Z	None	115/230	8.6/4.3	1.00	Ball	Rigid	C393	1D070	218.00	120.55	18.0
	1725	56	Auto	115/230	8.8/4.4	1.25	Ball	Cradle	C223	3K142	231.00	131.85	19.0
	1725	56	None	115/208-230	8.8/4.4-4.2	1.25	Ball	Cradle	C221	6K186	209.00	126.75	20.0
	1140	56	Auto	115/230	9.4/4.7	1.25	Ball	Cradle	C552	2K517	338.00	242.00	41.0
	1140	56	None	115/230	9.4/4.7	1.25	Ball	Cradle	C1264	2K516	390.00	237.00	41.0
3/4	3450	48	None	115/230	11.2/5.6	1.00	Ball	Rigid	C111	1D056	185.00	115.55	19.0
	3450	48Z	None	115/230	11.2/5.6	1.00	Ball	Rigid	C394	1D071	188.00	116.65	18.0
	1725	56	Auto	115/230	13.2/6.6	1.25	Ball	Cradle	C231	3K143	283.00	156.00	26.0
	1725	56	None	115/208-230	13.2/6.6-5.2	1.25	Ball	Cradle	C230	2K519	269.00	153.25	23.0
	1140	56	None	115/230	12.6/6.3	1.15	Ball	Cradle	C232	2K520	451.00	273.25	43.0
1	3450	56Z	None	115/230	13.4/6.7	1.00	Ball	Rigid	C449	1D074	224.00	132.85	20.0
	1725	56	Auto	115/230	13.6/6.8	1.15	Ball	Cradle	C236	3K144	301.00	176.25	34.0
	1725	56	None	115/208-230	13.6/6.8-6.2	1.15	Ball	Cradle	C235	2K502	299.00	177.50	29.0
1½	1725	56H	Auto	115/230	18.2/9.1	1.1a	Ball	Cradle	C239	3K147	365.00	206.75	46.0

TWO SPEED

HP at: 1725 RPM	HP at: 1140 RPM	Nameplate RPM	NEMA Frame	Thermal Protection	Volts 60 Hz	Full-Load Amps	Service Factor	Bearings	Mounting	GE Stock No.	Stock No.	List	Each	Ship Wt
3/4	1/4	1725/1140	56	None	115	10.6/5.4	1.25	Ball	Cradle Shell	C429	2K776	$300.00	$225.00	33.0
1	1/3	1725/1140	56	None	115	12.0/7.0	1.15	Ball	Cradle Stud	C475	2K778	346.00	246.25	41.0
	1/3	1725/1140	56	None	208-230	5.4-5.0/3.0-2.8	1.15	Ball	Cradle Stud	C476	2K779	415.00	251.75	10.0

Caution: Not for fans in unattended areas.

Refer to pages 207-212 for UL 507 Standard, proper thermal protection, and other motor selection information.

Dayton®

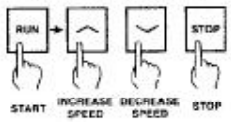
No. 3HX72

No. 3HX74

New

No. 5HV52

Advanced programming and simple operation for optimal performance.



AC Inverters (NEMA 1)

- High starting torque (up to 200%)
- UL Listed electronic motor overload
- Compact size
- Up to 16 preset speeds
- 'S' curve accel/decel
- Easy return to factory setting
- 3-wire Start/Stop control
- Program protection (lock out)
- Accepts 4 to 20 mAdc, 0 to 5Vdc, or 0 to 10Vdc Input

c UL us
E84642

5HV Series

SP UL
80755

3KV and 3HX Series

3KV, 3HX SERIES

Advanced IGBT torque vector PWM control method optimizes motor torque at any frequency. This high performance feature is selectable via the motor auto-tuning torque vector functions. LED digital display provides indication for running or reference frequency, output current, output voltage, motor synchronous or machine speed.

5HV SERIES

Innovative IGBT Dynamic torque vector PWM control method enhances motor torque accuracy at any frequency. The high performance is selectable via the motor on-line tuning function. Remote mountable backlit LCD keypad with separate FWD and REV keys stores functions and makes operation easy. Dayton offers keypad extension cables for all NEMA 1 drives in lengths of 2, 5, and 10 meters.

Typical Applications:
Variable speed operation of three-phase motors on pumps, fans, blowers, conveyors, machine tools and other industrial equipment. NEMA 1 drives should not be used in dusty or wet environments.

Advanced Programming:
Output frequency, Volts/Hz, torque boost, accel/decel time, volt limit, DC braking, auto restart, frequency bias and gain, multi-frequency setting, digital and analog outputs, slip compensation, current limiting, jump frequency, automatic accel/decel and sensorless torque vector.

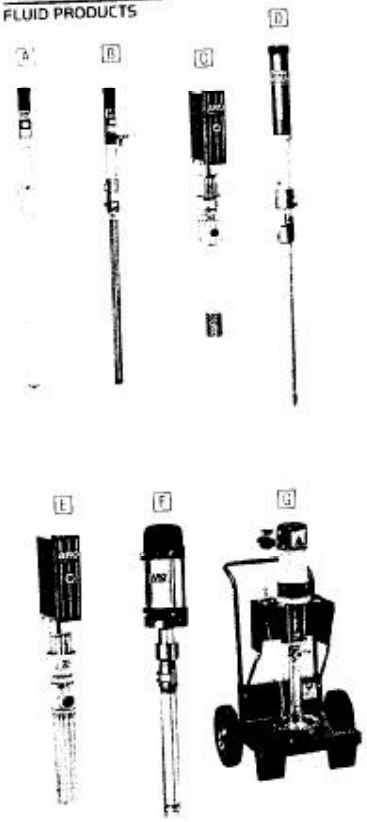
Ordering Data

Motor Output HP	Maximum Output Amps	Dimensions (In.) H	W	D	Stock No	List	Each	Shpg. Wt.
3KV, 3HX SERIES								
NEMA 1 Single-Phase Input, 200-240 Volts AC, 60/50 Hz								
1/4	1.3	6¼	4¼	3½	**3KV65**	$623.63	**$542.50**	2.8
1/2	2.5	6⅜	4¼	4⅛	**3KV67**	692.93	**603.00**	4.4
1	4.0	6⅜	5½	4⅛	**3KV62**	822.04	**715.00**	4.7
2	7.0	6¼	7⅝	5⅛	**3KV63**	912.06	**793.50**	6.9
3	10.0	6⅜	7⅝	5⅛	**3KV64**	1015.70	**883.50**	7.1
NEMA 1 Three-Phase Input, 200-230 Volts AC, 60/50 Hz								
1/4	1.3	5⅜	4¼	3⅛	**3HX70**	479.42	**417.00**	2.7
1/2	2.5	5⅜	4¼	3⅛	**3HX71**	519.09	**452.00**	3.2
1	4.0	5⅜	4¼	4⅛	**3HX72**	606.46	**527.50**	3.8
2	7.0	5¼	5½	4⅛	**3HX73**	791.83	**689.00**	5.2
3	10.0	5¼	7⅝	5⅛	**3HX74**	865.86	**753.00**	6.9
5	16.5	6¼	7⅝	5⅛	**3HX75**	1094.47	**952.00**	8.0
NEMA 1 Three-Phase Input, 380-480 Volts AC, 60/50 Hz								
1/2	1.4	5⅜	4¼	3⅛	**3KV66**	801.31	**697.00**	4.7
1	2.1	6⅛	4¼	4⅛	**3HX76**	1130.00	**735.50**	4.8
2	3.7	6⅜	5½	4⅛	**3HX77**	1210.00	**893.50**	6.9
3	5.3	6⅜	7⅝	5⅛	**3HX78**	1350.00	**972.00**	6.9
5	8.7	6⅜	7⅝	5⅛	**3HX79**	1650.00	**1183.00**	8.1
5HV SERIES								
NEMA 1 Three-Phase Input, 380-480 Volts AC, 60/50 Hz								
7½	13.0	18⅛	8⅝	7⅛	5HV52*	2233.96	**1943.00**	16.0
10	18.0	18⅛	8⅝	7⅛	5HV53*	2781.20	**2419.00**	16.0
15	24.0	15⅛	9⅛	7⅛	5HV54*	3494.27	**3039.00**	25.0
20	30.0	15⅛	9⅛	7⅛	5HV55*	4444.24	**3865.00**	25.0
25	39.0	15⅛	9⅛	7⅛	5HV56*	5404.87	**4700.00**	25.0
30	45.0	15⅛	9⅛	7⅛	5HV57*	6481.58	**5637.00**	25.0

(*) Accepts 0 to 5Vdc or 0 to 10Vdc or 4 to 20 mAdc.

DRUM, WALL, CART-MOUNTED FLUID TRANSFER PUMPS

ARO
INGERSOLL-RAND
FLUID PRODUCTS



A 1:1 OIL DRUM PUMPS
Nos. 2P529 AND 3P960

- For use with: motor oil, gear oil, and transmission fluid
- Up to 9 GPM max. flow rate
- Fits 2" bung opening

No. 2P529. Delivers up to 9 gallons of oil and other low-viscosity liquids per minute. Includes basic pump, bung adapter, air line coupler/connector, needle valve, 1:1 pressure ratio between inlet and outlet. Carbon steel plunger and suction tube with a cast iron foot valve. Carbon steel and Buna N wetted parts. Buna N packing. 2" Air motor. Aluminum outlet casting.

No. 3P960. Same as No. 2P529 above, except has Teflon packing for greater compatibility with fluids such as anti-freeze. Will handle fluids up to 200 centipoise.

B 2:1 STAINLESS STEEL PUMP
No. 2P687

- For use with: anti-freeze, solvents
- Fits 4.5 GPM max. flow rate
- 2" Bung openings

For high-volume, short-run delivery of low-viscosity materials compatible with 316 stainless steel. For adhesives, food additives, lacquers, solvents, varnishes, water and water-base fluids. Abrasive-resistant hardened stainless steel cylinder and tube. Teflon packing. 2:1 pressure ratio between inlet and outlet. 2" Diameter air motor with 6" stroke. Delivers 8.0 cubic inches per cycle. 2" Bung opening. Will pump liquids up to 1000 centipoise.

C 4:1 CARBON STEEL TRANSFER PUMP
No. 3P961

- For use with: lubricants, adhesives, paints, sealers, lacquers, and resins
- 6 GPM max. flow flow rate
- Fits 2" bung opening

For delivery of medium-viscosity fluids (to 4000 cps) direct from containers. Also used to transfer low-viscosity fluids through long piping runs such as hose reels in central piping systems. Stub style pump can be wall-mounted or used with 55-gallon drum with suction tube (included). Carbon steel construction, and Teflon packing. 3" Diameter air motor with 2½" stroke delivers 0.2 cubic inches per cycle.

D 2:1 STUB (WALL-MOUNTED), 55-GALLON DRUM PUMPS Nos. 4RN20 AND 4RN19

- For use with paints, stains, varnishes, coatings, solvents
- Up to 1 GPM maximum flow rate

No. 4RN20 features stainless steel construction with Teflon packings. Can be wall-mounted (use No. 4RM91 bracket).

No. 4RN19 carbon steel-constructed pump features Teflon packings. Mounts directly on 55-gallon drum.

E 4:1 STUB (WALL MOUNT), 55-GALLON DRUM PUMPS, STAINLESS STEEL CONSTRUCTION
Nos. 4RN35 AND 4RN36

- Stainless steel construction for use in corrosive environments, with fluids that include water-based paints and coatings
- 4.2 GPM maximum flow rate

No. 4RN35 features glass filled Teflon packings for high fluid compatibility. Mounts to wall using No. 4RM91 wall mounting bracket.

No. 4RN36 55-gallon pump mounts directly on drum. Features glass filled Teflon packings for water-based fluid compatibility.

F 9:1 STUB (WALL MOUNT), 55 GALLON DRUM PUMPS, STAINLESS STEEL CONSTRUCTION
Nos. 4RN21 AND 4RN22

- Higher ration for higher outlet pressure demand: 1,900 PSI at 300 PSI air inlet
- 4.0 GPM maximum flow rate

No. 4RN21 stub-type mounts to wall using No. 4RM91 wall mounting bracket. Features Teflon packings for wide fluid compatibility, including water-based.

No. 4RN22 55-gallon pump mounts directly on drum. Teflon packings for wide material compatibility.

G 43:1 CART-MOUNTED, 5-GALLON EXTRUSION PUMPS
Nos. 4RN23 AND 4RN24

- High ratio pressure pumps used for supply of high-viscosity materials: caulk, RTV, adhesives, sealants
- 0.85 GPM maximum flow rate

No. 4RN23 carbon steel-constructed pump features abrasion-resistant UHMW-PE packings. Unit shipped assembled with pump, air regulator, cart, follower.

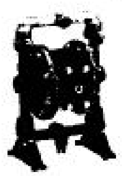
No. 4RN24 stainless steel-constructed pump offers maximum corrosion resistance with abrasive-resistant UHME-PE packings. Unit shipped complete/assembled with pump, air regulator, cart, and follower.

TRANSFER PUMP ORDERING DATA

Key	Ratio	Max. Flow Rate (GPM)	Discharge FPT (In.)	Body Material	Packing	ARO Model	Stock No.	List	Each	Ships Wt.
A	1:1	9	3/4	Carbon Steel	Buna-N	612041-1	2P529	$725.50	$718.50	18.0
A	1:1	9	3/4	Carbon Steel	Teflon	612041-3-G	3P960	847.36	580.50	21.0
B	2:1	4	1/2	Stainless Steel	Teflon	650133	2P687	1147.36	1060.00	21.0
C	4:1	6	1/2	Carbon Steel	Teflon	650132-C	3P961	1147.36	1073.86	21.0
D	2:1	1	1/2	Stainless Steel	Teflon	650810-1C	4RN20	1141.50	993.00	17.0
D	2:1	1	1/2	Carbon Steel	Teflon	650810-1C	4RN19	977.99	851.50	19.0
E	4:1	4	3/4	Stainless Steel	Teflon	NM2304B-11-311	4RN35	1420.54	1312.00	24.0
E	4:1	4	3/4	Stainless Steel	Teflon	NM2304B-41-311	4RN36	1595.38	1485.00	36.0
F	9:1	4	3/4	Stainless Steel	Teflon	650408-B	4RN21	2103.49	1838.00	35.0
F	9:1	4	3/4	Stainless Steel	Teflon	650409	4RN22	2227.50	2026.00	45.0
G	43:1	0.85	1/2	Carbon Steel	UHMW	650640-1	4RN23	3534.97	3094.00	166.0
G	43:1	0.85	1/2	Stainless Steel	UHMW	650541-1	4RN24	4414.61	3860.00	185.0

AIR-OPERATED DIAPHRAGM

ARO®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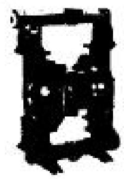
No. 2P598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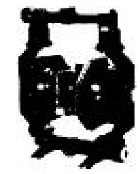
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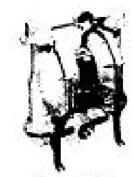

No. 4RN42

INGERSOLL-RAND
FLUID PRODUCTS

Replacement Parts Available
1-800-323-0620

FREE DELIVERY on orders of $100 or more
See Freight Policy

- 4RN43, 4RN44, 4RN45 Are flap check design (Good for passing 2" semi-solids, Material flow top to bottom)
- Twin diaphragm design, double acting
- No-stall air motor design
- Self priming 15 ft. wet; 10 ft. dry
- For pumping water, solvents, slurries, waste oils, paints, and adhesives compatible with pump component materials

Flow rate depends on air pressure and fluid viscosity. Max flow rates are achieved at 100 PSI for 1/2" pumps and 120 PSI for others. Verify materials of construction with Chemical Resistance Chart in the Terminology and Technical Data section.

Metallic Pumps: High strength, heat-treated aluminum alloy pumps offer high impact strength and good abrasion resistance. Aluminum pumps are the pump of choice in general industrial applications. **WARNING:** ALUMINUM IS NOT COMPATIBLE WITH HALOGENATED HYDROCARBON SOLVENTS. Stainless steel pumps offer high impact strength along with good corrosion resistance, making them a wise choice in marine or washdown operations, as well as areas where highly caustic or corrosive materials are in use. Max. temperature 150°F for aluminum pumps, 190°F for cast iron.

