

CONTEC

Comissão de Normalização
Técnica

SC-12

General Standards for
Design

**Graphic Symbols for Process and
Engineering Flowsheets**

Revalidation

Revalidated in 01/2012.

GRAPHIC SYMBOLS FOR PROCESS AND ENGINEERING FLOWSHEETS

Simbology

This Standard replaces and cancels the previous revision.

This Standard has been totally revised with respect to the previous revision.

The Responsible CONTEC Subcommittee provides guidance on the interpretation of this Standard when questions arise regarding its contents. The Department of PETROBRAS that uses this Standard is fully responsible for adopting and applying the clauses thereof.

Mandatory Requirement: a provision established as being the most adequate and which shall be used strictly in accordance with this Standard. If a decision is taken not to follow the requirement ("non-conformity" to this Standard) it shall be based on well-founded economic and management reasons, and be approved and registered by the Department of PETROBRAS that uses this Standard. It is characterized by the verb forms "shall", "it is necessary...", "is required to...", "it is required that...", "is to...", "has to...", "only ... is permitted", and other equivalent expressions having an imperative nature.

Recommended Practice (nonmandatory) a provision that may be adopted under the conditions of this Standard, but which admits (and draws attention to) the possibility of there being a more adequate alternative (not written in this Standard) to the particular application. The alternative adopted shall be approved and registered by the Department of PETROBRAS that uses this Standard. It is characterized by the verbal form "should" and equivalent expressions such as "it is recommended that..." and "ought to..." (verbs of a nonmandatory nature). It is indicated by the expression: [**Recommended Practice**].

Copies of the registered "non-conformities" to this Standard that may contribute to the improvement thereof shall be submitted to the Responsible CONTEC Subcommittee.

Proposed revisions to this Standard shall be submitted to the Responsible CONTEC Subcommittee, indicating the alphanumeric identification and revision of the Standard, the clause(s) to be revised, the proposed text, and technical/economic justification for revision. The proposals are evaluated during the work for alteration of this Standard.

"The present Standard is exclusive ownership of PETRÓLEO BRASILEIRO S.A. - PETROBRAS, for internal use in the company, and any copy for external use or disclosure, without previous express authorization, implies unlawful act pursuant the relevant legislation through which the applicable responsibilities shall be imputed. The external circulation shall be regulated by a specific clause of Secrecy and Confidentiality, pursuant the terms of the intellectual and industrial property law".

CONTEC

Comissão de Normas
Técnicas

SC - 12

General Standards for Design

Foreword

PETROBRAS technical standards are prepared by Working Groups – GTs (consisting of PETROBRAS specialists and PETROBRAS Subsidiaries specialists), are commented by Local Representatives (representatives of the Industrial Units, Engineering Projects, Technical Divisions and PETROBRAS Subsidiaries), are approved by Responsible Subcommittees SCs (consisting of specialists belonging to the same speciality, representing the various PETROBRAS Departments and PETROBRAS Subsidiaries), and approved by CONTEC General Assembly (consisting of representatives of the Superintendencias of the PETROBRAS Departments and PETROBRAS Subsidiaries that use PETROBRAS technical standards). A PETROBRAS technical standard is subjected to revision at any time by the Responsible Subcommittee and must be reviewed every five years to be revalidated, revised or cancelled. PETROBRAS technical standards are prepared in accordance with standard PETROBRAS N - 1. For complete information about PETROBRAS standards see PETROBRAS Technical Standards Catalog.



N-58

REV. C

ENGLISH

FEB / 99

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PREFACE

This Standard is the English version (issued in APR/99) of Standard PETROBRAS N-58 - REV. C FEB/99.

1 SCOPE

1.1 This Standard establishes the graphic symbols to be used in PETROBRAS drawings of process and engineering flowsheets.

1.2 For instrumentation symbols see ISA S 5.1 standard.

1.3 This Standard only applies to projects being initiated after this standard edition.

1.4 This Standard has only Mandatory Requirements.

2 COMPLEMENTARY DOCUMENTS

The following documents are referenced in the text and contain valid rules for this Standard.

PETROBRAS N-381	- Technical Drawings and Other General Documents Execution;
PETROBRAS N-1521	- Identification of Industrial Equipment;
ISA S 5.1	- Instrumentation Symbols and Identification.

3 GENERAL CONDITIONS

3.1 The symbols shall be traced so as, wherever possible, to maintain proportionality of its respective dimensions.

3.2 Equipment items with driver units (e.g., pumps, agitators, etc) should be represented by combining the symbols for both the driven equipment and the driver unit.

3.3 The industrial equipment shall be identified according to PETROBRAS N-1521 standard.

3.4 The flowsheets shall be elaborated according to PETROBRAS N-381 standard.

4 SPECIFIC CONDITIONS

4.1 Piping Items (ANNEX A)

- Pulsation Damper;
- Piping Heating and Insulation;
- Gas Burner;
- Foam Liquid Generator Recipient;
- Spray Nozzle;
- Plug;
- Exhaust Head;
- Shower;
- Hose Connection;
- Swivel Connection;
- Rupture Disc;
- Foam Generator Jet;
- Spectacle Flange;
- Air Filter for Compressor Suction;
- Line Filters;
- Flanges and Joints;
- Hydrants;
- Expansion Joint;
- Eye-Wash;
- Flexible Hose and Hose Reel;
- Injection Pot;
- Steam Trap;
- Racket;
- Reduction;
- Air Vent;
- In-Line Separator;
- Siphon;
- In-Line Silencer;
- Piping Special Symbol;
- "T" Grilled;
- "T" Mixer;
- Screwed Cap;
- Valves;
- Air Trap;
- Line Visor (Flow Visor).

4.2 Engines and Fluids Transfer Equipment (ANNEX B)

- Drivers;
- Pumps;
- Compressors and Blowers;
- Ejector;
- Fan.

4.3 Heat Exchange Equipment (ANNEX C)

- Line Heater;
- Electric Bayonet;
- Boiler (Steam Generator);
- Barometric Condenser;
- Condenser or Air Cooler;
- Furnace;
- Reformer Steam Generator;
- Shell and Tube Heat Exchanger and Condenser;
- Double Pipe Heat Exchanger;
- Plate Heat Exchanger;
- Heat Recovery Unit;
- Reboiler;
- Refrigerator;
- Sample Cooler;
- Heating Coil;
- Cooling Tower;
- Multiflow Heat Exchanger;
- Flare Vaporizer.

4.4 Boiler Making Equipment (ANNEX D)

- Well Head;
- Stack;
- Coalescer;
- Deaerator;
- Filters;
- Gasometer;
- Jet-Mixer;
- In-Line Mixer;
- Silencer;
- Storage Tank;
- Flare;
- Multipoint Flare Type.
- Distillation or Rectifying Fractioning Column;
- Oil Treater;
- Waste Discharge Pipe;
- Pressure Vessel.

4.5 Equipment Internals (ANNEX E)

- Demisting Pad;
- Vortex-Breaker.

4.6 Mechanical Equipment (ANNEX F)

- Scale;
- Loading Arm;
- Traveling Screen Filter;
- Mixer (Agitator).