PUMP CROSS-REFERENCE

Stock No.	Wilden Model	Warren/Rupp Model	Aro Model
METALLIC PUMPS			
4RN37	M1/SDPC/TF/TF/STF	SB1/2-A TGF-2-S	PD05P-ASS-STT
2P598	M2/00/BN/BN/AP	SB1-A/SB-2-A	666100-362-C
5U664	M2/TO/TF/TF/AT	SB1-A/SGN-3-A	666100-244-C
4RN27	M2/WAAB/WF/WF/WF	EB1-M TN-3-2	666102-2EB-C
5U665	M2/ST/TF/TF/ST	SB1-A/SGN-3-SS	666111-244-C
5U666	M2/ST/WF/WF/WF	SB1-A/SGN-3-SS	666101-24B-C
2P599	M4/OP/BN/BN/BF	SB1-1/2-A/SB-4-A	666150-362-C
5U671	M4/TO/TF/TF/AT	SB1 1/2-A/SGN-5-A	666150-244-C
5U672	M4/ST/FT/TF/ST	SB1-1/2-A/SSN-3-S1	666161-244-C
4RN28	M4/WMAB/WF/WF/WF	EB 11/2-A TN-2-CI	666152-2EB-C
5U673	M4/ST/TF/TF/ST	SB1-1/2-1/SI-3-SS	666151-24B-C
2P600	M8/FQ/BN/BN/BN	SB1-1/2-1/SI-3-55	PD20A-AAP-GGG
4RN38	M8/WAAD/WF/WF/WF	EB2-M TN-3-1	PD20A-ACS-HAA
5U676	M8/TD/TF/TF/AT	EB2-M/TGN 2-A	PD20A-AAP-KTT
5U678	M8/ST/TF/TF/ST	SB2-A/TGN-2-S	PD20A-ASP-AAA
5U677	M8/54/TF/TF/ST	—	PD20C-ASS-KTT
4RN43	—	SA2-A DP-S-A	PF20A-AAS-SAA
4RN39	M15/AAAB/WF/WF/WF	EB-SM TN-3-A	PD30A-AAS-AAA-D

SCREENED INLET PUMP

Used in applications where unwanted solids pose a problem to the pump's intake. Pump has a special strainer to prevent solids from entering.
No. 4RN46. ARO brand. Shpg. wt. 95.0 lbs. List ....$1147.36. Each **$1012.00**

METALLIC PUMPS

GPM Flow Typical†	Max. GPM*	Max CFM	Max. PSI Oper. Pressure	Pump Body Material	Materials of Construction: Diaphragm	Materials of Construction: Ball	Check Seal	Air Inlet FNPT	Fluid Inlet/ Outlet FNPT	Port Type #	Susp. Solids Max. Dia.	ARO Model	Stock No.	List	Each	Shpg. Wt.
10	13	20	100	Stainless Steel	Teflon	Teflon	Stainless Steel	1/4	1/2	Single	3/32	PD05P-ASS-STT	**4RN37**	$939.74	**$817.50**	15.0
22	35	38	120	Aluminum	Buna	Acetal	Polypro	1/4	1	Single	1/8	666100-362-C	**2P598**	546.36	**513.50**	19.0
22	35	38	120	Aluminum	Teflon	Teflon	Stainless Steel	1/4	1	Single	1/8	666100-244-C	**5U664**	874.18	**767.50**	21.0
22	[illegible]	38	120	Cast Iron	Santoprene	Santoprene	Stainless Steel	1/4	1	Single	1/8	666102-2EBC	**4RN27**	874.18	**766.00**	45.0
22	[illegible]	[illegible]	120	Stainless Steel	Teflon	Teflon	Stainless Steel	1/4	1	Single	1/8	666111-244-C	**5U665**	1469.71	**1291.00**	46.0
22	[illegible]	38	[illegible]	Stainless Steel	Santoprene	Teflon	Stainless Steel	1/4	1	Single	1/8	666101-24B-C	**5U666**	1243.70	**1094.00**	36.0
80	[illegible]	[illegible]	[illegible]	Aluminum	Buna	Acetal	Polypro	1/2	1½	Single	1/4	666150362-C	**2P599**	693.88	**669.00**	44.0
80	[illegible]	[illegible]	[illegible]	Aluminum	Teflon	Teflon	Stainless Steel	1/2	1½	Single	1/4	666150244-C	**5U671**	1245.70	**1091.00**	54.0
80	[illegible]	[illegible]	120	Stainless Steel	Teflon	Teflon	Stainless Steel	1/2	1½	Single	1/4	666161244-C	**5U672**	2617.08	**2291.00**	116.0
80	[illegible]	[illegible]	[illegible]	Stainless Steel	Santoprene	Teflon	Stainless Steel	1/2	1½	Single	1/4	66615124B-C	**5U673**	2322.04	**2034.00**	86.0
80	[illegible]	112	[illegible]	Cast Iron	Santoprene	Teflon	Stainless Steel	1/2	1½	Single	1/4	666152-2EB C	**4RN28**	901.50	**796.00**	81.0
125	[illegible]	125	[illegible]	Cast Iron	Santoprene	Santoprene	Stainless Steel	1/2	2	Single	1/4	PD20A-ACS-HAA	**4RN38**	1726.50	**1525.00**	160.0
125	[illegible]	125	[illegible]	Aluminum	Santoprene	Santoprene	Santoprene	1/2	2	Single	1/4	PS20A-AAS-AAA	**4RN46**	1147.36	**1012.00**	95.0
125	[illegible]	125	[illegible]	Aluminum	Geolast	Geolast	Geolast	3/4	2	Single	1/4	PD20A-AAP-GGG	**2P600**	898.03	**849.50**	76.0
125	[illegible]	[illegible]	[illegible]	Aluminum	Teflon	Teflon	Kynar	3/4	2	Single	1/4	PD20A-AAP-KTT	**5U676**	1431.47	**1258.00**	54.0
125	160	125	120	Stainless Steel	Teflon	Teflon	Kynar	3/4	2	Single	1/4	PD20A-ASP-AAA	**5U678**	2906.15	**2268.00**	152.0
125	160	125	120	Stainless Steel	Santoprene	Acetal	Santoprene	3/4	2	Single	1/4	PD20C-ASS-KTT	**5U677**	3857.32	**3292.00**	116.0
125	[illegible]	125	120	Aluminum	Santoprene	Santoprene	Stainless Steel	1/2	2	Single	2	PF20A-AAS-SAA	**4RN43** ‡	1750.29	**1544.00**	104.0
125	160	125	120	Stainless Steel	Teflon	Viton	Stainless Steel	1/2	2	Single	2	PF20C-ASS-SVT	**4RN45** ‡	4895.41	**4283.00**	222.0
125	[illegible]	[illegible]	[illegible]	Cast Iron	Santoprene	Santoprene	Stainless Steel	1/2	2	Single	2	PF20C-ACS-SAA	**4RN44** ‡	2529.66	**2228.00**	200.0
200	[illegible]	125	120	Aluminum	Santoprene	Santoprene	Santoprene	3/4	3	Single	3/8	PD30A-AAS-AAA-B	**4RN39**	1327.66	**1173.00**	124.0
200	275	125	120	Aluminum	Teflon	Teflon	Stainless Steel	3/4	3	Single	3/8	PD30A-APS-STT-B	**4RN40**	2879.33	**2560.00**	128.0
200	275	125	[illegible]	Cast Iron	Santoprene	Santoprene	Stainless Steel	3/4	3	Single	3/8	PD30A-ACS-HAA-B	**4RN41**	2305.65	**2041.00**	210.0
200	275	125	[illegible]	Stainless Steel	Teflon	Teflon	Stainless Steel	3/4	3	Single	3/8	PD30S-ASS-STT-B	**4RN42**	7621.77	**6645.00**	210.0

(*) GPM pumping water with no back pressure (0 PSI fluid back pressure). CFM required for this flow at 100 PSI (air inlet pressure). (†) Typical flow rate at 70 PSI (air inlet pressure) with 15 PSI (fluid back pressure). [illegible] (#) Single = Single-piece nonrotating manifold ports. Three = Three-piece inlet/outlet manifolds which can be rearranged to create multiple inlet/outlet configurations. Flange = Flanges and flange adapters included. (‡) PF= flap check valve design.

HIGH TORQUE GEAR AND DIAPHRAGM PUMPS

SCIENCO

No. 4UP49

- 12 Volt DC pumps available individually or in convenient Caddy systems
- Transfer concentrated non-flammable agricultural chemicals to secondary containers
- 1" diameter suction tube and 2" NPT inlet adapter included
- Flow rates from 4 to 14 U.S. GPM

Gear Pump

No. 4UP42. High-torque, horizontally mounted gear pump is ideal for the transfer of low to medium viscosity pesticides, herbicides and industrial chemicals.

Diaphragm Pumps

Positive displacement, self-priming pumps mount vertically or horizontally. Suitable for stationary or portable usage. Simple, no-seal design allows pumps to operate dry without damage.

No. 4UP48. Discharge pressure rating of 25 psi; this pump handles even the thickest pesticides, down to temperatures as low as 40°F (4°C).

No. 4UP49. Handles various viscosities, from light liquids to heavy flowable pesticides. Automatic pressure-relief valve operates at 1? psi for internal bypass. Includes 1½ x 12', 2-braid, 4-ply EPDM discharge hose and 1" 4-bolt ball valve and spout with reducer.

No. 4UP42

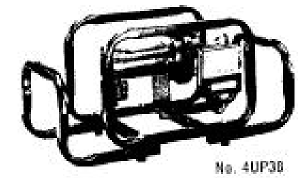
GEAR/DIAPHRAGM PUMPS SPECIFICATIONS AND ORDERING DATA

Gear/Diaphragm	Description	Construction	GPM	Mfr. Model	Stock No.	List	Each	Shpg. Wt.
Ryton plastic	High-torque gear	Aluminum, Viton, plastic	8 to 14	EP-12H	4UP42	$373.80	$356.00	19.0
6-cell Santoprene	Double diaphragm	Stainless steel, Viton, plastic	6 to 8	556	4UP48	669.90	638.00	19.0
3-cell Santoprene	Double diaphragm	Polypropylene, stainless steel and Viton	Up to 4	TF-04 SYS	4UP49	390.56	372.25	15.0

CADDY SYSTEMS

SCIENCO New

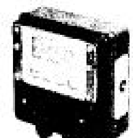
Portable and rugged closed transfer systems featuring pump and flow meter or batch/flow meter pre-installed in tubular steel cradle for maximum flexibility and handling. Ideal for the user of multiple mini-bulk containers. Suction, discharge hoses and 4-bolt ball valve and spout included.



No. 4UP38

No. 4UP44

No. 4UP43



No. 4UP45

FLOW METERS AND BATCH/FLOW METERS

Description	Scienco Model No.	Stock No.	List	Each	Shpg. Wt.
Totalizing flow meter up to 30GPM.	SEM-10	4UP13	$215.77	$205.50	2.8
Totalizing flow meter up to 30GPM. Three calibration modes, operates to 100 psi. Includes 4AA batteries.	SEM-30	4UP44	342.03	325.75	[illegible]
Electronic batch/flow meter. Similar to 4UP44, with batch electronics and air sensor designed to shut down the system if air is detected in the meter.	SEM-30B	4UP45	762.82	726.50	[illegible]
Two-inch flow meter assembly. Includes paddle-wheel flow sensor, electronic LCD flow monitor with three totalizers, 10-foot sensor and power cables, and pipe-mounting kit for 2" PVC installation. Flow rate to 150 GPM.	[illegible]	[illegible]	901.95	859.00	[illegible]
Two-inch batch/flow meter assembly. Same as 4UP46 with built-in batch electronics.	SEM-15B	[illegible]	1360.80	1296.00	[illegible]

CADDY SPECIFICATIONS AND ORDERING DATA

Meter Type	Discharge Hose (In.)	Suction Hose (In.)	Pump	Scienco Model No.	Stock No.	List	Each	Shpg. Wt.
SEM-30 Flow	1 x 12 EPDM	[illegible]	4UP42	CADDY-EP	4UP36	[illegible]	$810.00	[illegible]
SEM-30B Batch/Flow	1 x 12 EPDM	[illegible]	4UP42	CADDY-EP-B	4UP37	[illegible]	1198.00	[illegible]
SEM-30 Flow	[illegible]	[illegible]	[illegible]	CADDY-556	4UP38	[illegible]	1178.00	[illegible]
SEM-30B Batch/Flow	1 x 12 EPDM	[illegible]	[illegible]	[illegible]	4UP39	[illegible]	1593.00	[illegible]
SEM-30 Flow	[illegible]	[illegible]	[illegible]	[illegible]	4UP40	[illegible]	831.00	[illegible]
SEM-30B Batch/Flow	[illegible]	[illegible]	[illegible]	[illegible]	4UP41	[illegible]	1231.00	[illegible]

No. 3ZH86

EXTECH INSTRUMENTS

No. 3ZH70

No. 3ZH73

HANNA instruments

No. 4KF21

EXTECH HEAVY-DUTY pH/mV/TEMPERATURE METER KIT

- Extra large dual display LCD
- Read pH/temperature or mV/temperature in °F or °C
- Ranges: 0-14pH, 0-1999mV, 0-100°C, 32-212°F
- Min./Max./Average with Recall
- Auto OFF and Data Hold
- Easy slope and calibration adjustments
- Manual and auto temperature compensation
- Optional serial cable and data acquisition software (No. 3ZH86) and datalogger (No. 1M980)
- Includes pH electrode, temperature probe (No. 3ZJ04), protective holster, 9V battery, and carrying case

No. 3ZH86. Extech brand (407228). Shpg. wt. 2.5 lbs. Each **$269.00**

OPTIONAL FLAT SURFACE ELECTRODE

- Ideal for testing pH on solid products such as cheese or soils
- Polymer bodied electrode makes clean-up easy
- End mounted, large flat sensor for fast, efficient response
- Probe dimensions are 5mm Diameter x 114mm Long; includes 39" cable

No. 3ZH98. Flat Surface Electrode. Extech brand (00110B). Shpg. wt. 0.4 lbs. Each **$65.00**

ACCESSORIES

No. 3ZJ04. Stainless Steel Temperature Probe. Extech brand (850188). Shpg. wt. 0.2 lbs. Each **$49.00**

No. 3ZH67. 117V AC Adapter. Extech brand (1561191). Shpg. wt. 0.5 lbs. Each **$17.00**

HANNA DIST WATERPROOF CONDUCTIVITY AND DISSOLVED SOLIDS TESTERS

- Large and easy to read LCD
- Automatic temperature compensation
- Housed in waterproof ABS cases for the best protection against dust and humidity
- Manual one-point calibration through trimmer
- Accuracy: ±2% Full Scale
- Rated to like 350 hours of continuous use

CONDUCTIVITY CALIBRATION SOLUTIONS

- Used to calibrate Hanna or other brands of instruments
- 30 ml bottles, 2 bottles per unit

No. 4KF27. ❶ 84 µS/cm @ 25°C. Hanna brand (HI7033P). Shpg. wt. 0.2 lbs. Each **$7.50**

No. 4KF28. ❶ 5000 µS/cm @ 25°C. Hanna brand (HI7030P). Shpg. wt. 0.2 lbs. Each **$7.50**

❶ These products are covered by OSHA Hazard Communication Standard and Material Safety Data Sheets (MSDS) are available. See page opposite back cover.

Range	Hanna Model	Stock No.	Each	Shpg. Wt.
1999 ppm	DIST WP 1	4KF21	$46.70	0.6
10.00 ppt	DIST WP 2	4KF22	46.70	0.6
1999 µS/cm	DIST WP 3	4KF23	46.70	0.6
19.99 mS/cm	DIST WP 4	4KF24	46.70	0.6

TDS/CONDUCTIVITY METER KITS Nos. 3ZH70 and 3ZH71

- Economy models measure TDS (total dissolved solids) or conductivity
- TDS range: 10 to 19,990 PPM; Conductivity range: 10 to 19,990 µS
- ±0.5% accuracy; cell adjust for calibration
- Adjustable LCD with Auto OFF when cover is closed
- Includes polymer cell (No. 3ZJ03) with 39" cable, hard vinyl carrying case, and 9V battery

No. 3ZH70. Oyster TDS Meter Kit. Extech brand (341150). Shpg. wt. 1.8 lbs. Each **$199.00**

No. 3ZH71. Oyster Conductivity Kit. Extech brand (341250). Shpg. wt. 1.8 lbs. Each **$199.00**

PH/CONDUCTIVITY/ TDS METER KITS Nos. 3ZH72 and 3ZH73

- Measure pH, Conductivity and TDS (Total Dissolved Solids)
- Ranges: 0.0 pH to 14.00 pH, 10 to 19,990 µS, 10 to 19,990 PPM
- Accuracy: ±0.01pH, ±0.5% µS and PPM
- Select Glass Cell (on No. 3ZH72) or durable Polymer Cell (on No. 3ZH73)
- Adjustable LCD with Auto OFF when cover is closed
- Complete with pH electrode, TDS/Conductivity cell, buffer solutions, carrying case, 9V battery, and instructions

No. 3ZH72. pH/Conductivity/TDS Kit. Glass Cell. Extech brand (341350). Shpg. wt. 2.9 lbs. Each **$379.00**

No. 3ZH73. pH/Conductivity/TDS Kit. Polymer Cell. Extech brand (341350-P). Shpg. wt. 2.9 lbs. Each **$359.00**

CONDUCTIVITY ACCESSORIES

- Glass and polymer conductivity cells provide precise measurements from 0.01 to 200,000 µS/cm with 1.0K constant and automatic temp control
- Conductivity cells are corrosion resistant with platinized electrodes
- Choice of conductivity solutions permits calibration close to measurement range

No. 3ZH99. Glass Conductivity Cell 0.5"Dx5.6"L (12mm x 137mm). Extech brand (800410). Shpg. wt. 0.4 lbs. Each **$95.00**

No. 3ZJ03. Polymer Conductivity Cell 0.5"Dx6.4"L (12mm x 157mm). Extech brand (800410). Shpg. wt. 0.4 lbs. Each **$95.00**

No. 3ZJ02. 1,000 mS/cm Solution, 500ml. Extech brand (800459). Shpg. wt. 1.2 lbs. Each **$32.00**

No. 3ZJ01. 10,000 mSem Solution, 500ml. Extech brand (800458). Shpg. wt. 1.2 lbs. Each **$32.00**

EXPLORER® ELECTRONIC BALANCE

When you need a reliable balance, look no further than the Ohaus Explorer. Big on features, the Explorer is an incredible combination of performance and value.

Four cursor keys provide easy menu navigation and lead you through on-screen prompts for a wide range of applications. And our one key/one function buttons make it incredibly easy to operate. Features like an up-front level bubble and spill gutter make the explorer even more user-friendly. When additional features are needed, you can easily upgrade to the Ohaus Voyager balance with a simple, snap-in module.

Capacity (Grams)	Readability (Grams)	Repeatability (Std. Dev.) (g)	Linearity (Grams)	Pan Size (cm)	Ohaus Item No.	Stock No.	Each	Ship. Wt.
410	0.001	0.0005	±0.002	12 dia.	E04130	4UG66	$1939.00	15.0
100/410*	0.001/0.01	0.0005/0.005	±0.002/0.005	12 dia.	E0RV70	4UG72	1890.00	15.0
1000/4100*	0.01/0.1	0.005/0.05	±0.02/0.05	17.2 x 17.2	E0RW60	4UG73	1809.00	15.0
4100	0.1	0.05	±0.1	20.3 x 20.3	E0D110	4UG67	1291.00	15.0
8100					E0H110	4UG68	1515.00	15.0
12,000	0.1	0.1	±0.4	28 x 35	E0K210	4UG69	2479.00	26.0
22,000					E0L210	4UG70	2911.00	31.0
32,000					E0M210	4UG71	3991.00	31.0

*Optional Fine Range (*) With windshield

No. 4UG67

Perfect for users that demand high performance in a dependable, easy-to-use workhorse balance. Applications include GLP protocol, parts counting, animal weighing and percent weighing. Ohaus brand.