4.7 Solids Handling Equipment (ANNEX G)

- Belt Feeder;
- Belt Feeder with Scale;
- Apron Feeder;
- Electro-Mechanical Vibrating Feeder;
- Automatic Sampler;
- Dual Automatic Sampler;
- Manual Sampler;
- Briquetter;
- Conical Crusher;
- Gyratory Crusher;
- Jaw Crusher;
- Hammer Crusher;
- Vibrating Feeder;
- Off-Road Dump Truck;
- Power Shovel;
- Centrifugal Classifier;
- Cyclone/Hydrocyclone;
- Spiral Classifier;
- Sample Collector;
- Automatic Diverter;
- Manual Diverter;
- Motorized Diverter;
- Three Ways Out Diverter;
- Bucket Elevator;
- Stacker;
- Stacker/Reclaimer;
- Enquarter;
- Sacker;
- Press Filter;
- Bag Filter;
- Fasten Grill;
- Vibratory Grill;
- Screw Thread Mixer;
- Autogenous Mill;
- Rod Mill;
- Ball Mill;
- Disc Mill;
- Sieve;

- Inclined Vibrating Sieve;
- Inclined Vibrating Sieve with Two Decks;
- Overhead Traveller Crane;
- Bucket Wheel Retaker;
- Retort;
- Hydraulic Hammer;
- Silo;
- Silo with Load Cell;
- Clam Shell Unload Silo;
- Hoist;
- Electric Hoist;
- Fixed Tripper;
- Mobile Tripper;
- Conveyors;
- Belt Conveyor;
- Belt Conveyor with Special Drive;
- Belt Conveyor with Scale;
- Belt Conveyor with Metal Detector;
- Belt Conveyor with Magnetic Separator;
- Reversible Belt Conveyor;
- Screw Conveyor;
- Shuttle Conveyor;
- Air Slide;

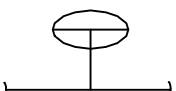
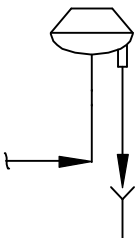
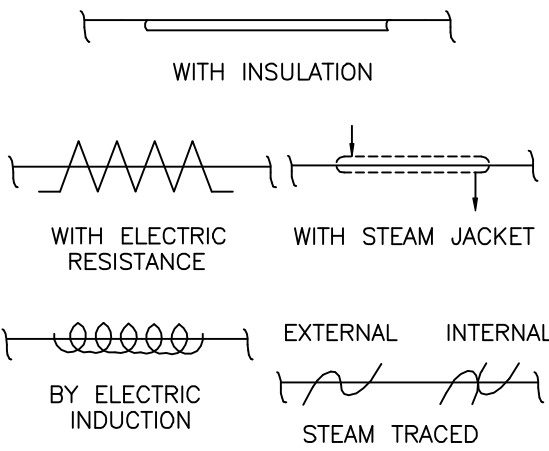
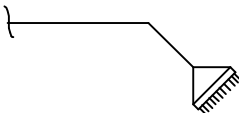

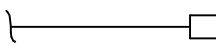
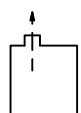
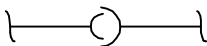
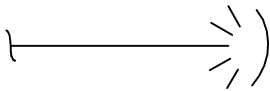
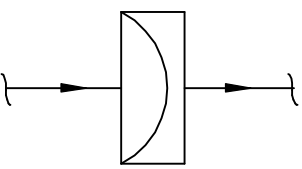
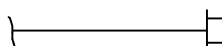
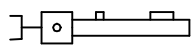
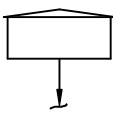
Note For a better understanding, the electric motor driver was included on the several symbols. User shall decide when is applicable.

4.7 Miscellaneous (ANNEX H)

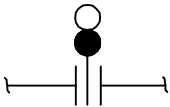
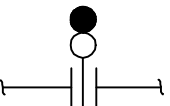
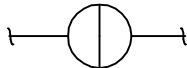
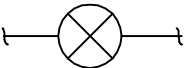
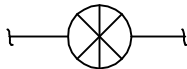

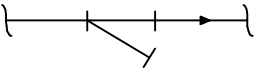
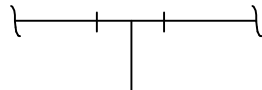
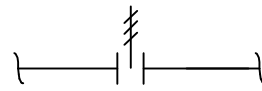
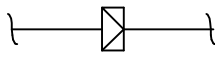
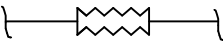
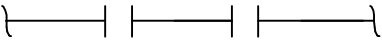
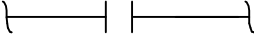
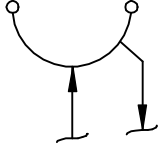
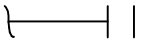
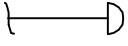
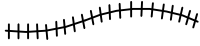
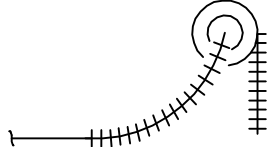
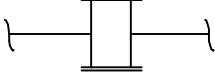
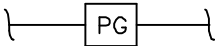
- Slide Valves and Sluice Gates;
- Sea Chest;
- Foam Chamber and Operating Mechanism;
- Gas Cylinder;
- Desanding Unit;
- Pig Launcher/Receiver;
- Electrostatic Precipitator;
- Flame Arrestor;
- Water-Oil Separator;
- Operating Condition Symbols.

/ANNEX A

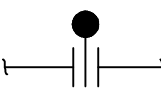
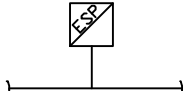
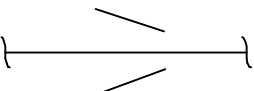
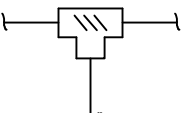

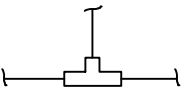
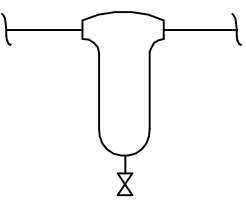
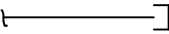
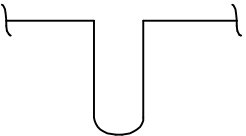
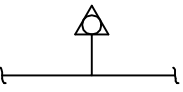
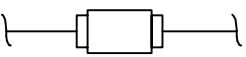

ANNEX A - PIPING ITEMS (CONTINUE)

<p>PULSATION DAMPER</p> 	<p>EXHAUST HEAD</p> 
<p>PIPING HEATING AND INSULATION</p> 	<p>SHOWER</p> 
<p>GAS BURNER</p> 	<p>HOSE CONNECTION</p> 
<p>FOAM LIQUID GENERATOR RECIPIENT</p> 	<p>SWIVEL CONNECTION</p> 
<p>SPRAY NOZZLE</p> 	<p>RUPTURE DISC</p> 
<p>PLUG</p> 	<p>FOAM GENERATOR JET</p> 
	<p>AIR FILTER FOR COMPRESSOR SUCTION</p> 

ANNEX A - PIPING ITEMS (CONTINUATION)

<p>SPECTACLE FLANGE</p>  <p>CLOSED POSITION</p>  <p>OPEN POSITION</p>	<p>HYDRANTS</p>  <p>WITH 2 OUTLETS</p>  <p>WITH 4 OUTLETS</p>  <p>WITH 6 OUTLETS</p>  <p>WITH MONITOR(*)</p> <p>(*) 2/4/6 outputs with water or foam</p>
<p>LINE FILTERS</p>  <p>" Y " TYPE</p>  <p>" T " TYPE</p>  <p>TEMPORARY</p>  <p>CONE STRAINER</p>	<p>EXPANSION JOINT</p> 
<p>FLANGES AND JOINTS</p>  <p>SPOOL</p>  <p>FLANGED CONNECTION</p>	<p>EYE-WASH</p> 
<p>BLIND FLANGE</p>  <p>WELDED CAP</p> 	<p>FLEXIBLE HOSE</p>  <p>HOSE REEL</p> 
	<p>INJECTION POT</p> 
	<p>STEAM TRAP</p> 

ANNEX A - PIPING ITEMS (CONTINUATION)

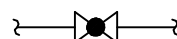
RACKET 	PIPING SPECIAL SYMBOL 
REDUCTION 	"T" GRILLED 
AIR VENT 	"T" MIXER 
IN-LINE SEPARATOR 	SCREWED CAP 
SIPHON 	AIR TRAP 
IN-LINE SILENCER 	LINE VISOR (FLOW VISOR) 

ANNEX A - PIPING ITEMS (CONCLUSION)
VALVES


GATE



GLOBE



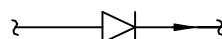
BALL



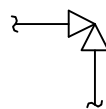
NEEDLE



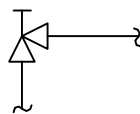
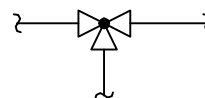
DIAPHRAGM



CHECK



ANGLE


 ANGLE WITH
MANUAL CONTROL


3-WAY BALL



"Y" GLOBE



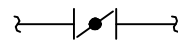
WITH BUOY CONTROL



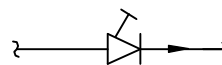
SLIDE



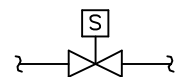
INVERTED PLUG



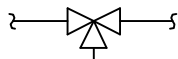
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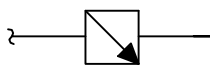
STOP CHECK



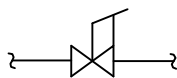
SOLENOID



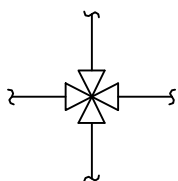
3-WAY



SWING-CHECK



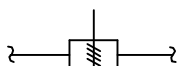
QUICK CLOSING



4-WAYS



FOOT WITH FILTER


 DOUBLE BLOCK
AND DRAIN PLUG


DAMPER

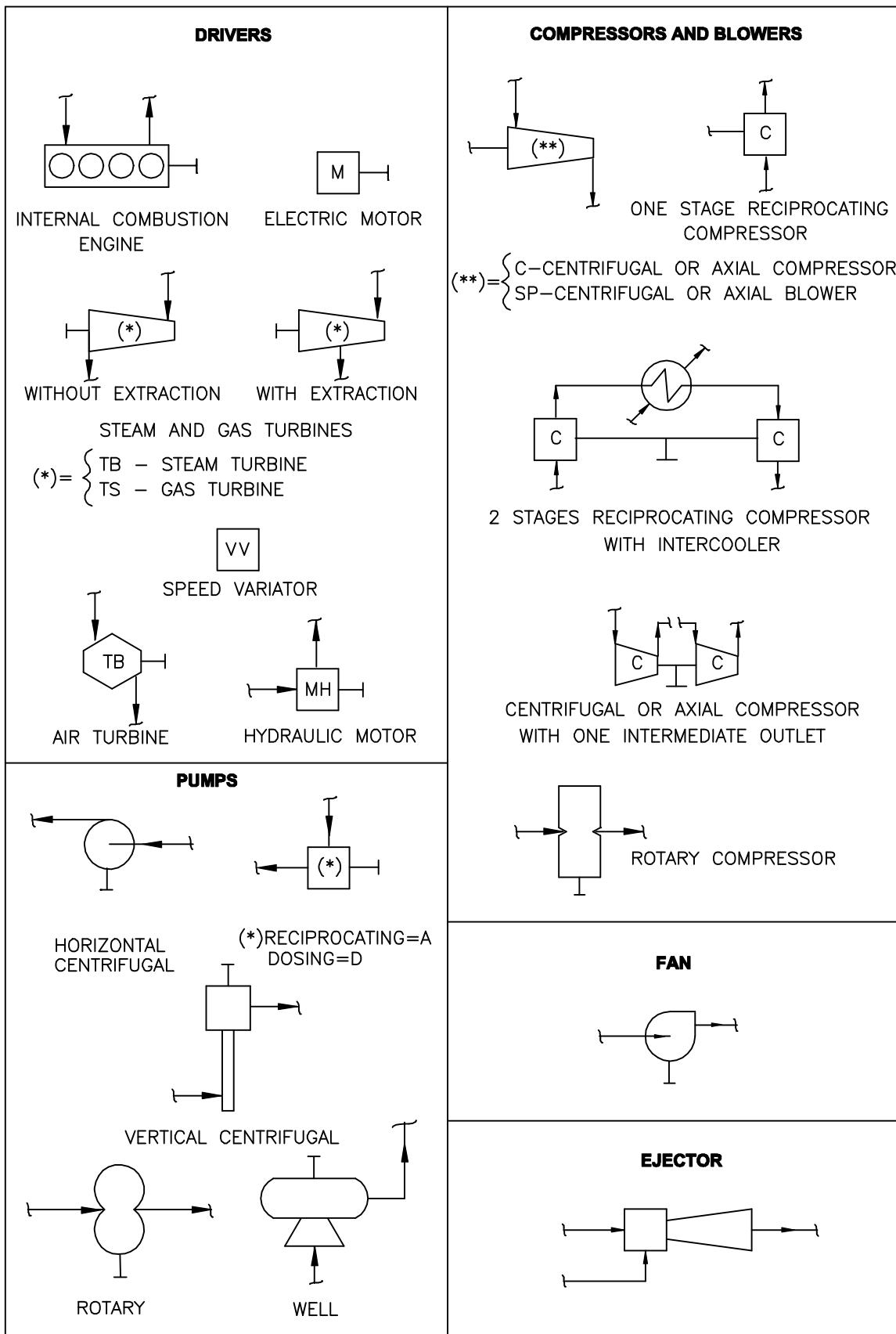


PLUG

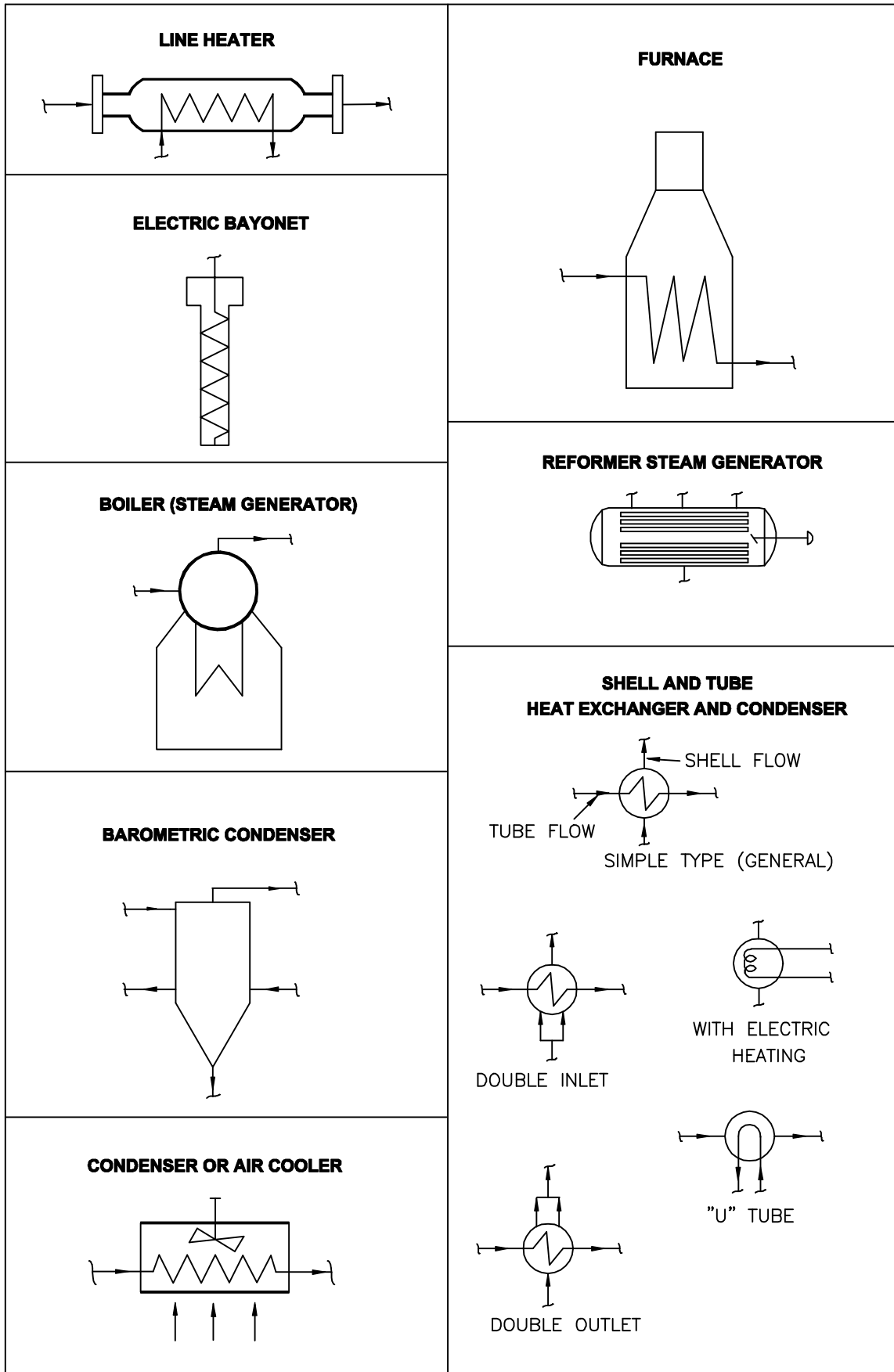


MANUAL CONTROL

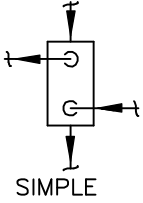
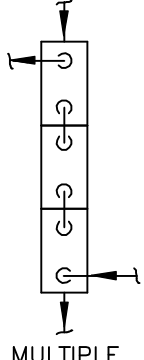
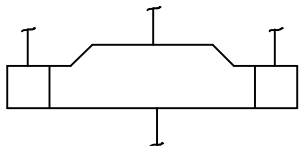
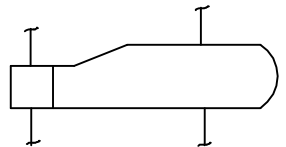
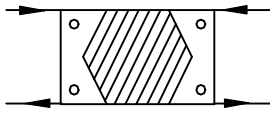
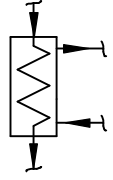
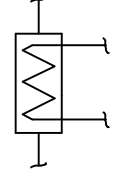