NAVIGATOR® BALANCES

The power of laboratory balance functions in a portable unit. Applications include animal weighing, parts counting, and check weighing. Features RS232 bidirectional interface with cursor keys to navigate menus and functions. High contrast LCD displays weight and text messages for guidance. Contoured design cleans easily. Sealed front panels and spill rings direct liquids off the balance. Large stainless steel weighing pan. AC powered (adapter included) or battery operated (8 "AA" alkaline batteries, not included) for mobile use. Ohaus brand.

Capacity (Grams)	Readability (Grams)	Repeatability (Grams)	Linearity (Grams)	Ohaus Item No.	Stock No.	Each	Ship. Wt.
210	0.01	0.01	±0.01	N02120	4UG75	$643.00	8.0
810	0.1	0.1	±0.1	N08110	4UG76	535.00	8.0
2100	0.1	0.1	±0.1	N08210	4UG77	643.00	4.8
8100	0.5	0.5	±0.4	N0H110	4UG79	697.00	8.0

No. 4UG75

SCOUT II® BALANCES

Scout's durable ergonomic construction and simple, two-button operation and versatility to laboratory and industrial environments. Features include a high-contrast display, large stainless steel weighing surface and auto shut-off, multiple weighing units and parts counting, battery or AC adapter operation, easy span and linearity calibration, integral security bracket, and weigh below hook.

Capacity (g)	Readability (g)	Repeatability (Std. Dev.) (g)	Linearity (Grams)	Pan Size (cm)	Ohaus Item No.	Stock No.	Each	Ship. Wt.
200	0.01	0.01	±0.1	10.2 dia.	SC2020	4UG80	$323.00	3.0
400	0.1	0.1	±0.1	12.7 x 14.6	SC4010	4UG81	156.75	4.0
600	0.1	0.1	±0.1	12.7 x 14.6	SC6010	4UG82	254.00	4.0

No. 4UG80

PORTABLE COMPACT SCALE

Offers total portability in a compact and durable balance. Features two-button operation, full capacity tare and a high contrast display reading in grams or pounds/ounces. Operates on 3 "AA" batteries (supplied) or optional AC adapter. Ohaus brand.

Capacity (g)	Readability (g)	Platform Size (cm)	Dimensions (cm) W	H	D	Ohaus Item No.	Stock No.	Each	Ship. Wt.
5000	2	13.3 x 13.3	14	4.1	19.1	CS5000	4UG74	$125.30	2.0

No. 4UG74

GENERAL PURPOSE BENCH SCALES

For shipping and other general weighing applications such as commercial legal-for-trade weighing, warehousing, or incoming goods. Delivers NTEP Certified performance in a simple, easy-to-use, battery operated unit. Select from 4 weighing modes: lb, kg, g, LCD display. Operating temperature range of 0° to 40°C. Stainless steel platform with painted steel frame (except No. 4UG65 has painted aluminum frame). Requires 6 alkaline "C" batteries. Ohaus brand.

Capacity (g)	Scale Base Size (cm) W	D	H	Ohaus Item No.	Stock No.	Each	Ship. Wt.
25	30	30	9.8	[illegible]	4UG65	$756.00	12.0
100	45	45	9.8	[illegible]	4UG63	784.00	12.0
250	45	60	9.8	[illegible]	4UG64	1296.00	12.0

No. 4UG63

FIRE EXTINGUISHING AGENTS

[A] **Tri-Class "ABC" Dry Chemical** - for class A, B, and C fires. Non-toxic mono-ammonium phosphate based material.

[B] **Regular "BC" Dry Chemical** - for class B fires. C rating for non-conductivity. Non-toxic sodium bicarbonate material.

[C] **Purple K Dry Chemical** - for class B and C fires. Potassium bicarbonate is twice as effective as regular dry chemical agent for heavy industrial uses.

[D] **Carbon Dioxide** - for class B and C fires. Extremely cold CO_2 gas dissipates quickly without leaving residues. Ideal for computer rooms, telecommunication hubs, clean rooms.

[E] **Halotron I** - for both class BC and ABC fires. Liquefied gas dissipates quickly without leaving residues. More effective, versatile and user friendly than CO_2. An environmentally friendly alternative to Halon 1211. Most effective agent in high tech electronic areas.

[F] **Class K Wet Chemical** - specifically for class K combustible cooking media fires. Recommended by NFPA10 for commercial kitchen deep fat fryer applications, required wall placard included. Low pH potassium acetate solution discharges in a fine mist.

FIRE EXTINGUISHERS

Pro Line Valve

Excel Line Valve

PRO, PROPLUS & EXCEL DRY CHEMICAL EXTINGUISHERS

- ProPlus features ergonomic, curved steel handle
- Hose comes standard on 5, 10 and 20 lbs. units
- 6-Year Limited Warranty

CARTRIDGE EXTINGUISHERS

- Higher operating PSI greatly increases flow rate and range
- Easy re-fill and replace CO_2 cartridge (No. 4XP75)
- Ideal in heavy industry such as refineries and paper mills

WHEELED EXTINGUISHERS

- High mobility and large capacity for hazard locations such as chemical/petroleum plants, airports and parking garages
- Features include: 16" wheels, 50ft. hose, 110 cu. ft. nitrogen cylinder, corrosion-resistant finish and highly visible pressure gauge

KIDDE Fyrnetics

New

No. 5T904 No. 5T899 No. 4T300 No. 4T301 No. 4XP87 No. 4XP88 No. 4XP78

Agent Key	UL Rating	Size (lbs.)	H (in.)	W (in.)	Cylinder Material	Bracket Type Included	USCG Bracket	PSI Operating Pressure	Discharge Time (Sec.)	Range (Ft. max)	Kidde Fyrnetics Model	Stock No. ❸	List	Each	Shpg. Wt.
PRO LINE DRY CHEMICAL EXTINGUISHERS—ALUMINUM VALVE															
A	1-A: 10-B: C	2.6	15.0	3.3	Alum	Wall Hanger	4T307	100	8.5-10.5	12	PRO2.5TCM	**5T904**	$28.80	**$19.95**	4.0
A	3-A: 40-B: C	5.0	16.0	4.5	Alum	Wall Hanger	4T308	195	13.0-15.0	12	PRO5TCM	**5T899**	43.20	**27.00**	8.0
A	4-A: 60-B: C	10.0	21.2	5.1	Steel	Wall Hook	5T909	195	17.0-21.0	20	PRO10TCM	**4T889**	68.70	**45.00**	17.0
A	10-A: 80-B: C	20.0	21.6	7.9	Steel	Wall Hook	5T908	195	20.0-24.0	20	PRO20TCM	**5T903**	112.70	**89.95**	33.0
PROPLUS LINE DRY CHEMICAL EXTINGUISHERS—ALUMINUM VALVE															
A	1-A: 10-B: C	2.6	15.0	3.3	Steel	Wall Hook	4T307	100	8.5-10.5	12	PROPLUS2.5	**4XP87**	34.50	**22.95**	4.2
A	3-A: 40-B: C	5.0	16.0	4.5	Steel	Wall Hook	4T308	195	13.0-15.0	12	PROPLUS5	**4XP88**	51.75	**32.95**	8.5
A	4-A: 60-B: C	10.0	21.2	5.1	Steel	Wall Hook	5T909	195	17.0-21.0	20	PROPLUS10	**4XP89**	82.23	**51.95**	20.0
A	10-A: 80-B: C	20.0	21.6	7.0	Steel	Wall Hook	5T908	195	20.0-24.0	20	PROPLUS20	**4XP90**	135.12	**95.95**	32.0
EXCEL LINE DRY CHEMICAL EXTINGUISHERS—NON-CORROSIVE NYLON VALVE															
A	1-A: 10-B: C	2.6	15.0	3.3	Alum	Nylon Strap	Included	100	8.5-10.5	12	XL2.5TCZ	**4T300**	23.30	**17.06**	4.0
A	3-A: 40-B: C	5.0	16.0	4.5	Alum	Wall Hanger	4T308	195	13.0-15.0	12	XL5TCZ	**4T301**	38.40	**28.95**	8.0
A	4-A: 60-B: C	10.0	21.2	5.1	Steel	Wall Hook	5T909	195	17.0-21.0	20	XL10TCZ	**5T905**	61.20	**48.95**	16.0
B	5-B: C	2.0	11.0	3.2	Alum	Nylon Strap	Included	100	8.5-10.5	12	FIREAWAY5	**5X662**	15.00	**11.91**	3.0
B	10-B: C	2.75	15.0	3.3	Alum	Nylon Strap	Included	100	8.5-10.5	12	XL2.75RZ	**2W091**	22.00	**17.95**	4.2
B	60-B: C	10.0	21.2	5.1	Steel	Wall Hook	5T909	195	17.0-21.0	20	XL10RZ	**1M792**	71.00	**54.95**	18.0
DRY CHEMICAL CARTRIDGE FIRE EXTINGUISHERS															
A	20-A: 60-B: C	21.0	23.6	11.3	Steel	—	—	585	20.0-26.0	30	PROPLUS20PTCMC	**4XP92**	455.75	**296.00**	47.0
C	80-B: C	21.0	23.6	11.3	Steel	—	—	585	20.0-26.0	30	PROPLUS20PKC	**4XP91**	455.50	**300.00**	47.0
Replacement Cartridge					—	—	—	585	—	—	440048	**4XP75**	44.50	**34.95**	2.0
PRO LINE CARBON DIOXIDE FIRE EXTINGUISHERS															
D	5-B: C	5.0	17.0	5.3	Alum	Wall Hook	5T906	850	8.5-10.5	8	PRO5CDM	**5T900**	150.50	**119.95**	13.0
D	10-B: C	10.0	19.3	7.0	Alum	Wall Hook	5T906	850	8.5-10.5	8	PRO10CDM	**5T901**	238.00	**180.00**	28.0
D	10-B: C	15.0	26.0	7.0	Alum	Wall Hook	5T908	850	11.0-15.0	8	PRO15CDM	**6T547**	269.30	**200.00**	37.0
D	10-B: C	20.0	26.0	9.0	Alum	Wall Hook	5T908	850	11.0-15.0	8	PRO20CDM	**6T548**	336.90	**250.00**	49.0
HALOTRON FIRE EXTINGUISHERS															
E	2-B: C	2.5	14.9	—	Steel	Wall Hook	5T906	100	9.0	10	PROPLUS2.5HM	**4XP81**	107.50	**79.95**	6.3
E	1-B: C	5.0	15.3	—	Steel	Wall Hook	5T909	100	9.0	15	PROPLUS5HM	**4XP82**	150.00	**139.95**	10.0
E	1-A: 10-B: C	11.0	16.2	—	Steel	Wall Hook	5T908	125	11.0	15	PROPLUS11HM	**4XP83**	322.50	**250.00**	23.0
E	2-A: 10-B: C	15.5	17.2	—	Steel	Wall Hook	5T908	125	14.0	15	PROPLUS15.5HM	**4XP84**	565.00	**400.00**	27.0
CLASS K WET CHEMICAL EXTINGUISHERS FOR COMMERCIAL KITCHENS															
F	K	6 liters	19.5	7.0	Stainless	Wall Hanger	—	100	55-60	12	PROPLUS100K	**4XP85**	225.50	**149.95**	15.0
F	K	9.4 liters	24.5	7.0	Stainless	Wall Hanger	—	100	75-83	12	PROPLUS250K	**4XP86**	249.00	**170.00**	19.0
WHEELED FIRE EXTINGUISHERS - 4XP78 & 4XP79 CONTAIN ABC AGENT, 4XP80 CONTAINS PURPLE K AGENT															
A	30-A: 160-B: C	50	51	22.0	Steel	—	—	240	36	35	CF50TCM	**4XP78**	1200.00	**900.00**	[illegible]
A	40-A: 240-B: C	150	60	28.0	Steel	—	—	240	45	40	CF150TCM	**4XP79**	2650.00	**1496.00**	[illegible]
C	240-B: C	125	62	23.0	Steel	—	—	230	43	35	CFC125PKM	**4XP80**	2805.00	**1800.00**	[illegible]

[illegible]

❸ [illegible]

PEDESTAL & WALL MOUNT EYE WASH STATIONS

Pedestal Mount Eye Washes provide emergency eye wash relief in locations where wall mount options are not possible. Pedestal pipe with floor flange measures 40" from floor and is 1¼" galvanized steel protected with a yellow polyurethane coating to prevent corrosion. Pedestal Mount and Wall Mount Eye Wash bowls measure 10" diameter and are available in either impact resistant plastic or corrosion resistant stainless steel. Hinged Dust cover keeps dust and other contaminants out of bowl. Dust Cover springs open when eye wash push handle is activated. Eye Wash includes twin chrome-plated brass spray-heads with flow control. (Eye/face spray-head is ABS plastic.) 1/2" NTP stay-open ball valve is operated by a highly visible push handle. Wall Mount Eye Wash includes heavy-gauge aluminum wall mounting bracket with three clearance holes. Water supply for pedestal and wall mount units is 1/2" IPS. Waste tee for pedestal mount eye washes is 1¼". Eye Washes deliver 2.5 GPM at 40 PSI. All units include a highly visible identification sign and inspection tag. Bradley brand.

Description	Eye Wash Bowl	Bradley No.	Stock No.	List	Each	Lot 3	Shpg. Wt.
Pedestal Mount Eye Wash	Plastic	S19-210	4R951	$276.04	$221.25	$210.13	15.0
Pedestal Mount Eye Wash	Stainless	S19-210E	4R959	390.46	257.25	244.38	16.0
Wall Mount Eye Wash	Plastic	S19-220	2P257	190.82	153.00	145.35	12.0
Wall Mount Eye Wash	Stainless	S19-220E	4T009	257.50	206.00	195.70	12.0
Wall Mount Eye Wash with Hinged Dust Cover	Stainless	S19-220DC	4T010	416.12	312.25	296.49	17.0
Wall Mount Eye/Face Wash	Plastic	S19-220FW	4R963	244.11	216.25	205.24	7.0
Wall Mount Eye/Face Wash	Stainless	S19-220T	4R965	295.51	257.25	244.38	7.0

No. 4T010

No. 4R965

No. 4R961

Replacement Parts Available 1-800-323-0620

EMERGENCY DRENCH SHOWERS

Designed for wall (horizontal supply) or ceiling (vertical supply) mounting, drench showers provide a deluge of water to entire face and body to rinse off chemicals or other contaminants. Shower head measures 10" diameter and is available in impact resistant plastic or corrosion resistant stainless steel. Flush Mount shower head measures 12¾" and includes integral flange to mount even with ceiling, concealing pipe and fittings. Showers activate with 1" chrome-plated brass stay-open ball valve and stainless steel triangular pull handle. Pipe and fittings are 1" galvanized steel protected with a yellow polyurethane coating to prevent corrosion. Water supply is 1" IPS vertical or horizontal. Showers deliver 80 GPM at 40 PSI. All units include a highly visible identification sign and inspection tag. Bradley brand.

Description	Shower Head	Bradley No.	Stock No.	List	Each	Lot 3	Shpg. Wt.
Horizontal Supply	Plastic	S19-120	2P268	$180.25	$135.20	$128.43	10.0
Horizontal Supply	Stainless	S19-120A	4R951	231.75	149.30	141.83	8.0
Horizontal Supply (flush mount with ceiling)	Stainless	S19-120FM	4R953	327.54	262.50	249.37	8.0
Vertical Supply	Plastic	S19-130	4T007	193.25	108.15	102.74	8.0
Vertical Supply	Stainless	S19-130A	4R955	214.24	144.15	136.94	7.0

No. 4R951

No. 4T007

No. 4R953

Replacement Parts Available 1-800-323-0620

DRENCH SHOWER ACCESSORIES

Emergency Drench Shower Privacy Curtain provides enclosure around drench shower stations during treatment. Industrial strength Tyvek curtain is designed in high visible yellow to mark location of shower. Curtain measures 70"L x 145"W with reinforcements at top and bottom for longer durability. 1½" x 42" diameter curtain rail and mounting brackets are all stainless steel to prevent corrosion. Mounts on any free standing drench shower unit. Emergency Drench Shower Tester keeps your showers in compliance with ANSI Standards which requires a weekly testing procedure to ensure proper operation of equipment. Tester includes 84" long watertight Tyvek funnel with weighted bottom to prevent splashing around the surrounding area. Funnel directs water to a drain or bucket (not provided) for disposal. Telescoping aluminum handle extends funnel 8' for easier reaching to shower head location. Bradley brand.