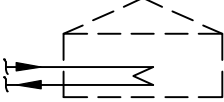
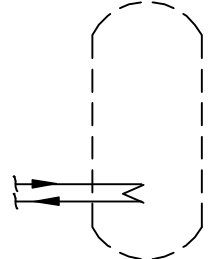

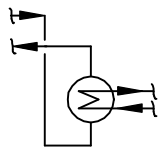
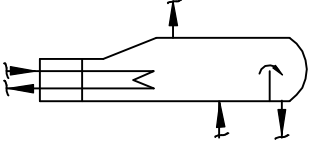
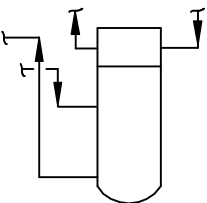
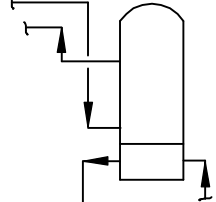
ANNEX B - ENGINES AND FLUIDS TRANSFER EQUIPMENT



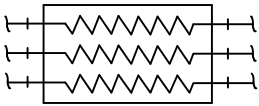
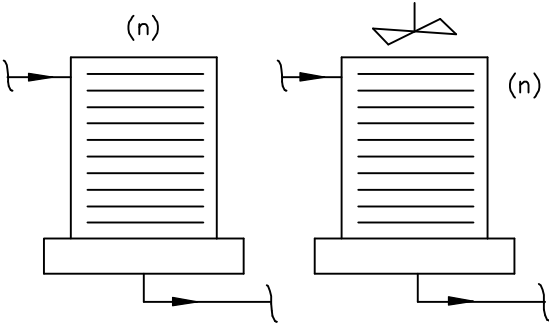
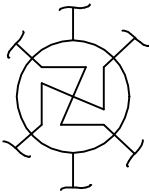
ANNEX C - HEAT EXCHANGE EQUIPMENT (CONTINUE)



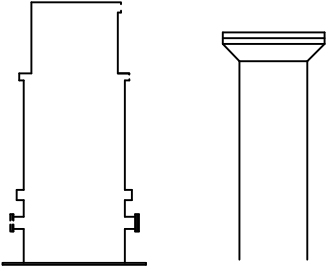
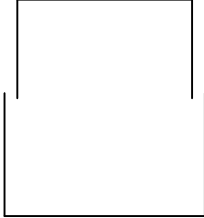
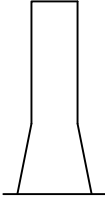
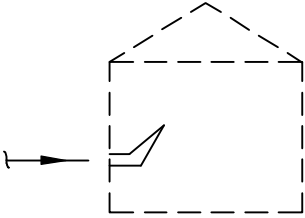
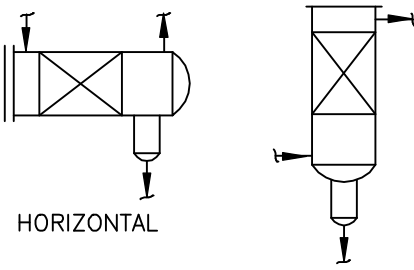
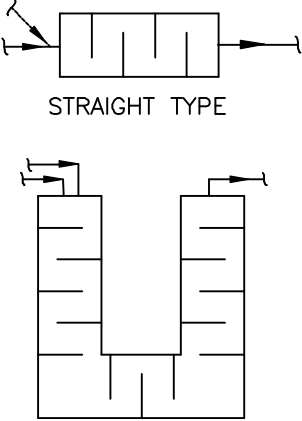
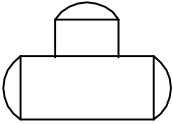
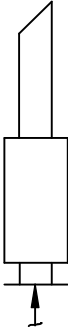
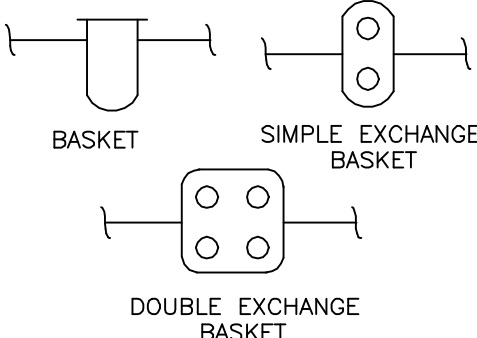
ANNEX C - HEAT EXCHANGE EQUIPMENT (CONTINUATION)

<p>DOUBLE PIPE HEAT EXCHANGERS</p>  <p>SIMPLE</p>  <p>MULTIPLE</p>	<p>REFRIGERATOR</p>  <p>TYPE 1</p>  <p>TYPE 2</p>
<p>PLATE HEAT EXCHANGER</p> 	<p>SAMPLE COOLER</p> 
<p>HEAT RECOVERY UNIT</p> 	<p>HEATING COIL</p>  <p>IN TANKS</p>  <p>IN DIFFERENT VESSELS</p>  <p>ELECTRIC HEATING</p>
<p>REBOILER</p>  <p>SIMPLE</p>  <p>"KETTLE" TYPE</p>   <p>VERTICAL, TUBE BUNDLE</p>	