Description	Bradley No.	Stock No.	List	Each	Lot/Qty	Shpg. Wt.
Privacy Shower Curtain	S19-330	4T015	$416.12	$354.00	$336.12/2	7.0
Drench Shower Tester	S19-330ST	31955	100.34	76.65	72.21/3	5.0

No. 4T015

No. 31955

Replacement Parts Available 1-800-323-0620

DISTRIBUIDORA DE ORIENTE

3a. Calle 12-32, Sector B-1, Zona 8 de Mixco Ciudad San Cristobal
Guatemala, C. A. Tel.: 443-1719
Ferretería en General, Materiales de Construcción
TRANSPORTE GRATIS

COTIZACION

Nº 000524

Guatemala, 13 de marzo del 2001 Dirección

Nombre: Luz Esther Lopéz Tel.:

Cantidad	DESCRIPCION	Valor Unitario	Valor Total
	tubo PVC 1" 250 PSI		43.07
	" 160 PSI		38.97
	" 125 PSI		29.75
	copla 1"		2.75
	codo 1"		3.98
	Te 1"		4.96
	Te c/rosca		9.85
	copla c/rosca		2.99
	adapt. macho 1"		3.14
	codo c/rosca 1"		5.25

10% descuento

Hecho por ______ Recibió: ______

ALIADOS AGROINDUSTRIALES, S.A. "ALAISA"

3a AVENIDA 3-35 ZONA 8 MIXCO
CIUDAD SAN CRISTOBAL I GUATE

Cotización 9336
ORIGINAL

(MOSTI)

Cliente :
Dirección :
Población :
NIT. :
Teléfono :
Enviar a :
Fecha Ent. : 5/Dic/00

Fecha : 13/Mar/01
Vendedor :

Fecha Doc. 13/Mar/01

Cantidad	Codigo	Descripción	Precio Unitario	Importe
1	017AC080061	TUBO ACERO CARBON 1" ERW C80	195.00	195.00
1	04002HN260R061M	CODO 90-ROSC 1" MEX 300V HN	25.00	25.00
1	04011HN260R061M	TEE-ROSC 1" MEX 300V HN	25.00	25.00
1	04012IDN260R061M	UNION UNI-ROSC 1" MEX 300V HN	60.00	60.00
1	04004HN260R061M	COPLA-ROSC 1" MEX 300V HN	18.00	18.00

MATERIAL EN ESTOCK SALVO PREVIA VENTA

TRESCIENTOS VEINTITRES QUETZALES 00/100

481279-4

Sub-Total	323.00
Descuento	0.00
	323.00

Aceptación de la Orden Fecha

Nombre

Firma Sello de la Empresa

F. Vapor

En las siguientes páginas se muestra una tabla de propiedades del agua en el rango de 4.972 a 32.53 psia.

También se muestran tres tablas obtenidas del manual del ICAITI (Instituto centroamericano de instrumentación y tecnología ivestigativa) , a partir de las cuales se calculó el diámetro de la tubería para la distribución del vapor saturado.

Por último se muestra una tabla con información general sobre el tamaño de las calderas y la generación de vapor asociada, así como las dimensiones de las mismas.

TABLA C.3 PROPIEDADES DEL AGUA UNIDADES EN SISTEMA INGLÉS (Continúa)

TEMPERATURA	PRESIÓN ABSOLUTA	VOLUMEN ESPECÍFICO v			ENERGÍA INTERNA u			ENTALPÍA h			ENTROPÍA s		
T (DEG F)	P (PSIA)	LÍQUIDO SATURADO	EVAPORACIÓN	VAPOR SATURADO	LÍQUIDO SATURADO	EVAPORACIÓN	VAPOR SATURADO	LÍQUIDO SATURADO	EVAPORACIÓN	VAPOR SATURADO	LÍQUIDO SATURADO	EVAPORACIÓN	VAPOR SATURADO
152	4.372	0.01641	73.90	73.92	129.95	933.0	1063.0	129.96	1001.0	1131.0	0.2345	1.6103	1.8448
154	4.612	0.01642	70.70	70.72	131.96	931.6	1063.6	131.96	999.8	1131.8	0.2377	1.6032	1.8409
156	4.862	0.01643	67.67	67.68	133.96	930.2	1064.2	133.97	998.6	1132.6	0.2409	1.5951	1.8371
158	5.122	0.01644	64.78	64.80	135.95	928.8	1064.8	135.97	997.4	1133.4	0.2441	1.5892	1.8333
160	5.393	0.01645	62.04	62.06	137.96	927.4	1065.4	137.97	996.2	1134.2	0.2473	1.5822	1.8295
162	5.674	0.01646	59.43	59.45	139.96	926.0	1066.0	139.98	995.0	1135.0	0.2505	1.5753	1.8258
164	5.966	0.01647	56.95	56.97	141.96	924.6	1066.6	141.98	993.8	1135.8	0.2537	1.5684	1.8221
166	6.269	0.01649	54.59	54.61	143.97	923.2	1067.2	143.99	992.6	1136.6	0.2568	1.5616	1.8184
168	7.184	0.01650	52.35	52.35	145.97	921.8	1067.8	145.99	991.4	1137.4	0.2600	1.5548	1.8147
180	7.511	0.01651	50.21	50.22	147.98	920.4	1068.4	148.00	990.2	1138.2	0.2631	1.5480	1.8111
182	7.850	0.01652	48.17	48.19	149.98	919.0	1069.0	150.01	989.0	1139.0	0.2662	1.5413	1.8075
184	8.203	0.01653	46.23	46.25	151.99	917.6	1069.6	152.01	987.8	1139.8	0.2694	1.5346	1.8040
185	8.568	0.01655	44.38	44.40	153.99	916.2	1070.2	154.02	986.6	1140.6	0.2725	1.5279	1.8004
188	8.947	0.01656	42.62	42.64	156.00	914.7	1070.7	156.03	985.3	1141.3	0.2756	1.5213	1.7969
190	9.340	0.01657	40.94	40.96	158.01	913.3	1071.3	158.04	984.1	1142.1	0.2787	1.5148	1.7934
192	9.747	0.01658	39.34	39.35	160.02	911.9	1071.9	160.05	982.8	1142.9	0.2818	1.5082	1.7900
194	10.168	0.01659	37.81	37.82	162.02	910.5	1072.5	162.06	981.6	1143.7	0.2848	1.5017	1.7865
196	10.606	0.01661	36.35	36.36	164.03	909.0	1073.1	164.06	980.4	1144.4	0.2879	1.4952	1.7831
198	11.058	0.01662	34.96	34.97	166.04	907.6	1073.6	166.08	979.1	1145.2	0.2910	1.4888	1.7798
200	11.526	0.01664	33.62	33.64	168.05	906.2	1074.2	168.09	977.9	1146.0	0.2940	1.4824	1.7764
202	12.011	0.01665	32.35	32.37	170.06	904.7	1074.8	170.10	976.6	1146.7	0.2971	1.4760	1.7731
204	12.512	0.01666	31.13	31.15	172.07	903.3	1075.3	172.11	975.4	1147.5	0.3001	1.4697	1.7698
206	13.031	0.01668	29.97	29.99	174.08	901.8	1075.9	174.12	974.1	1148.2	0.3031	1.4634	1.7665
208	13.568	0.01669	28.86	28.88	176.09	900.4	1076.5	176.14	972.8	1149.0	0.3061	1.4571	1.7632
210	14.123	0.01670	27.80	27.82	178.11	898.9	1077.0	178.15	971.5	1149.7	0.3091	1.4509	1.7600
212	14.696	0.01672	26.78	26.80	180.12	897.5	1077.6	180.17	970.3	1150.5	0.3121	1.4447	1.7568
215	15.592	0.01674	25.34	25.36	183.14	895.3	1078.4	183.19	968.4	1151.6	0.3166	1.4354	1.7520
220	17.186	0.01676	23.13	23.15	188.18	891.6	1079.8	188.23	965.2	1153.4	0.3241	1.4201	1.7442
225	18.912	0.01681	21.15	21.17	193.22	888.0	1081.2	193.28	962.0	1155.3	0.3315	1.4051	1.7365
230	20.78	0.01685	19.364	19.381	198.27	884.3	1082.5	198.33	958.7	1157.1	0.3388	1.3902	1.7290
235	22.79	0.01689	17.755	17.773	203.32	880.5	1083.9	203.39	955.4	1158.8	0.3461	1.3754	1.7215
240	24.97	0.01693	16.304	16.321	208.37	876.8	1085.2	208.45	952.1	1160.6	0.3533	1.3609	1.7142
245	27.31	0.01697	14.991	15.008	213.43	873.1	1086.5	213.52	948.8	1162.3	0.3606	1.3465	1.7070
250	29.82	0.01701	13.802	13.819	218.50	869.3	1087.8	218.59	945.4	1164.0	0.3677	1.3323	1.7000
255	32.53	0.01705	12.724	12.741	223.57	865.5	1089.0	223.67	942.1	1165.7	0.3748	1.3182	1.6930

Cuadro 2.1

CAPACIDADES DE TUBERIA A VELOCIDADES ESPECIFICAS

presión psig	Velocidad pie/s	½"	¾"	1"	1¼"	1½"	2"	2½"	3"	4"	5"	6"
						lb/h						
5	50	12	26	45	70	100	190	280	410	760	1250	1770
	80	19	45	75	115	170	300	490	710	1250	1800	2700
	120	29	60	110	175	245	460	700	1000	1800	2900	4000
10	50	15	35	55	88	130	240	365	550	950	1500	2220
	80	24	52	95	150	210	380	600	900	1500	2400	3300
	120	35	72	135	210	330	590	850	1250	2200	3400	4800
20	50	21	47	82	123	185	320	520	740	1340	1980	2900
	80	32	70	120	190	260	520	810	1100	1900	3100	4500
	120	50	105	190	300	440	840	1250	1720	3100	4850	6750
30	50	26	56	100	160	230	420	650	950	1650	2600	3650
	80	42	94	155	250	360	655	950	1460	2700	3900	5600
	120	62	130	240	370	570	990	1550	2100	3950	6100	8700
40	50	32	75	120	190	260	505	790	1100	1900	3100	4200
	80	51	110	195	300	445	840	1250	1800	3120	4900	6800
	120	75	160	290	460	660	1100	1900	2700	4700	7500	11000
60	50	43	95	160	250	360	650	1000	1470	2700	3900	5700
	80	65	140	250	400	600	1000	1650	2400	4400	6500	9400
	120	102	240	410	610	950	1660	2600	3800	6500	10300	14700
80	50	53	120	215	315	460	870	1300	1900	3200	5200	7000
	80	85	190	320	500	730	1300	2100	3000	5000	8400	12200
	120	130	290	500	750	1100	1900	3000	4200	7800	12000	17500
100	50	62	130	240	360	570	980	1550	2100	4000	6100	8800
	80	102	240	400	610	950	1660	2550	3700	6400	10200	14600
	120	150	350	600	900	1370	2400	3700	5000	9100	15000	21600
120	50	74	160	290	440	660	1100	1850	2600	4600	7000	10500
	80	120	270	450	710	1030	1800	2800	4150	7200	11600	16500
	120	175	400	680	1060	1520	2850	4300	6500	10700	17500	26000
150	50	90	208	340	550	820	1380	2230	3220	5500	8800	12900
	80	145	320	570	900	1250	2200	3400	4900	8500	14000	20000
	120	215	450	850	1280	1890	3400	5300	7500	13400	20600	30000
200	50	110	265	450	680	1020	1780	2800	4120	7100	11500	16300
	80	180	410	700	1100	1560	2910	4400	6600	11000	18000	26600
	120	250	600	1100	1630	2400	4350	6800	9400	16900	25900	37000

Cuadro 2.2

FACTORES DE PRESION PARA TUBERIA

Ins of Vacuum	Volume cu ft/lb	Pressure Factor
26	173·0	4
24	118·0	9
22	91·0	15
20	74·8	22
18	62·0	31
16	53·0	41
14	47·5	54
12	43·0	67
10	39·0	83
9	36·8	92
8	35·3	100
7	34·0	110
6	32·8	120
5	31·6	130
4	30·4	140
3	29·3	150
2	28·2	160
1	27·3	170
·5	27·0	176
Pressure psig		
0	26·7	183
1	25·1	210
2	23·7	235
3	22·4	265
4	21·3	295
5	20·3	325
6	19·4	355
7	18·6	390
8	17·8	425
9	17·1	460
10	16·5	500
11	15·9	540
12	15·3	580
13	14·8	625
14	14·3	670
15	13·9	715
16	13·5	760
17	13·1	810
18	12·7	860
19	12·4	910
20	12·1	965
21	11·7	1020
22	11·4	1075
23	11·1	1135
24	10·8	1195
25	10·6	1255
26	10·4	1315
27	10·1	1385
28	9·9	1445
29	9·7	1525
30	9·5	1595
31	9·3	1665
32	9·1	1735
33	8·9	1805
34	8·7	1875
35	8·6	1945
36	8·4	2020
37	8·2	2100
38	8·1	2180
39	8·0	2260
40	7·8	2340
41	7·7	2420
42	7·6	2500
43	7·4	2590
44	7·3	2680
45	7·2	2770
46	7·1	2860

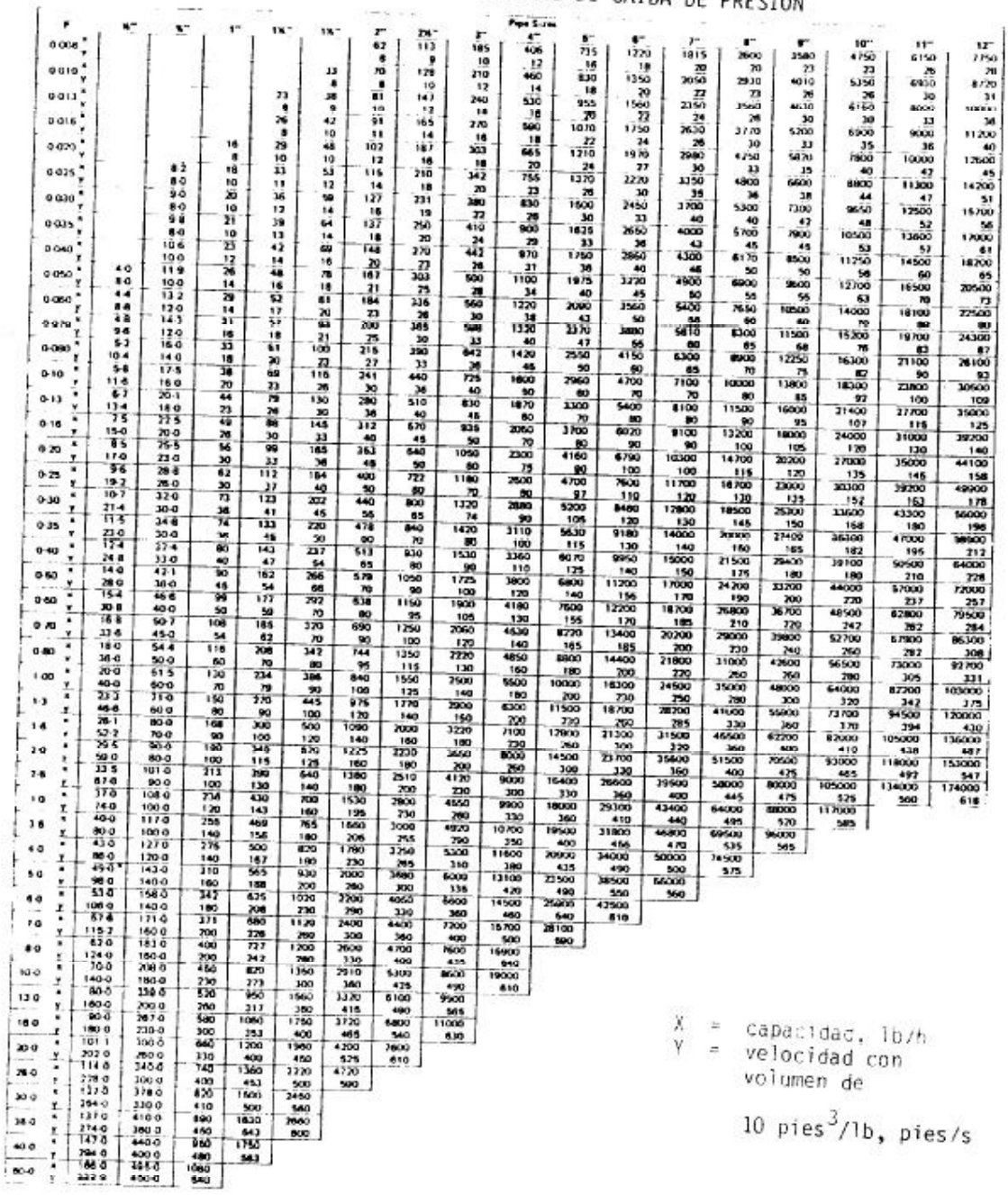
Pressure psig	Volume cu ft/lb	Pressure Factor
48	6·9	3040
49	6·8	3130
50	6·7	3225
51	6·6	3325
52	6·5	3425
53	6·4	3525
54	6·3	3625
55	6·2	3725
56	6·1	3825
57	6·1	3935
58	6·0	4045
59	5·9	4155
60	5·8	4265
61	5·8	4370
62	5·7	4485
63	5·6	4600
64	5·6	4720
65	5·5	4840
66	5·4	4960
67	5·4	5080
68	5·3	5200
69	5·2	5320
70	5·2	6440
71	5·1	5560
72	5·1	5680
73	5·0	5820
74	5·0	5950
75	4·9	6080
76	4·9	6210
77	4·8	6350
78	4·8	6490
79	4·7	6630
80	4·7	6770
81	4·6	6910
82	4·6	7050
83	4·6	7190
84	4·5	7330
85	4·5	7470
86	4·4	7610
87	4·4	7760
88	4·4	7910
89	4·3	8060
90	4·3	8210
91	4·2	8360
92	4·2	8510
93	4·2	8660
94	4·1	8820
95	4·1	8980
96	4·1	9140
97	4·0	9300
98	4·0	9460
99	4·0	9620
100	3·9	9790
101	3·9	9960
102	3·9	10130
103	3·8	10300
104	3·8	10470
105	3·8	10640
106	3·7	10810
107	3·7	10980
108	3·7	11155
109	3·6	11335
110	3·6	11515
111	3·6	11695
112	3·6	11875
113	3·5	12055
114	3·5	12235

Pressure psig	Volume cu ft/lb	Pressure Factor
116	3·5	12610
117	3·4	12800
118	3·4	12990
119	3·4	13180
120	3·4	13370
121	3·3	13560
122	3·3	13750
123	3·3	13940
124	3·3	14140
125	3·3	14340
126	3·2	14540
127	3·2	14740
128	3·2	14940
129	3·2	15140
130	3·1	15350
131	3·1	15560
132	3·1	15770
133	3·1	15980
134	3·1	16190
135	3·0	16400
136	3·0	16620
137	3·0	16840
138	3·0	16960
139	3·0	17180
140	2·9	17470
141	2·9	17680
142	2·9	17910
143	2·9	18130
144	2·9	18360
145	2·8	18580
146	2·8	18790
147	2·8	19020
148	2·8	19250
149	2·8	19480
150	2·8	19710
151	2·8	19950
152	2·7	20180
153	2·7	20510
154	2·7	20650
155	2·7	20890
156	2·7	21130
157	2·7	21380
158	2·7	21610
159	2·6	21850
160	2·6	22110
161	2·6	22350
162	2·6	22590
163	2·6	22850
164	2·6	23150
165	2·6	23350
166	2·5	23600
167	2·5	23840
168	2·5	24110
169	2·5	24350
170	2·5	24620
171	2·5	24880
172	2·5	25140
173	2·5	25400
174	2·4	25670
175	2·4	25930
176	2·4	26200
177	2·4	26450
178	2·4	26730
179	2·4	27010
180	2·4	27280
181	2·4	27540
182	2·3	27830

Pressure psig	Volume cu ft/lb	Pressure Factor
183	2·3	28090
184	2·3	28380
185	2·3	28650
186	2·3	28920
187	2·3	29200
188	2·3	29480
189	2·3	29770
190	2·3	30040
191	2·2	30340
192	2·2	30630
193	2·2	30910
194	2·2	31200
195	2·2	31490
196	2·2	31770
197	2·2	32070
198	2·2	32370
199	2·2	32660
200	2·2	32810
201	2·2	32960
202	2·1	33560
203	2·1	33860
204	2·1	34170
205	2·1	34450
206	2·1	34760
207	2·1	35080
208	2·1	35390
209	2·1	35700
210	2·1	35990
211	2·1	36320
212	2·1	36630
213	2·0	36940
214	2·0	37260
215	2·0	37570
216	2·0	37880
217	2·0	38210
218	2·0	38550
219	2·0	38880
220	2·0	39160
221	2·0	39510
222	2·0	39830
223	2·0	40150
224	2·0	40490
225	1·9	40870
226	1·9	41110
227	1·9	41440
228	1·9	41780
229	1·9	42100
230	1·9	42450
231	1·9	42790
232	1·9	43100
233	1·9	43470
234	1·9	43810
235	1·9	44150
236	1·9	44490
237	1·9	44830
238	1·8	45200
239	1·8	45530
240	1·8	45870
241	1·8	46220
242	1·8	46580
243	1·8	46935
244	1·8	47272
245	1·8	47632
246	1·8	47995
247	1·8	48362
248	1·8	48707
249	1·8	49079

Cuadro 2.3

CAPACIDAD DE TUBERIA Y FACTORES DE CAIDA DE PRESION



X = capacidad, lb/h
Y = velocidad con volumen de

10 pies^3/lb, pies/s

Table 2-2
General Characteristics of Packaged Firetube Boilers

Boiler Size, hp	Steam Output, lbs/hr	Fireside Heating Surface, sq ft	Natural Gas Firing Rate, cfh	No. 2 Fuel Oil Firing Rate, gph	Boiler Dimensions, ft			Shipping Weight, lbs
					Length	Height	Width	
20	690	100	835	6	10	5	4	3,300
30	1,035	150	1,255	9	10	5	4½	4,700
40	1,380	200	1,675	12	11	5	5	5,250
50	1,725	250	2,100	15	11½	5½	5	6,050
60	2,070	300	2,510	18	14	6	5	6,750
80	2,760	400	3,350	24	13	6	5½	7,600
100	3,450	500	4,185	30	14	6½	6	9,800
125	4,312	625	5,230	37	15	7	6	11,200
150	5,175	750	6,280	45	16	7	6	12,500
200	6,900	1,000	8,375	60	17½	7½	6½	16,000
250	8,625	1,250	10,500	75	16	7½	7	22,100
300	10,350	1,500	12,600	90	18	7½	7	25,300
350	12,075	1,750	14,600	105	19	8	7½	27,200
400	13,800	2,000	16,800	120	20	9	8	35,700
500	17,250	2,500	21,000	150	21	9	8	37,400
600	20,700	3,000	25,200	180	23	9½	8½	42,000
700	24,150	3,500	29,400	210	25	10	9	50,000

Note: Energy units in rating boilers:
1 hp = 34.5 lbs of steam per hour = 33,472 Btu/hr
1 therm = 100,000 Btu

Source: Holzhauer, Ron, "Packaged Boilers," *Plant Engineering*, December 11, 1980, p. 72.

Figure 2-5. Classification of firetube boilers

Table 2-3
Derivation of Fuel Consumption from Horsepower Rating

Fuel Type	Consumption
No. 2 fuel oil	0.3 gal/hr × hp
No. 6 fuel oil	0.28 gal/hr × hp
Gas @ 500 Btu/ft³	84 ft³/hr × hp
Gas @ 800 Btu/ft³	53 ft³/hr × hp
Gas @ 1,000 Btu/ft³	42 ft³/hr × hp

The following data compare the efficiencies of firetube and watertube boilers:[1]

	Firetube (1000 hp)	Watertube (956 hp)
Natural gas	$1.25	78.5%
No. 2 fuel oil	84.7%	21.0%

Electrical boilers. These are available in different sizes also. They are less efficient than fuel-fired boilers; however, they have no stack losses and no burner cleaning or adjustment. The typical power-generating plant can convert only about one-third of the fuel energy into electricity that will be delivered to the user.

The fuel consumption for steam boilers can be estimated from its hp rating, as shown in Table 2-3. In these estimates, the boiler runs at 80% fuel-to-steam efficiency. Tables 2-4 and 2-5 show the number of boilers classified by fuel use, heat-transfer distribution, and capacity.

Operating Procedures

Boiler manufacturers publish operating manuals on their boilers. For instance, an operating manual for packaged boilers of 125–350 hp using distillate oil, heavy oil, gas, or a combination can be ordered from Cleaver-Brooks Company in three different languages: English, Spanish, and French.[2]

G. Aire Comprimido

En las siguientes hojas se muestran especificaciones de fabricantes de compresores *Ingersoll-Rand* que van desde 5 HP hasta 30 HP, información utilizada en la sección de aire comprimido, insumos, capítulo IV

[illegible] PACKAGED AIR COMPRESSORS

[illegible] cast iron air compressors provide high quality air supply.

- 100% continuous duty on 5, 7.5, and 10 HP units 80% on 20% off duty cycle on 15 through 30 HP
- Assembled, pre-piped, and pre-wired complete package for quick field connection and start up
- Factory mounted and pre-wired magnetic motor starter
- Beltguard mounted air cooled aftercooler
- Low oil level shutdown protection
- Electric drain valve automatically removes tank condensate
- Auto start/stop control (5 and 7.5 HP units)
- Dual control for auto start/stop or constant speed operation (10-30 HP)
- Reliable splash lubrication (units shipped without oil in the crankcase-see page 2996 for start up kit/lubricant information)
- Stainless steel finger valves prolonging service intervals
- ASME tank with auto tank drain, discharge isolation ball valve, 300 psig pressure gauge, check valve and relief valve
- V-cylinder design makes maintenance easy and provides maximum compressor cylinder cooling
- Complies with State of California Code 462(L)(2)
- Tough, baked on powder coat gray enamel finish
- Ingersoll-Rand warrants the compressor bare pump for two years when using T30 All Season Select lubricant and/or start-up kit (see page 3002)
- Maximum PSI: 175

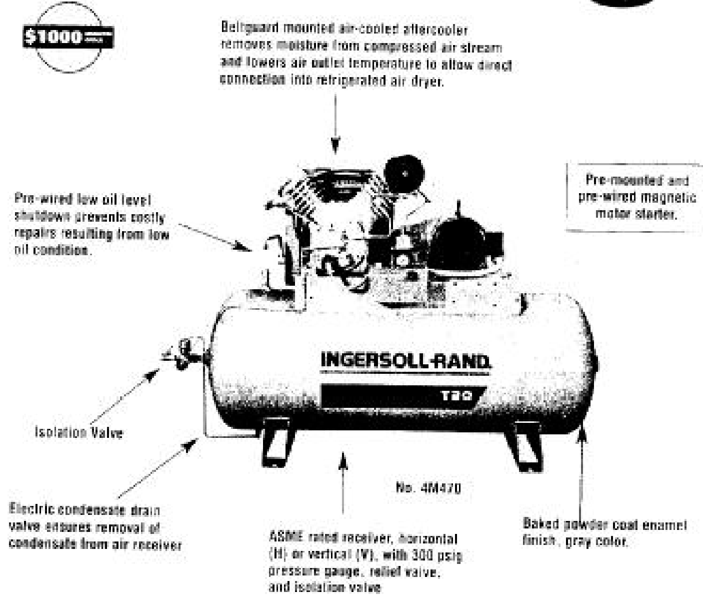
IR 2-Year Extended Pump Warranty

Ingersoll-Rand warrants compressor pump for 2 years when used with No. 4ZS78 T30 Select Lubricant. Text of warranty available on request, see page opposite inside back cover.

INGERSOLL-RAND

AIR COMPRESSORS

New



- Maintenance kit for Type 30 air compressors listed on page 3002

Installation & Service Available
Contact Your Local Branch

Replacement Parts Available
1-800-323-0620

AIR COMPRESSOR SPECIFICATIONS AND ORDERING DATA

HP	Delivery CFM	Oil Cty. (Oz.)	Air Receiver*	Voltage Phase	(F) NPT Outlet (In.)	Full Load Amps	Dimensions (In.) L	W	H	Startup Kit No.	I-R Model	Stock No.	List	Each	Shpg. Wt.
5	17.0	43	80V	230-1	3/4	25.5	36.2	30.5	70	4M579	2475N5 Package	4R802	$2570.08	$2140.00	700.0
	[illegible]		80V	200-3	3/4	17.5	36.2	30.5	70			4R806	2459.59	2109.00	700.0
	[illegible]		80V	230/460-3	3/4	15.2/7.6	36.2	30.5	70			4R804	2459.59	2109.00	700.0
7.5	24.0	43	80V	230-1	3/4	37	36.2	30.5	70	4M579	2475N7.5 Package	4R810	2840.49	2438.00	710.0
	24.0		80V	200-3	3/4	21	36.2	30.5	70			4R816	2810.32	2407.00	710.0
	24.0		80V	230/460-3	3/4	15.0/9.5	36.2	30.5	70			4R812	2810.32	2407.00	710.0
10	35.0	74	120H	230-3	1	40.6	74.6	34.2	51.8	4M550	2545E10 Package	4M471	4198.72	3194.00	1085.0
	35.0		120V	200-3	1	30.6	71.3	29	51.0			4ZJ96	3927.00	3229.00	1085.0
	35.0		120V	230-3	1	26.6	71.3	29	51.8			4ZJ97	3927.00	3229.00	1085.0
	35.0		120V	460-3	1	13.3	71.3	29	51.8			4ZJ98	3927.00	3229.00	1085.0
	35.0		120H	230/460-1	1	26.6/13.3	74.6	34.2	51.8			4M470	4194.32	3194.00	1085.0
15	52.0	80	120H	200-3	1	44.5	74.6	34.2	56.8	4M580	2100E15 Package	4R772	5656.70	4186.00	1350.0
	52.0		120H	230/460-3	1	39.0/19.5	74.6	34.2	50.8			4R768	5556.70	4186.00	1350.0
20	56.2	144	120H	200-3	1	58.6	74.6	37.3	60.5	4M581	3000E20 Package	4M498	7965.82	6102.00	1610.0
	56.2		120H	230/460-3	1	51.0/25.5	74.6	37.3	63.5			4M496	7965.82	6102.00	1610.0
25	85.1	144	120H	200-3	1	71.8	74.6	37.3	60.5	4M581	3000E25 Package	4M568	8434.41	6330.00	1680.0
	85.1		120H	230/460-3	1	65.0/32.5	74.6	37.3	60.5			4M533	8434.41	6330.00	1650.0
30	100.0	144	120H	200-3	1	58.6	74.6	37.3	60.5	4M581	3000E30 Package	4M574	9690.55	6846.00	1710.0
	100.0		120H	230/460-3	1	77.1/38.5	74.6	37.3	60.5			4M572	9706.22	6850.00	1730.0

(*) V=Vertical, H=Horizontal

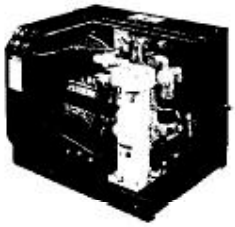
What is a Rotary Screw Air Compressor? Rotary compressors use two intermeshing rotors to compress air. As the rotor turns, their configuration compresses the trapped air. This simple process lowers the operating temperatures approximately 50% (as compared to reciprocating designs), increases efficiency and delivers a clean air supply. A rotary compressor uses a coolant to cool its internal components. This allows the compressor to operate at a fully loaded, continuous duty cycle.

What are the benefits of Rotary Screw Air Compressors?

SSR Rotary Screw Air compressors feature

- Reliability
- Low noise level, 75dBA (Enclosed), 85dBA (Unenclosed)
- Minimum maintenance
- Low discharge air temperature
- Improved air quality
- Fully packaged design —online, offline and auto start/stop control, aircooled aftercooler and full voltage starter
- 8,000 hour/two-year cooling lubricant
- Easy installation/operation
- Two year warranty with the use of G-cool lubricant (see page 2961 for details)

INGERSOLL-RAND AIR COMPRESSORS



No. 4MJ32 Shown with No. 4TM98 Canopy sold separately

No. 4MJ38

$1000 Repair Service Available Contact Your Local Branch

Replacement Parts Available 1-800-323-0620

SSR SERIES AIR COMPRESSOR SPECIFICATIONS AND ORDERING DATA*

HP	Delivered CFM	Receiver	Mount Type	(F) NPT Outlet (In.)	dBA @ 3 Feet	Voltage/ Phase	Full Amp	Overall Dimensions (In.) L	W	H	IR Model	Stock No.	List	Each	Ship. Wt.
7.5	28	—	Baseplate	3/4	85	230-1	37.9	35	29	29	EP7.5/BM/UN	4MJ11	$5959.59	$4666.00	652.0
7.5	28	—	Baseplate	3/4	85	200-3	23.4	35	29	29	EP7.5/BM/UN	4MJ12	5777.00	4513.00	652.0
7.5	28	—	Baseplate	3/4	85	230-3	20.4	35	29	29	EP7.5/BM/UN	4MJ13	5777.00	4553.00	652.0
7.5	28	—	Baseplate	3/4	85	460-3	10.2	35	29	29	EP7.5/BM/UN	4MJ14	5777.00	4553.00	652.0
7.5	28	—	Baseplate	3/4	85	575-3	8.2	35	29	29	EP7.5/BM/UN	4MJ15	5777.00	4553.00	652.0
7.5	28	—	Tank	1	85	230-1	37.9	56	29	60	EP7.5/TM/UN	4MJ21	6504.67	5180.00	950.0
7.5	28	80H	Tank	1	85	200-3	23.4	56	29	60	EP7.5/TM/UN	4MJ22	6360.00	5037.00	950.0
7.5	28	80H	Tank	1	85	230-3	20.4	56	29	60	EP7.5/TM/UN	4MJ23	6360.00	5037.00	950.0
7.5	28	80H	Tank	1	85	460-3	10.2	56	29	60	EP7.5/TM/UN	4MJ24	6360.00	5037.00	950.0
10	37	—	Baseplate	3/4	85	200-3	32.2	35	29	29	EP10/BM/UN	4MJ31	6545.55	5150.00	660.0
10	37	—	Baseplate	3/4	85	230/460-3	25.8/12.9	35	29	29	EP10/BM/UN	4MJ32	6545.55	5150.00	660.0
10	37	80H	Tank	1	85	200-3	32.2	56	29	60	EP10/TM/UN	4MJ37	6707.70	5576.00	960.0
10	37	80H	Tank	1	85	230/460-3	25.8/12.9	56	29	60	EP10/TM/UN	4MJ38	6707.70	5576.00	960.0
15	53	—	Baseplate	3/4	85	200-3	47.2	35	29	29	EP15/BM/UN	4MJ43	7785.00	6188.00	670.0
15	53	—	Baseplate	3/4	85	230/460-3	43.2/20.6	35	29	29	EP15/BM/UN	4MJ44	7785.00	6188.00	670.0
15	53	120H	Tank	1	85	200-3	47.2	76	30	64	EP15/TM/UN	4MJ49	7908.00	6686.00	1070.0
15	53	120H	Tank	1	85	230/460-3	43.2/20.6	76	30	64	EP15/TM/UN	4MJ50	7908.00	6686.00	1070.0
20	79	—	Baseplate	1	85	200-3	60.7	45	30	38	EP20/BM/UN	4TM99	9025.00	7112.00	805.0
20	79	—	Baseplate	1	85	230/460-3	52.9/26.8	45	30	38	EP20/BM/UN	4TN01	9025.00	7112.00	805.0
20	79	120H	Tank	1	85	200-3	60.7	76	30	64	EP20/TM/UN	4TN03	9560.00	7573.00	1335.0
20	79	120H	Tank	1	85	230/460-3	52.9/26.8	76	30	64	EP20/TM/UN	4TN04	9560.00	7573.00	1335.0
25	97	—	Baseplate	1	85	200-3	75.0	45	30	38	EP25/BM/UN	4TN06	9675.00	7623.00	955.0
25	97	—	Baseplate	1	85	230/460-3	65.3/33.0	45	30	38	EP25/BM/UN	4TN07	9675.00	7623.00	955.0
25	97	120H	Tank	1	85	200-3	75.0	76	30	64	EP25/TM/UN	4TN09	10250.00	8121.00	1355.0
25	97	120H	Tank	1	85	230/460-3	65.3/33.0	76	30	64	EP25/TM/UN	4TN10	10250.00	8121.00	1355.0
30	112	—	Baseplate	1	85	200-3	90.4	45	30	38	EP30/BM/UN	4TN12	10742.00	8452.00	975.0
30	112	—	Baseplate	1	85	230/460-3	78.7/39.7	45	30	38	EP30/BM/UN	4TN13	10742.00	8452.00	975.0
30	112	120H	Tank	1	85	200-3	90.4	76	30	64	EP30/TM/UN	4TN15	11395.00	9011.00	1375.0
30	112	120H	Tank	1	85	230/460-3	78.7/39.7	76	30	64	EP30/TM/UN	4TN16	11395.00	9011.00	1375.0

* Additional pressure ratings of 140 psi (HP Series 7.5-15 HP) and 175 psi (XP Series 7.5-15 HP). Please contact your local Grainger Branch.