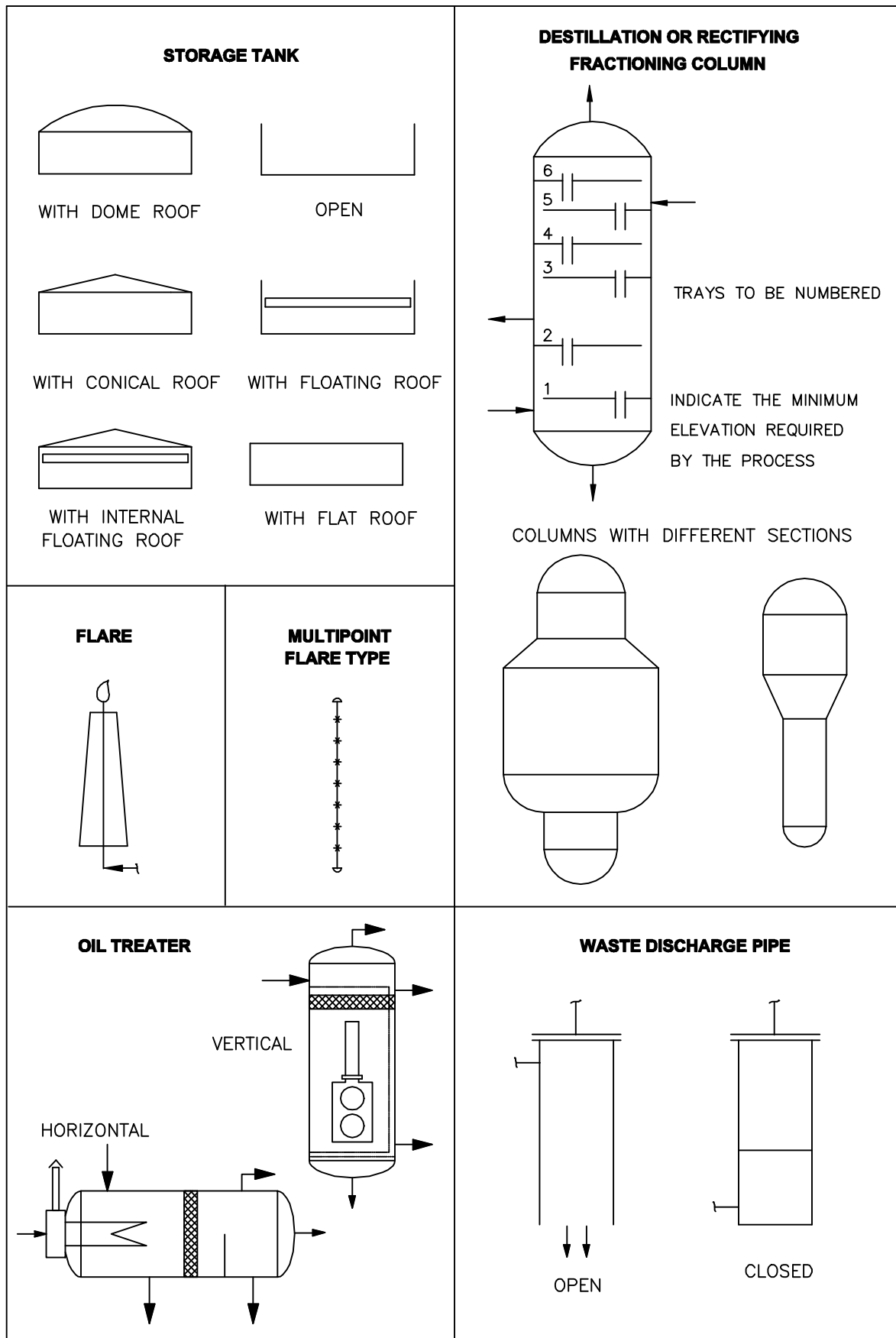
ANNEX C - HEAT EXCHANGE EQUIPMENT (CONCLUSION)

<p>MULTIFLOW HEAT EXCHANGER</p> 	<p>COOLING TOWER</p>  <p>SIMPLE CELL SIMPLE CELL WITH FAN</p> <p>n = NUMBER OF CELLS</p>
<p>FLARE VAPORIZER</p> 	

ANNEX D- BOILER MAKING EQUIPMENT (CONTINUE)

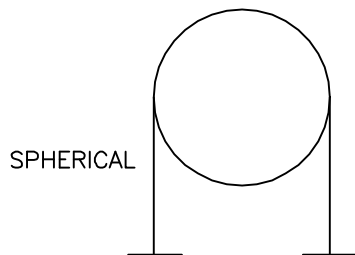
<p>WELL HEAD</p>  <p>SUBMARINE DRY</p>	<p>GASOMETER</p> 
<p>STACK</p> 	<p>JET-MIXER</p> 
<p>COALESCER</p>  <p>HORIZONTAL VERTICAL</p>	<p>IN-LINE MIXER</p>  <p>STRAIGHT TYPE</p> <p>"U" TYPE</p>
<p>DEAERATOR</p> 	<p>SILENCER</p> 
<p>FILTERS</p>  <p>BASKET SIMPLE EXCHANGE BASKET</p> <p>DOUBLE EXCHANGE BASKET</p>	

ANNEX D - BOILER MAKING EQUIPMENT (CONTINUATION)



ANNEX D - BOILER MAKING EQUIPMENT (CONCLUSION)

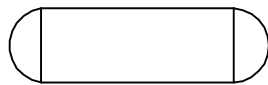
PRESSURE VESSEL



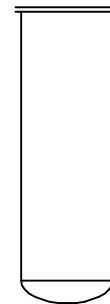
SPHERICAL



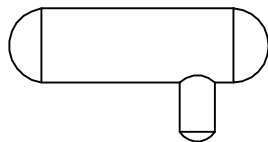
VERTICAL WITH
CONICAL TRANSITION



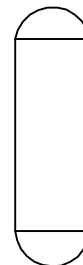
HORIZONTAL



VERTICAL WITH
FLAT TOP


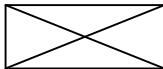


HORIZONTAL WITH
DRAINAGE BOOT



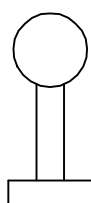
VERTICAL

ANNEX E - EQUIPMENT INTERNALS

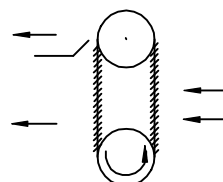
<p>DEMISTING PAD</p> 	<p>VORTEX-BREAKER</p> 

ANNEX F - MECHANICAL EQUIPMENT

SCALE

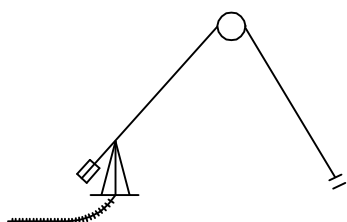


TRAVELING SCREEN FILTER

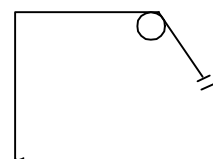


LOADING ARM

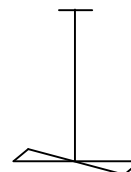
BY TOP



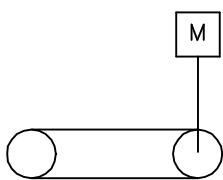

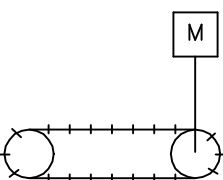
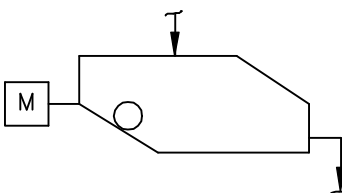
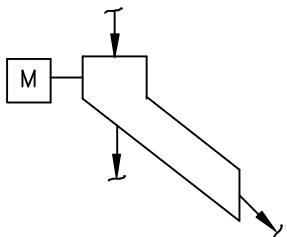
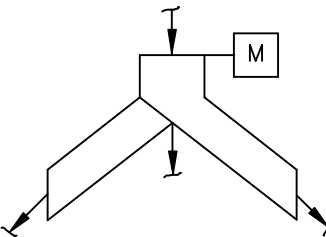
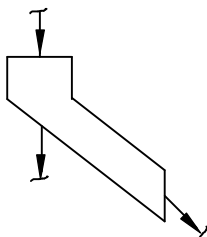
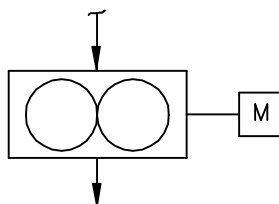
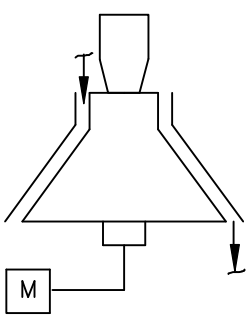
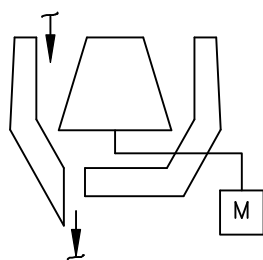
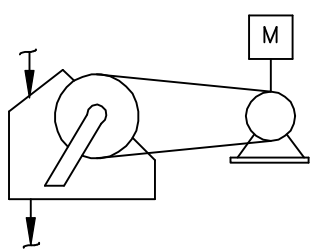
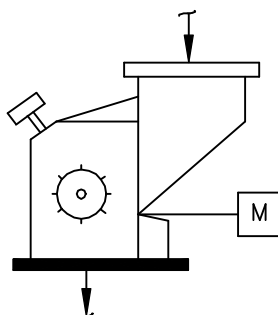
BY BOTTOM