Can't find something?

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See **cross-reference guide** on pages.....**3727-3730**

To look up by brand
See name **brand index** on pages.....**3831-3878**

To look up by product type
See **product index** on pages.....**3879-4009**

H. Iluminación

En las siguientes páginas se muestra la información utilizada para el cálculo del alumbrado del área de producción en la sección de insumos, capítulo IV., por medio del método de Cavidad Zonal (Kenigsberger).

4.4.2. Métodos de Diseño.

Los principales métodos que se utilizan para el diseño lumínico son: Punto por Punto, Curvas Isolux, Utilización y Cavidad Zonal.

Los dos primeros se aplican especialmente para alumbrado exterior, donde se desprecian factores de reflexión, y se considera que toda la luz producida por las lámparas es enfocada o dirigida hacia la superficie a iluminar.

Los últimos dos se aplican para el alumbrado de interiores, en los cuales un cálculo exacto o directo es prácticamente imposible, debido a las variantes de reflexión de los ambientes. Los dos se basan en factores experimentales, que relacionan el rendimiento lumínico total con las dimensiones y acabados de los ambientes.

4.4.2.1. Método del Rendimiento o Utilización.

Este es el método más sencillo para iluminaciones interiores ordinarias. Para su aplicación seguiremos los siguientes pasos:

1) Escoger el nivel lumínico de acuerdo a una de las normas.
2) Escoger el tipo de luminaria, clasificadas generalmente en: directo, indirecto, semidirecto, semi-indirecto y de difusión general, de acuerdo con el porcentaje de luz dirigida hacia arriba y abajo. (D, I, SD, SI y G; ver pág. 64)
3) Escoger los colores del ambiente. A falta de mayor información, podemos aceptar la siguiente tablita:

Color:	Coef. de reflexión %	
Blanco	75 - 85	claros
marfil	70 - 75	
col. pálidos	60 - 70	
amarillo	55 - 65	semiclaros
marrón claro	45 - 55	
verde claro	40 - 50	
gris	30 - 50	
azul	25 - 35	oscuros
rojo	15 - 20	
marrón oscur	10 - 15	

4) Estimar el coeficiente de mantenimiento, que toma en cuenta la disminución de la luz debido al envejecimiento, y el ensuciamiento, (K') que oscila entre 0.50 y 0.80.

5) Calcular la relación de ambiente (RR) con la fórmula:

$$RR = \frac{W\ L}{H(W+L)}$$

en la que W es el ancho y L el largo del ambiente, siendo H la altura de suspensión de la lámpara sobre la superficie de trabajo, fijada según el principio de ausencia de deslumbramiento.

6) En la tabla (página 64), buscar el coeficiente de utilización (K) para las condiciones indicadas. Si no aparece el valor exacto de RR, se interpolará o extrapolará, según el caso.

7) Se calcula el flujo lumínico total que hay que proporcionar:

$$\emptyset = \frac{E \times S}{K \times K'}$$

siendo $\emptyset$ el flujo total, E la iluminancia en lux, S la superficie en metros cuadrados, K el coeficiente de utilización y K' el factor de mantenimiento.

8) Se calcula el espaciamiento máximo de lámparas, de acuerdo al principio de uniformidad, para determinar el número de lámparas requeridas.

9) Se determina el flujo por lámpara, dividiendo el flujo total entre el número de lámparas, y se escogen las bombillas o tubos adecuados para proporcionar como mínimo ese flujo, de acuerdo con la tabla siguiente:

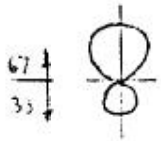
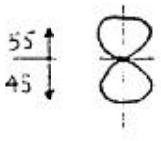
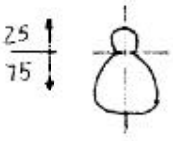
Lámpara	W	Lúmenes iniciales	Vida útil horas
Incandescente standard	25	230	2,500
" "	40	450	1,500
" "	60	890	1,000
" "	75	1,200	850
" "	100	1,700	750
" "	150	2,850	750
Fluorescente standard	20	1,220	9,000
" "	40	3,200	18,000
" High Output	85	6,450	12,000
" "	110	9,000	12,000
" slimline	38.5	2,900	12,000
" "	56	4,400	12,000
" "	73.5	6,300	12,000
" tipo "U"	40	3,000	12,000

Nota: Datos de Catálogo Westinghouse 1973.

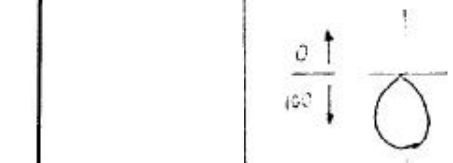
TABLA DE REFLECTANCIAS EFECTIVAS DE CAVIDAD DE CIELO (ρ_{CC}) Y DE PISO (ρ_{CP}) en %

Reflectancia Piso o cielo	90				80				70			50			30				10		
% Refl. Pared	90	70	50	30	80	70	50	30	70	50	30	70	50	30	65	50	30	10	50	30	10
0	90	90	90	90	80	80	80	80	70	70	70	50	50	50	30	30	30	30	10	10	10
0.1	90	89	88	87	79	79	78	78	69	69	68	59	49	48	30	30	29	29	10	10	10
0.2	89	88	86	85	79	78	77	76	68	67	66	49	48	47	30	29	29	28	10	10	9
0.3	89	87	85	83	78	77	75	74	68	66	64	49	47	46	30	29	28	27	10	10	9
0.4	88	86	83	81	78	76	74	72	67	65	63	48	46	45	30	29	27	26	11	10	9
0.5	88	85	81	78	77	75	73	70	66	64	61	48	46	44	29	28	27	25	11	10	9
0.6	88	84	80	76	77	75	71	68	65	62	59	47	45	43	29	28	26	25	11	10	9
0.7	88	83	78	74	76	74	70	66	65	61	58	47	44	42	29	28	26	24	11	10	8
0.8	87	82	77	73	75	73	69	65	64	60	56	47	43	41	29	27	25	23	11	10	8
0.9	87	81	76	71	75	72	68	63	63	59	55	46	43	40	29	27	25	22	11	9	8
1.0	86	80	74	69	74	71	66	61	63	58	53	46	42	39	29	27	24	22	11	9	8
1.1	86	79	73	67	74	71	65	60	62	57	52	46	41	38	29	26	24	21	11	9	8
1.2	86	78	72	65	73	70	64	58	61	56	50	45	41	37	29	26	23	20	12	9	7
1.3	85	78	70	64	73	69	63	57	61	55	49	45	40	36	29	26	23	20	12	9	7
1.4	85	77	69	62	72	68	62	55	60	54	48	45	40	35	28	26	22	19	12	9	7
1.5	85	76	68	61	72	68	61	54	59	53	47	44	39	34	28	25	22	18	12	9	7
1.6	85	75	66	59	71	67	60	53	59	53	45	44	39	33	28	25	21	18	12	9	7
1.7	84	74	65	58	71	66	59	52	58	51	44	44	38	32	28	25	21	17	12	9	7
1.8	84	73	64	56	70	65	58	50	57	50	43	43	37	32	28	25	21	17	12	9	6
1.9	84	73	63	55	70	65	57	49	57	49	42	43	37	31	28	25	20	16	12	9	6
2.0	83	72	62	53	69	64	56	48	56	48	41	43	37	30	28	24	20	16	12	9	6
2.1	83	71	61	52	69	63	55	47	56	47	40	43	36	29	28	24	20	16	13	9	6
2.2	83	70	60	51	68	63	54	45	55	46	39	42	36	29	28	24	19	15	13	9	6
2.3	83	69	59	50	68	62	53	44	54	46	38	42	35	28	28	24	19	15	13	9	6
2.4	82	68	58	48	67	61	52	43	54	45	37	42	35	27	28	24	19	14	13	9	6
RCC 2.5	82	68	57	47	67	61	51	42	53	44	36	41	34	27	27	23	18	14	13	9	6
° 2.6	82	67	56	46	66	60	50	41	53	43	35	41	34	26	27	23	18	13	13	9	5
RCP 2.7	82	66	55	45	66	60	49	40	52	43	34	41	33	26	27	23	18	13	13	9	5
2.8	81	66	54	44	66	59	48	39	52	42	33	41	33	25	27	23	18	13	13	9	5
2.9	81	65	53	43	65	58	48	38	51	41	33	40	33	25	27	23	17	12	13	9	5
3.0	81	64	52	42	65	58	47	38	51	40	32	40	32	24	27	22	17	12	13	8	5
3.1	80	64	51	41	64	57	46	37	50	40	31	40	32	24	27	22	17	12	13	8	5
3.2	80	63	50	40	64	57	45	36	50	39	30	40	31	23	27	22	16	11	13	8	5
3.3	80	62	49	39	64	56	44	35	49	39	30	39	31	23	27	22	16	11	13	8	5
3.4	80	62	48	38	63	56	44	34	49	38	29	39	31	22	27	22	16	11	13	8	5
3.5	79	61	48	37	63	55	43	33	48	38	29	39	30	22	26	22	16	11	13	8	5
3.6	79	60	47	36	62	54	42	33	48	37	28	39	30	21	26	21	15	10	13	8	5
3.7	79	60	46	35	62	54	42	32	48	37	27	38	30	21	26	21	15	10	13	8	4
3.8	79	59	45	35	62	53	41	31	47	36	27	38	29	21	26	21	15	10	13	8	4
3.9	78	59	45	34	61	53	40	30	47	36	26	38	29	20	26	21	15	10	13	8	4
4.0	78	58	44	33	61	52	40	30	46	35	26	38	29	20	26	21	15	9	13	8	4
4.1	78	57	43	32	60	52	39	29	46	35	25	37	28	20	26	21	14	9	13	8	4
4.2	78	57	43	32	60	51	39	29	46	34	25	37	28	19	26	20	14	9	13	8	4
4.3	78	56	42	31	60	51	38	28	45	34	25	37	28	19	26	20	14	9	13	8	4
4.4	77	56	41	30	59	51	38	28	45	34	24	37	27	19	26	20	14	8	13	8	4
4.5	77	55	41	30	59	50	37	27	45	33	24	37	27	19	25	20	14	8	14	8	4
4.6	77	55	40	29	59	50	37	26	44	33	24	36	27	18	25	20	14	8	14	8	4
4.7	77	54	40	29	58	49	36	26	44	33	23	36	26	18	25	20	13	8	14	8	4
4.8	76	54	39	28	58	49	36	25	44	32	23	36	26	18	25	19	13	8	14	8	4
4.9	76	53	38	28	58	49	35	25	44	32	23	36	26	18	25	19	13	7	14	8	4
5.0	76	53	38	27	57	48	35	25	43	32	22	36	26	17	25	19	13	7	14	8	4

COEFICIENTES DE UTILIZACION PARA ALGUNAS LUMINARIAS TIPICAS.

Distribución típica	p_{cc}	80			70			50		30		10		
	p_p	70	50	30 10	70	50	30 10	50	30 10	50	30 10	50	30	10
	RCA	Coeficientes de utilización, método cavidad zonal, p_{cp}=20												
	1	.72	.70	.67	.65	.63	.61	.52	.51 .49					
	2	.64	.59	.56	.58	.54	.51	.46	.44 .42					
	3	.56	.51	.47	.51	.47	.43	.41	.38 .35					
	4	.50	.44	.40	.46	.41	.37	.37	.34 .31					
	5	.45	.39	.34	.41	.36	.32	.33	.29 .27					
	6	.40	.34	.30	.37	.31	.28	.30	.26 .23					
	7	.36	.30	.26	.33	.28	.24	.27	.23 .20					
	8	.33	.27	.23	.30	.25	.21	.25	.21 .18					
	9	.30	.24	.20	.27	.22	.19	.22	.18 .16					
	10	.27	.21	.18	.25	.20	.16	.20	.17 .14					
	1	.74	.71	.69	.67	.65	.63	.56	.54 .53					
	2	.65	.61	.57	.60	.56	.53	.50	.47 .45					
	3	.58	.53	.49	.53	.49	.45	.45	.41 .39					
	4	.52	.46	.42	.48	.43	.39	.40	.36 .34					
	5	.47	.40	.36	.43	.38	.34	.36	.32 .29					
	6	.42	.36	.31	.39	.33	.30	.33	.29 .26					
	7	.38	.32	.27	.35	.30	.26	.29	.25 .22					
	8	.34	.28	.24	.31	.26	.23	.27	.23 .20					
	9	.31	.25	.21	.28	.23	.20	.24	.20 .17					
	10	.28	.23	.19	.26	.21	.18	.22	.18 .16					
	1	.89	.86	.83				.78	.76 .74			.65	.64	.63
	2	.79	.74	.69				.69	.66 .63			.58	.56	.54
	3	.70	.64	.59				.62	.57 .54			.53	.50	.47
	4	.62	.56	.51				.55	.50 .46			.47	.44	.41
	5	.55	.48	.43				.49	.44 .40			.42	.38	.35
	6	.50	.42	.37				.44	.39 .34			.38	.34	.31
	7	.45	.37	.33				.40	.34 .30			.34	.30	.27
	8	.40	.33	.28				.36	.30 .26			.31	.27	.24
	9	.36	.29	.24				.32	.27 .22			.28	.23	.20
	10	.33	.26	.21				.29	.24 .20			.25	.21	.18

CONTINUA

Distribución típica	p_{cc}	80				70				50			30			10		
	p_p	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10
	RCA	Coeficientes de utilización, método cavidad zonal, p_{cp} = 20																
 Tipo A	1	.86	.84	.82	.79	.84	.81	.79	.77	.77	.75	.74	.73	.72	.71	.70	.69	.68
	2	.81	.77	.73	.70	.79	.75	.71	.69	.71	.69	.66	.68	.66	.64	.65	.63	.62
	3	.76	.70	.66	.62	.74	.69	.65	.61	.66	.63	.60	.63	.61	.58	.61	.59	.57
	4	.71	.64	.59	.56	.69	.63	.59	.55	.61	.57	.54	.58	.55	.52	.56	.54	.51
	5	.67	.59	.54	.50	.65	.58	.53	.49	.56	.52	.49	.54	.50	.48	.52	.49	.47
	6	.63	.55	.49	.45	.61	.54	.49	.45	.52	.47	.44	.50	.46	.44	.49	.45	.43
	7	.59	.50	.45	.41	.57	.49	.44	.41	.48	.43	.40	.46	.42	.39	.45	.41	.39
	8	.55	.46	.41	.37	.54	.45	.40	.37	.44	.40	.36	.43	.39	.36	.41	.38	.35
	9	.51	.43	.37	.34	.50	.42	.37	.33	.41	.36	.33	.40	.35	.33	.38	.35	.32
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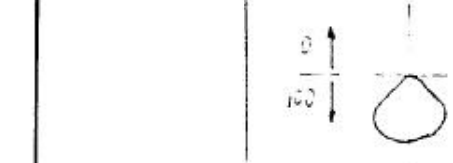
 Tipo B	1	.73	.70	.68	.66	.71	.68	.67	.65	.66	.64	.63	.63	.62	.61	.61	.60	.59
	2	.67	.63	.59	.56	.66	.62	.58	.56	.59	.57	.54	.57	.55	.53	.55	.54	.52
	3	.62	.57	.52	.49	.61	.56	.52	.48	.54	.50	.47	.52	.49	.47	.51	.48	.46
	4	.58	.51	.46	.43	.57	.50	.46	.42	.49	.45	.42	.47	.44	.41	.46	.44	.41
	5	.53	.46	.41	.37	.52	.45	.40	.37	.44	.40	.36	.43	.39	.36	.41	.38	.36
	6	.50	.42	.36	.33	.48	.41	.36	.32	.40	.35	.32	.39	.35	.32	.38	.34	.32
	7	.46	.38	.32	.29	.45	.37	.32	.29	.36	.32	.28	.35	.31	.28	.34	.31	.28
	8	.42	.34	.29	.25	.41	.33	.28	.25	.32	.28	.25	.32	.28	.25	.31	.27	.24
	9	.39	.31	.25	.22	.38	.30	.25	.22	.29	.25	.22	.29	.24	.21	.28	.24	.21
	10	.36	.28	.23	.19	.36	.27	.23	.19	.27	.22	.19	.26	.22	.19	.25	.22	.19
 Tipo C	1		.98	.96	.95					.92	.91	.90				.87	.86	.85
	2		.94	.91	.89					.89	.87	.86				.85	.84	.83
	3		.90	.87	.85					.87	.85	.83				.83	.82	.80
	4		.87	.83	.81					.84	.81	.80				.81	.79	.78
	5		.83	.80	.77					.81	.78	.76				.79	.77	.75
	6		.81	.77	.75					.79	.76	.74				.77	.75	.73
	7		.78	.74	.72					.76	.73	.71				.74	.72	.70
	8		.75	.72	.69					.74	.71	.69				.72	.70	.68
	9		.73	.69	.67					.72	.68	.66				.70	.68	.66
	10		.70	.67	.64					.69	.66	.64				.68	.66	.64

TABLA DE FACTORES DE MULTIPLICACION

PARA REFLECTANCIAS DE CAVIDAD DE PISO DEL 10%.

p_{cc}	80				70				50			30			10		
p_p	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10
1	.92	.93	.93	.94	.93	.94	.94	.95	.96	.96	.96	.97	.98	.98	.99	.99	.99
2	.93	.94	.95	.96	.94	.95	.96	.96	.96	.97	.97	.98	.98	.98	.99	.99	.99
3	.94	.95	.96	.97	.94	.96	.97	.97	.97	.97	.98	.98	.99	.99	.99	.99	.99
4	.94	.96	.97	.98	.95	.96	.97	.98	.97	.98	.99	.98	.99	.99	.99	.99	.99
RCA 5	.95	.96	.98	.98	.95	.97	.98	.98	.97	.98	.99	.98	.99	.99	.99	.99	1.0
6	.95	.97	.98	.99	.96	.97	.98	.99	.98	.98	.99	.98	.99	.99	.99	.99	1.0
7	.96	.97	.98	.99	.96	.97	.98	.99	.98	.99	.99	.98	.99	1.0	.99	.99	1.0
8	.96	.98	.99	.99	.96	.98	.99	.99	.98	.99	.99	.98	.99	1.0	.99	.99	1.0
9	.96	.98	.99	.99	.96	.98	.99	.99	.98	.99	1.0	.98	.99	1.0	.99	.99	1.0
10	.96	.98	.99	.99	.97	.98	.99	.99	.98	.99	1.0	.99	.99	1.0	.99	.99	1.0

TABLA DE FACTORES DE MULTIPLICACION

PARA REFLECTANCIAS DE CAVIDAD DE PISO DEL 30%.

p_{cc}	80				70				50			30			10		
p_p	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10
1	1.09	1.08	1.07	1.07	1.08	1.07	1.06	1.06	1.05	1.04	1.04	1.03	1.03	1.02	1.01	1.01	1.01
2	1.08	1.07	1.05	1.05	1.07	1.06	1.05	1.04	1.04	1.03	1.03	1.03	1.02	1.02	1.02	1.01	1.01
3	1.07	1.05	1.04	1.03	1.06	1.05	1.04	1.03	1.03	1.03	1.02	1.02	1.02	1.01	1.01	1.01	1.00
4	1.06	1.04	1.03	1.02	1.05	1.04	1.03	1.02	1.03	1.02	1.01	1.02	1.01	1.01	1.01	1.01	1.00
RCA 5	1.06	1.04	1.03	1.02	1.05	1.03	1.02	1.01	1.03	1.02	1.01	1.02	1.01	1.01	1.01	1.01	1.00
6	1.05	1.03	1.02	1.01	1.05	1.03	1.02	1.01	1.02	1.01	1.01	1.02	1.01	1.01	1.01	1.01	1.00
7	1.05	1.03	1.02	1.01	1.04	1.03	1.02	1.01	1.02	1.01	1.01	1.02	1.01	1.01	1.01	1.01	1.00
8	1.04	1.03	1.01	1.01	1.04	1.02	1.01	1.01	1.02	1.01	1.01	1.02	1.01	1.00	1.01	1.01	1.00
9	1.04	1.02	1.01	1.01	1.04	1.02	1.01	1.01	1.02	1.01	1.00	1.02	1.01	1.00	1.01	1.01	1.00
10	1.04	1.02	1.01	1.01	1.03	1.02	1.01	1.00	1.02	1.01	1.00	1.01	1.01	1.00	1.01	1.01	1.00

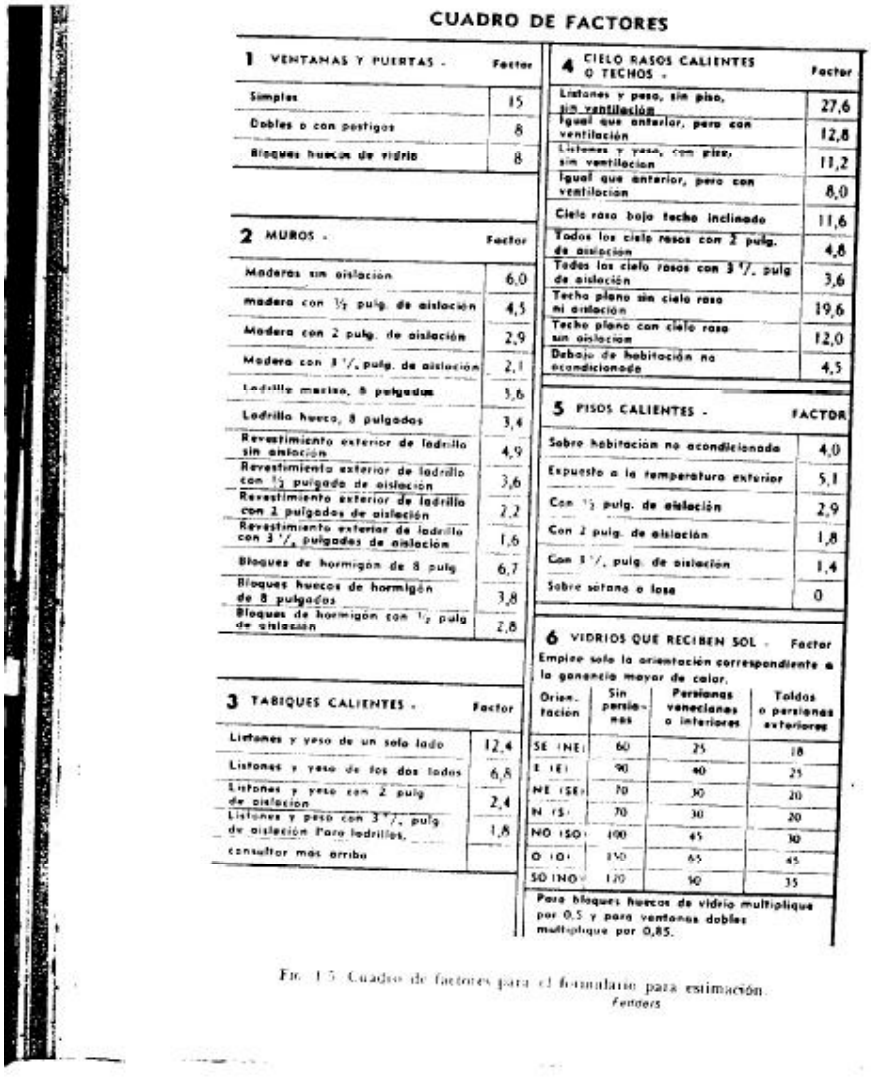
p_{cc} = porcentaje de reflectancia efectiva de cavidad cielo

p_p = porcentaje de reflectancia de paredes

RCA = Relación de Cavidad de Ambiente

I. Ventilación

A continuación se muestra el cuadro de factores utilizados en la sección de insumos capítulo IV, para el cálculo de ventilación de la planta de producción.



CUADRO DE FACTORES

1 VENTANAS Y PUERTAS -	Factor
Simples	15
Dobles o con postigos	8
Bloques huecos de vidrio	8

2 MUROS -	Factor
Maderos sin aislacion	6,0
madera con ½ pulg. de aislación	4,5
Madera con 2 pulg. de aislación	2,9
Madera con 3 ½ pulg. de aislacion	2,1
Ladrillo macizo, 8 pulgadas	3,6
Ladrillo hueco, 8 pulgadas	3,4
Revestimiento exterior de ladrillo sin aislación	4,9
Revestimiento exterior de ladrillo con ½ pulgada de aislacion	3,6
Revestimiento exterior de ladrillo con 2 pulgadas de aislación	2,2
Revestimiento exterior de ladrillo con 3 ½ pulgadas de aislacion	1,6
Bloques de hormigon de 8 pulg	6,7
Bloques huecos de hormigón de 8 pulgadas	3,8
Bloques de hormigon con ½ pulg de aislacion	2,8

3 TABIQUES CALIENTES -	Factor
Listones y yeso de un solo lado	12,4
Listones y yeso de los dos lados	6,8
Listones y yeso con 2 pulg de aislacion	2,4
Listones y yeso con 3 ½ pulg de aislación Para ladrillos, consultar mas arriba	1,8

4 CIELO RASOS CALIENTES O TECHOS -	Factor
Listones y yeso, sin piso, sin ventilación	27,6
Igual que anterior, pero con ventilación	12,8
Listones y yeso, con piso, sin ventilacion	11,2
Igual que anterior, pero con ventilacion	8,0
Cielo raso bajo techo inclinado	11,6
Todos los cielo rasos con 2 pulg. de aislacion	4,8
Todos los cielo rasos con 3 ½ pulg de aislación	3,6
Techo plano sin cielo raso ni aislación	19,6
Techo plano con cielo raso sin aislacion	12,0
Debajo de habitación no acondicionada	4,5

5 PISOS CALIENTES -	FACTOR
Sobre habitacion no acondicionada	4,0
Expuesto a la temperatura exterior	5,1
Con ½ pulg. de aislación	2,9
Con 2 pulg. de aislación	1,8
Con 3 ½ pulg. de aislacion	1,4
Sobre sotano o losa	0

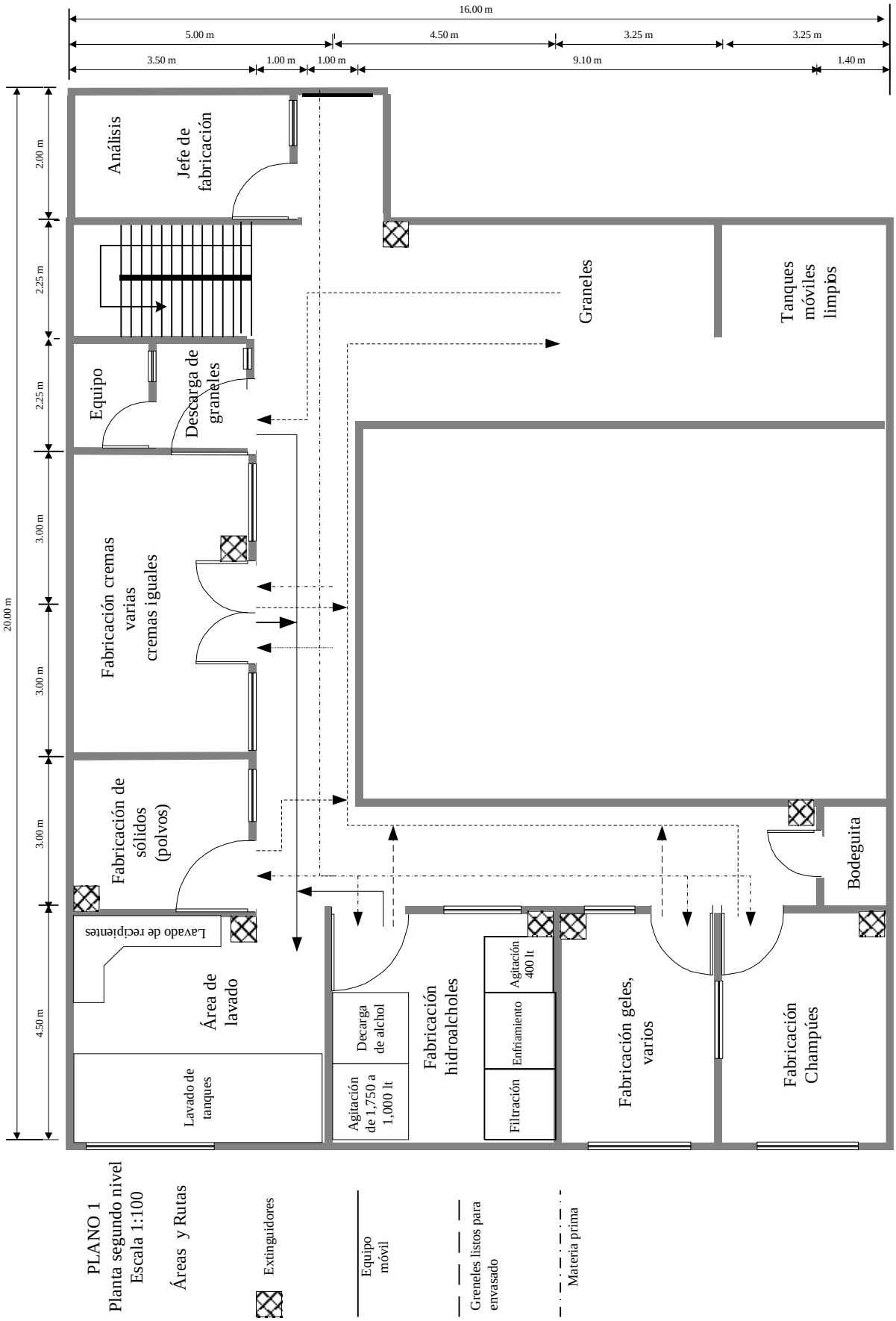
6 VIDRIOS QUE RECIBEN SOL - Factor

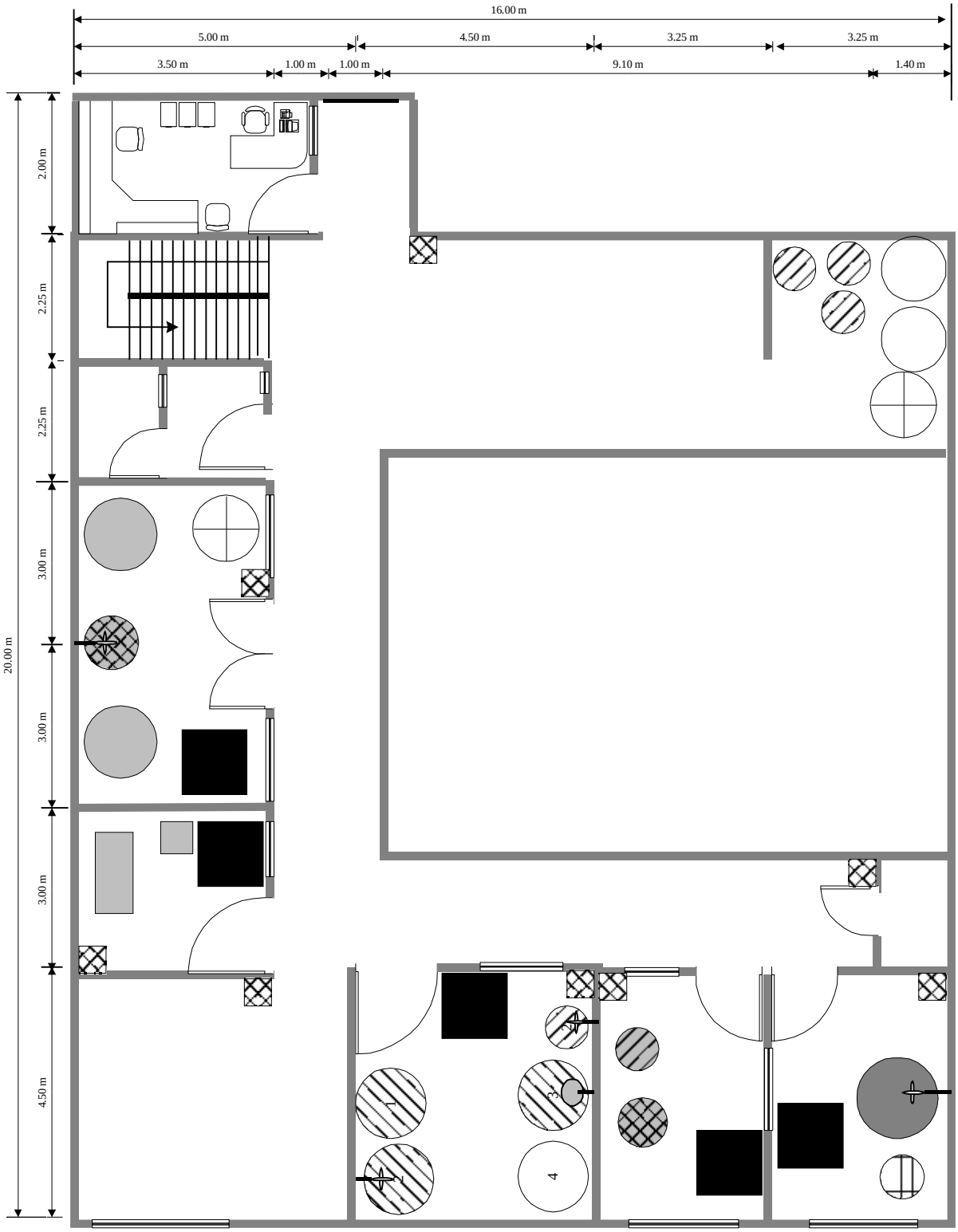
Emplee solo la orientación correspondiente a la ganancia mayor de calor.