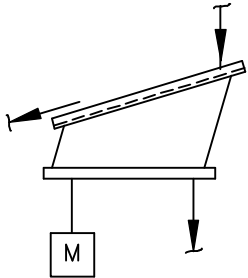
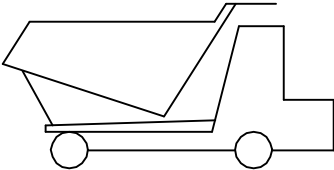
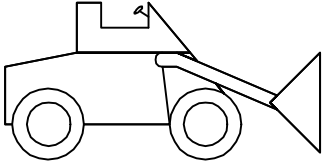
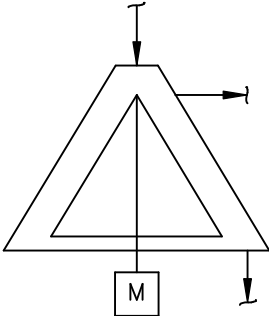
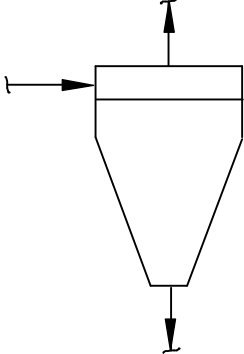
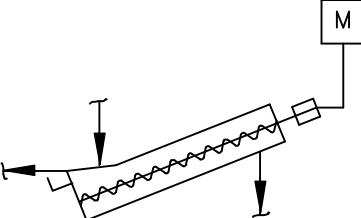

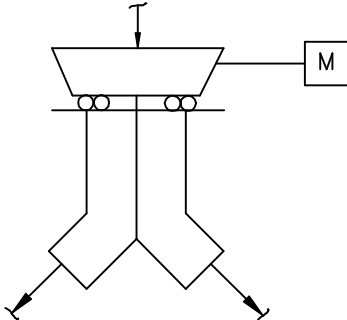
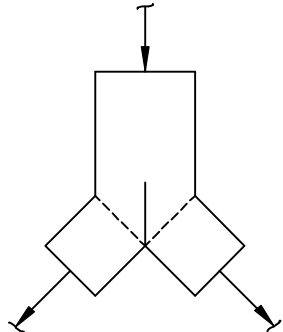
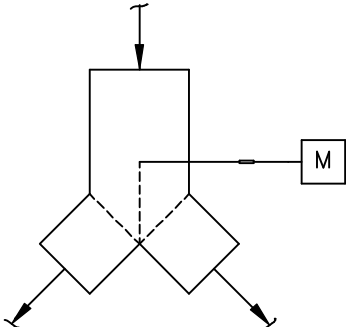
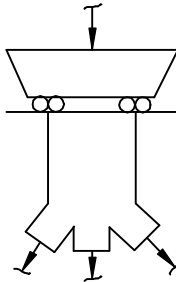
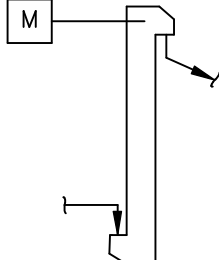
MIXER (AGITATOR)



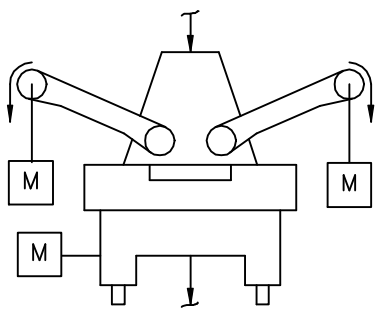
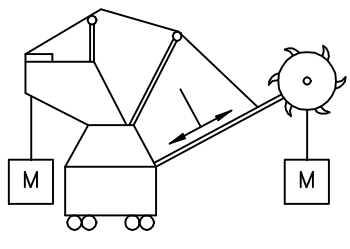
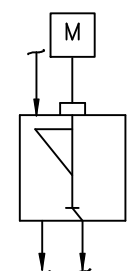
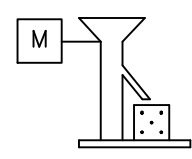
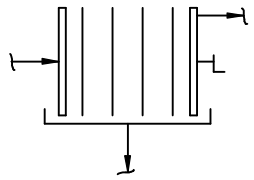
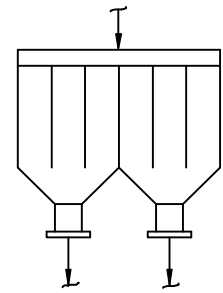
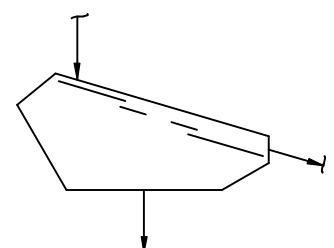
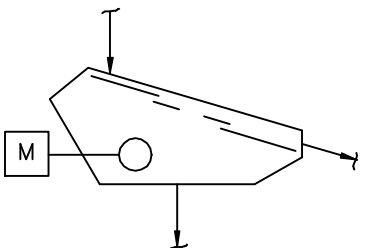
ANNEX G - SOLIDS HANDLING EQUIPMENT (See item 4.7 Note) (CONTINUE)

 <p>BELT FEEDER</p>	 <p>BELT FEEDER WITH SCALE</p>	 <p>APRON FEEDER</p>
 <p>ELECTRO-MECHANICAL VIBRATING FEEDER</p>	 <p>AUTOMATIC SAMPLER</p>	 <p>DUAL AUTOMATIC SAMPLER</p>
 <p>MANUAL SAMPLER</p>	 <p>BRIQUETTER</p>	 <p>CONICAL CRUSHER</p>
 <p>GYRATORY CRUSHER</p>	 <p>JAW CRUSHER</p>	 <p>HAMMER CRUSHER</p>

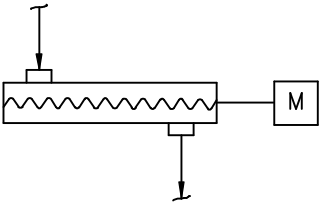
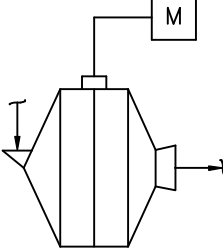
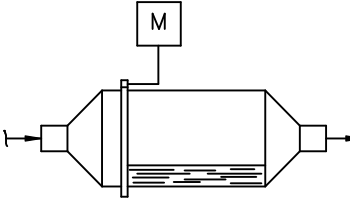
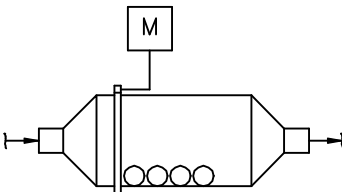
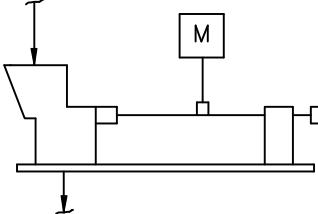
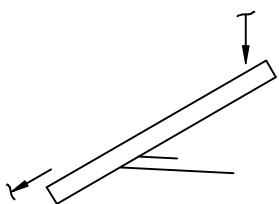
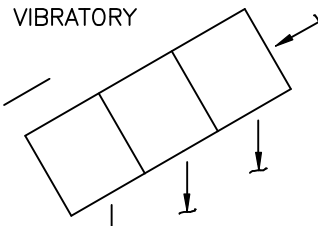
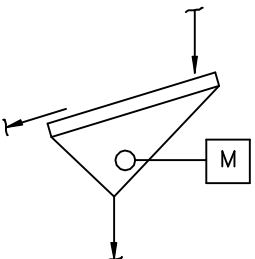
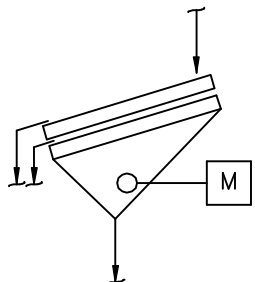
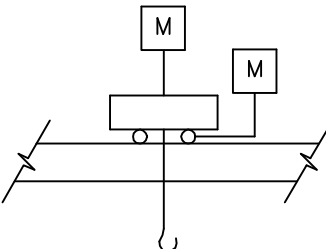
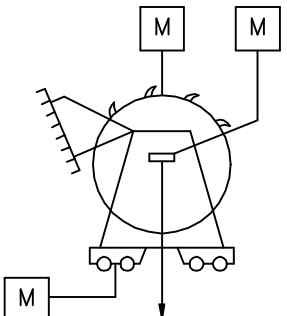
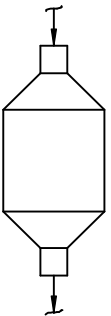
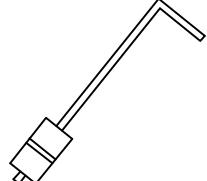
ANNEX G - SOLIDS HANDLING EQUIPMENT (CONTINUATION)

 <p>VIBRATING FEEDER</p>	 <p>OFF-ROAD DUMP TRUCK</p>	 <p>POWER SHOVEL</p>
 <p>CENTRIFUGAL CLASSIFIER</p>	 <p>CYCLONE/HYDROCYCLONE</p>	 <p>SPIRAL CLASSIFIER</p>
 <p>SAMPLE COLLECTOR</p>	 <p>AUTOMATIC DIVERTER</p>	 <p>MANUAL DIVERTER</p>
 <p>MOTORIZED DIVERTER</p>	 <p>THREE WAYS OUT DIVERTER</p>	 <p>BUCKET ELEVATOR</p>

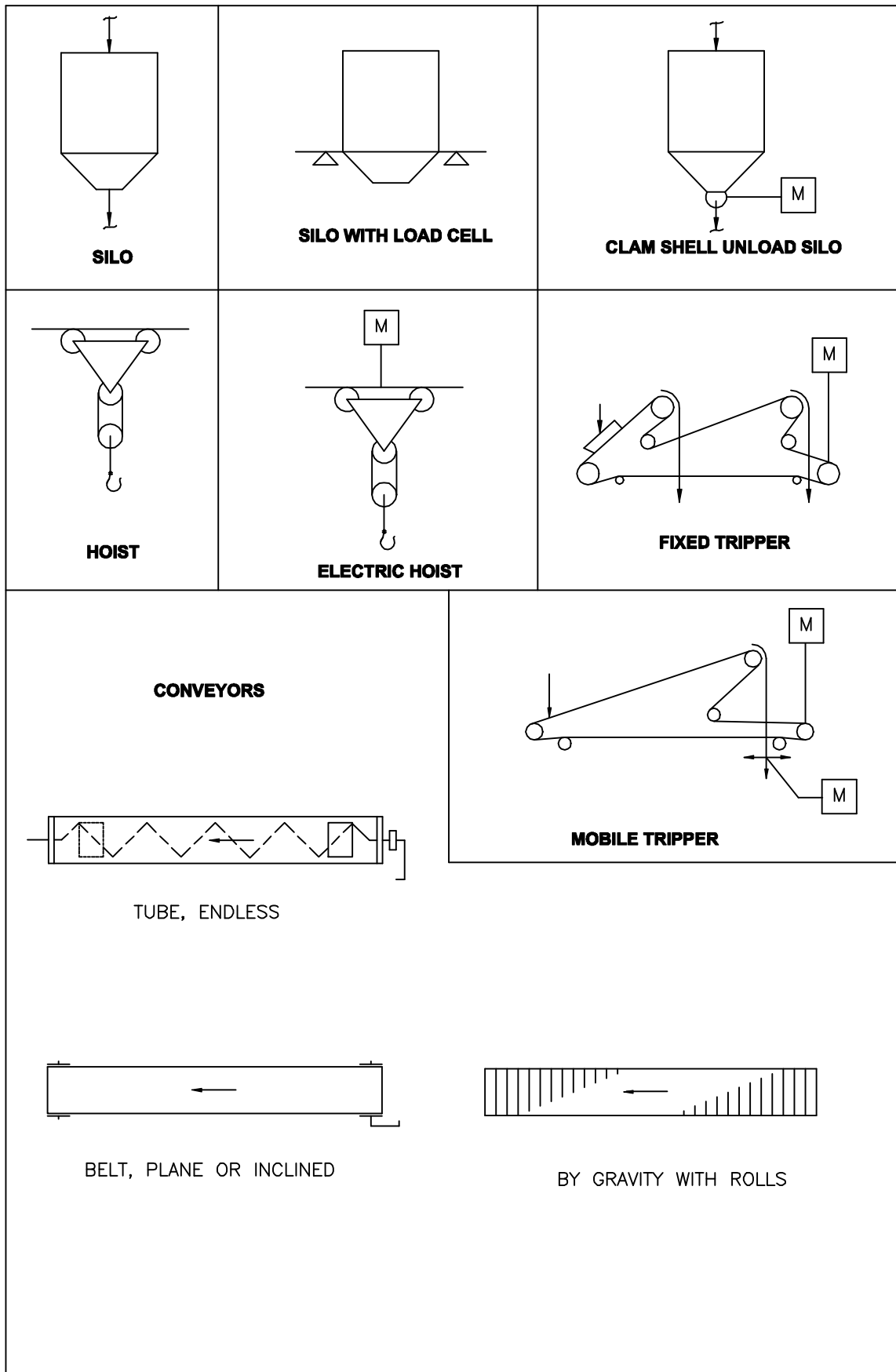
ANNEX G - SOLIDS HANDLING EQUIPMENT (CONTINUATION)

 <p>STACKER</p>	 <p>STACKER/RECLAIMER</p>
 <p>ENQUARTER</p>	 <p>SACKER</p>
 <p>PRESS FILTER</p>	 <p>BAG FILTER</p>
 <p>FASTEN GRILL</p>	 <p>VIBRATORY GRILL</p>