Orientacion	Sin persianas	Persianas venecianas o interiores	Toldos o persianas exteriores
SE (NE)	60	25	18
E (E)	90	40	25
NE (SE)	70	30	20
N (S)	70	30	20
NO (SO)	100	45	30
O (O)	150	65	45
SO (NO)	120	50	35

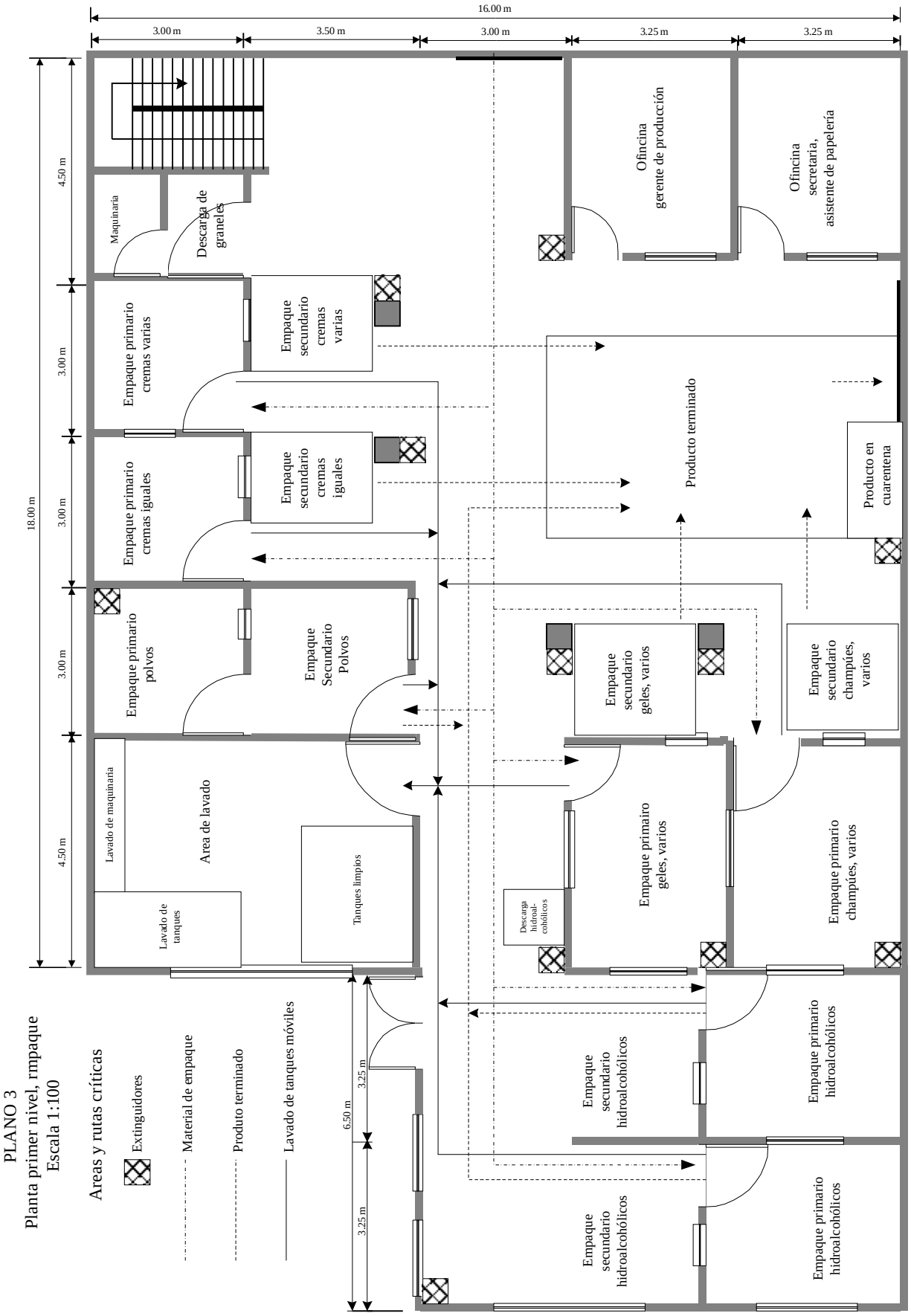
Para bloques huecos de vidrio multiplique por 0.5 y para ventanas dobles multiplique por 0,85.

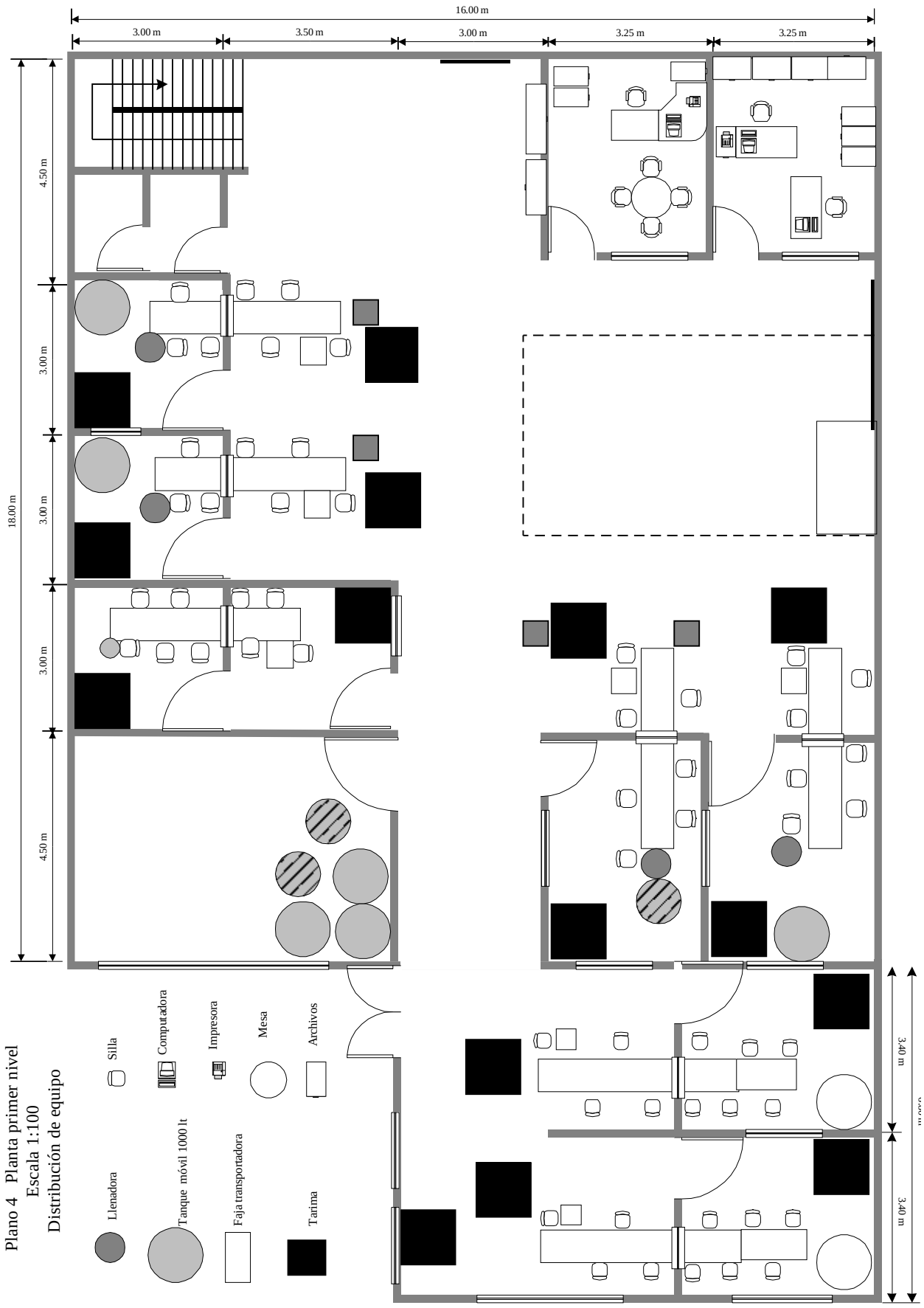
FIG. 1.5 Cuadro de factores para el formulario para estimación.
Fenders



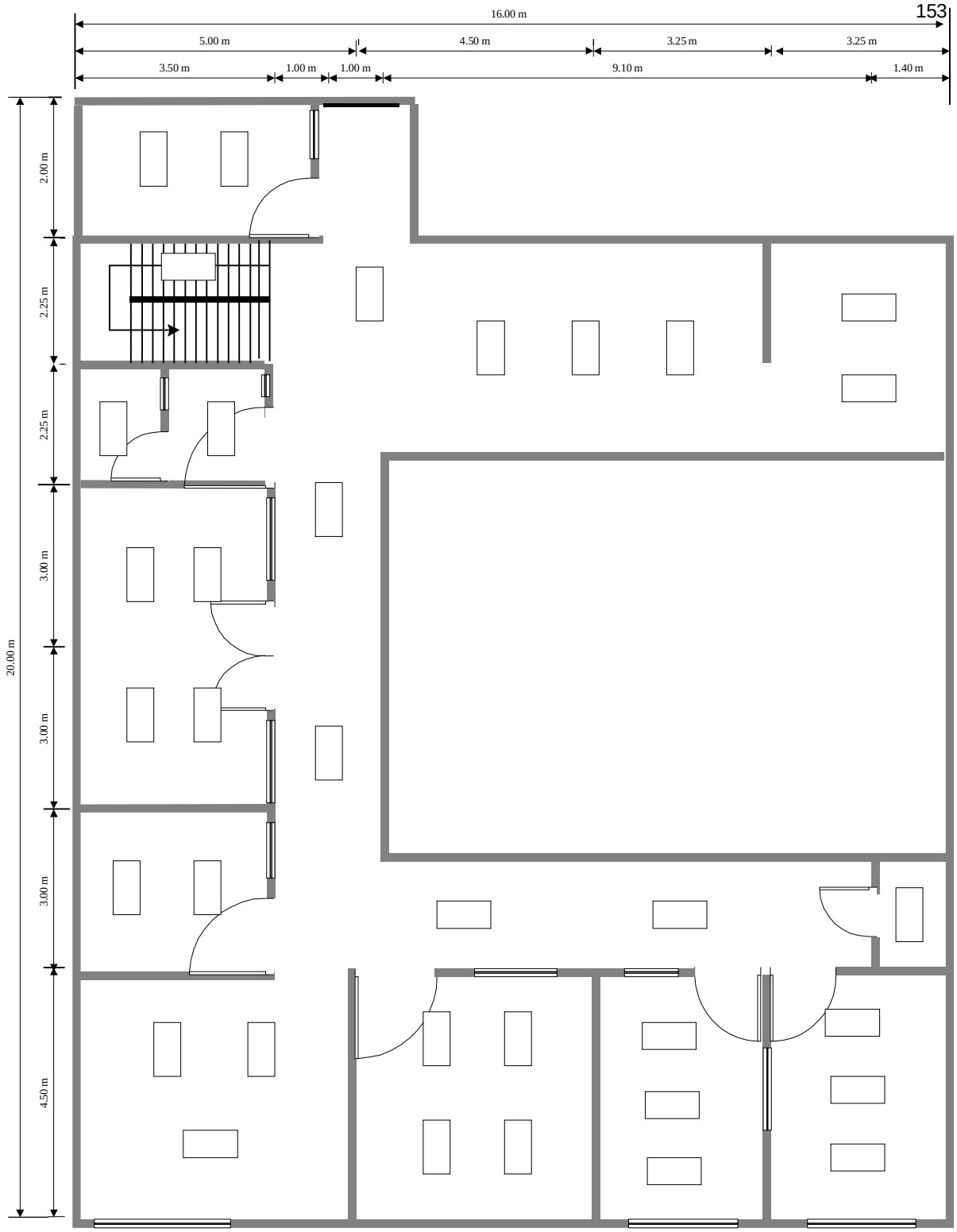


PLANO 2
Planta segundo nivel
Escala 1 : 100
Distribución
de equipo





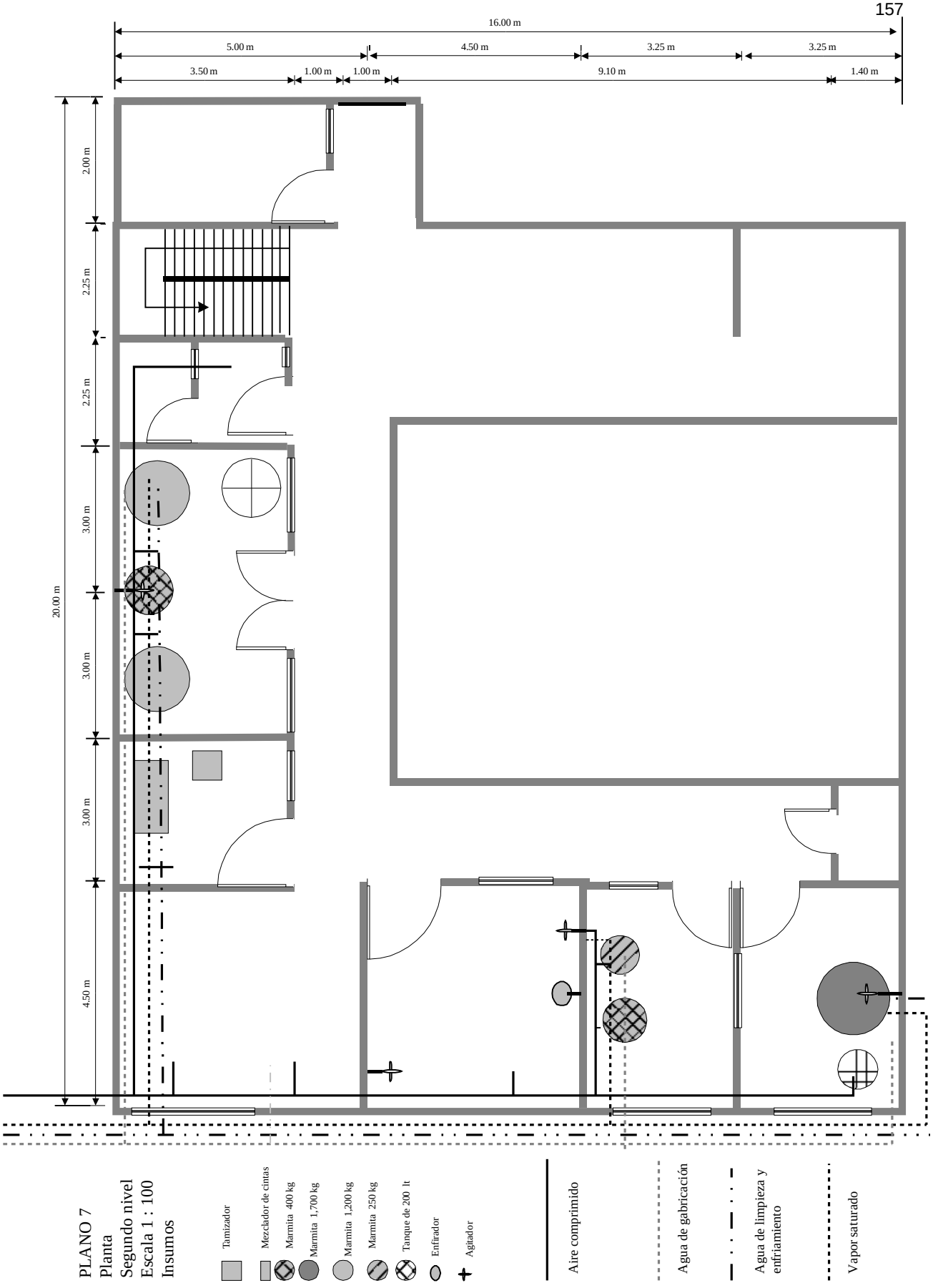
Plano 4 Planta primer nivel
Escala 1:100
Distribución de equipo

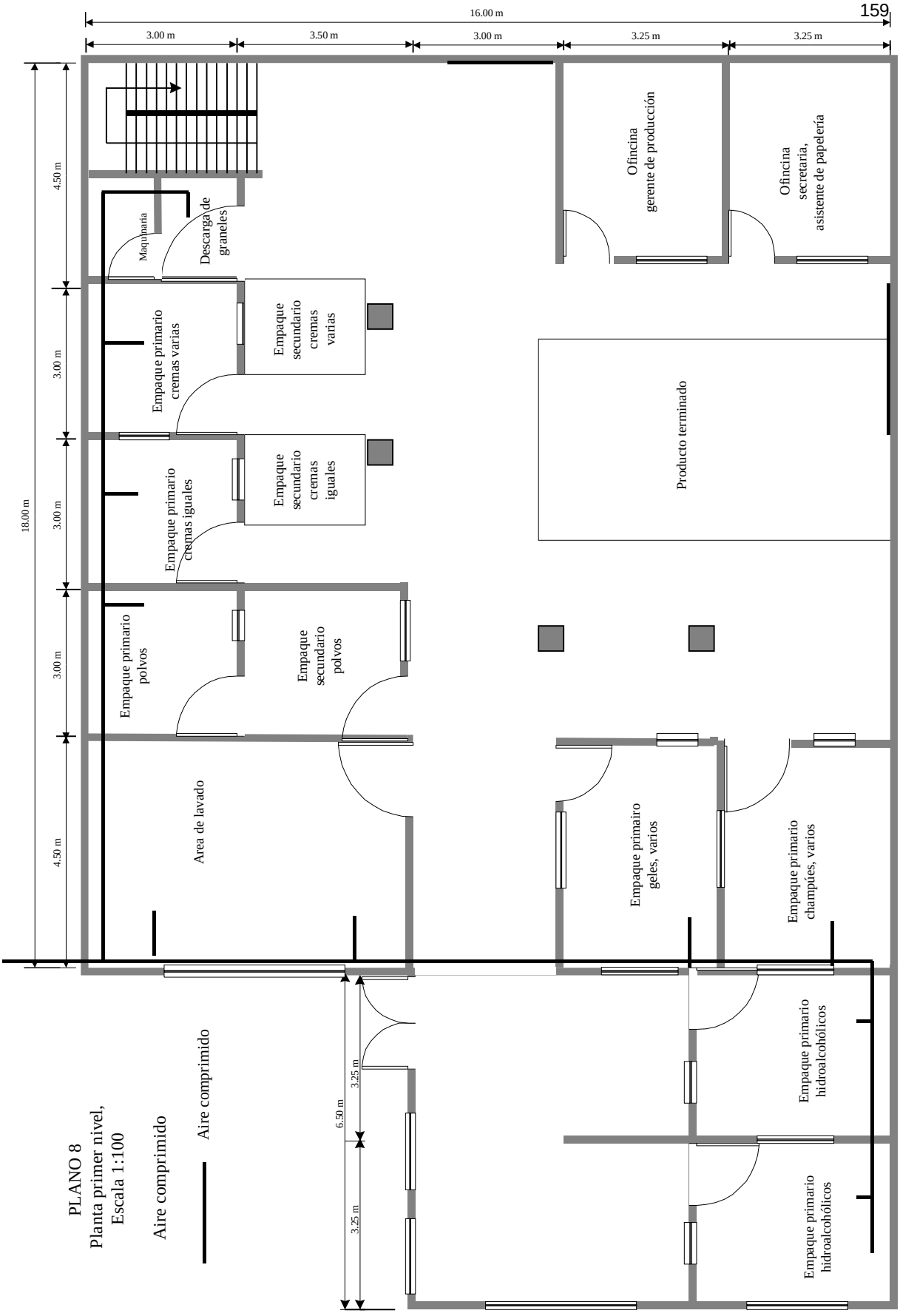


PLANO 5
Planta segundo nivel
Escala 1:100

Iluminación

Lámpara de 1X0.5 m2
2 tubos fluorescentes tipo B
cada tubo de 40 watts





PLANO 9
Planta primer nivel,
Escala 1:100

Delimitación de áreas consideradas para ventilación