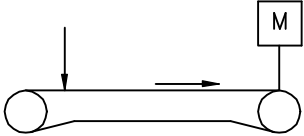
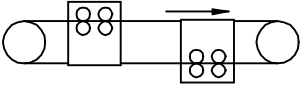
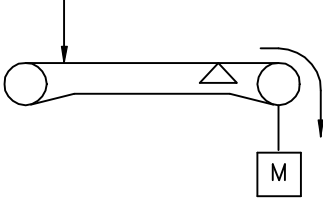
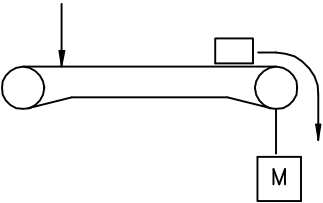
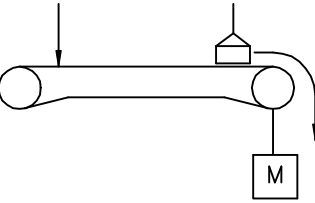
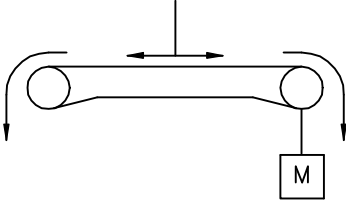
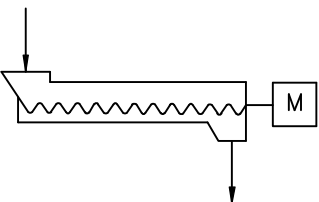
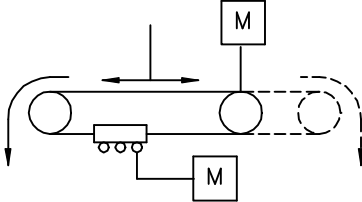
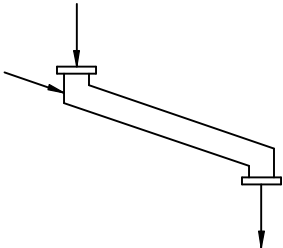
ANNEX G - SOLIDS HANDLING EQUIPMENT (CONTINUATION)

 <p>SCREW THREAD MIXER</p>	 <p>AUTOGENOUS MILL</p>	 <p>ROD MILL</p>
 <p>BALL MILL</p>	 <p>DISC MILL</p>	<p>SIEVE</p>  <p>VIBRATORY</p>  <p>ROTARY</p>
 <p>INCLINED VIBRATING SIEVE</p>	 <p>INCLINED VIBRATING SIEVE WITH TWO DECKS</p>	 <p>OVERHEAD TRAVELLER CRANE</p>
 <p>BUCKET WHEEL RECLAIMER</p>	 <p>RETORT</p>	 <p>HYDRAULIC HAMMER</p>

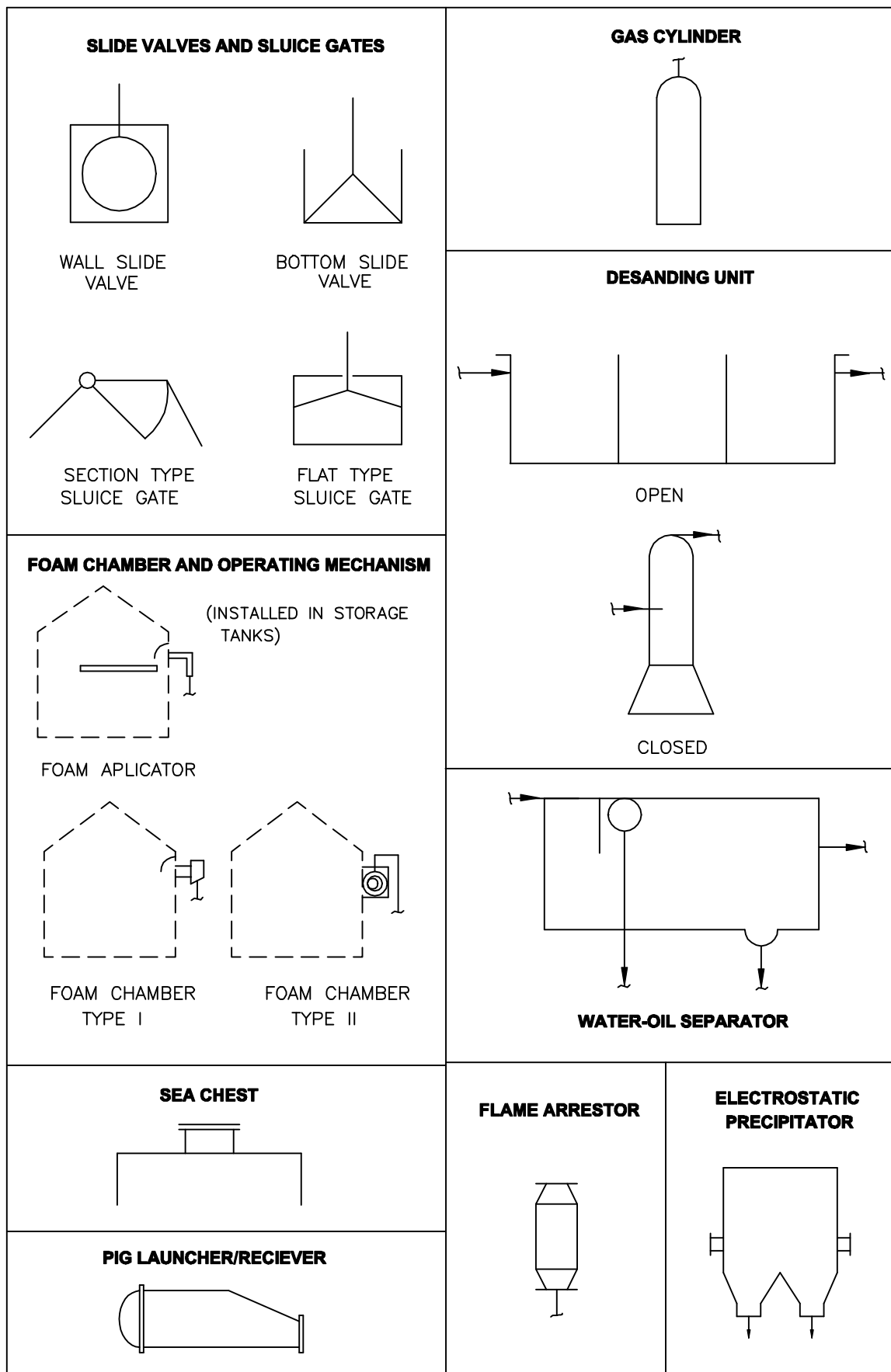
ANNEX G - SOLIDS HANDLING EQUIPMENT (CONTINUATION)



ANNEX G - SOLIDS HANDLING EQUIPMENT (CONCLUSION)

 <p>BELT CONVEYOR</p>	 <p>BELT CONVEYOR WITH SPECIAL DRIVER</p>	 <p>BELT CONVEYOR WITH SCALE</p>
 <p>BELT CONVEYOR WITH METAL DETECTOR</p>	 <p>BELT CONVEYOR WITH MAGNETIC SEPARATOR</p>	 <p>REVERSIBLE BELT CONVEYOR</p>
 <p>SCREW CONVEYOR</p>	 <p>SHUTTLE CONVEYOR</p>	 <p>AIR SLIDE</p>

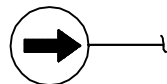
ANNEX H - MISCELLANEOUS (CONTINUE)



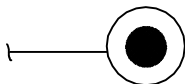
ANNEX H - MISCELLANEOUS (CONCLUSION)

OPERATING CONDITION SYMBOLS

(INDICATE WHEN MAXIMUM CONDITIONS ARE APPLIED)



SYSTEM OR PROCESS STARTING



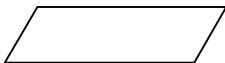
SYSTEM OR PROCESS END



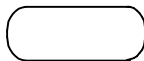
LIQUID FLOW RATE



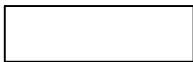
GAS FLOW RATE



STEAM FLOW RATE



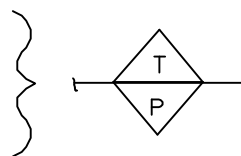
DUTY INDICATING



TEMPERATURE



PRESSURE



SPECIFIC GRAVITY, SPECIFIC WEIGHT
OR MOLECULAR WEIGHT

- Notes: 1) THE MEASUREMENT UNITS SHOULD BE INDICATED BY NOTES IN THE FLOWSHEET.
2) THE OPERATING CONDITIONS SHOULD BE INDICATED IN TABLES RELATED WITH THE DIFFERENT STREAMS, BY MEANS OF A REFERENTIAL SEQUENCE NUMERATION. REPRESENTED BY LOZENGES AS FOLLOWS:

