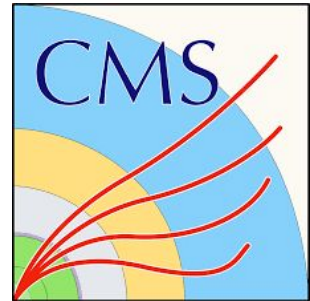




BUAP



Puebla Laboratory: Gas System

Benemérita Universidad Autónoma de Puebla

February 6 2019



Minutes Gas Meeting Feb 6 (Salvador)

We had a meeting on Monday Feb 4th with Louis Philipp (Gas Group), Nicolas Zagadiniz and Savador Carrillo at CERN, Isabel connected remotely to discuss about the Mexican Gas System.

- Louis Philippe sent already detailed gas system drawings with the name of the components. From this list we should ask for quotation from Mexico, important recommendations from Louis Phillippe are
 - We should provide to Bronkhorst 1 bar input/output pressure difference (like 2.5 bar input vs 1.0 - 1.5 bar output values).
 - For the humidifier we should use like this 1.5 bar as input and 0.5 bar as output.
 - Inside the Humidifier there are two components: each should be able to manage the maximum flow of the system!

Some other recommendations and request from us from Luis Philippe:

- Ask for the price of the mass flow meters (Bronkhorst) and also ask for the cost and frequency of the calibration (maintenance)
- It seems that we are looking for a system with a Mixture outside of the gas lab, and the humidifier is going to be inside of the lab.
 - For this we need a continuous stractor (most be on the floor).
 - We can use heating tape (for BUAP lab) outside section that is between building and outside gas room.
 - It will be important to cover the outside gas pipes, to prevent lower temperatures
- Infrared system: if we have a continuous extractor (correct one) inside the gas room, we can avoid the infrared-system wich is very expensive like 15KCHF → **what this has to do with the extractor? Is the IR more a safety measurement?**
- We need to have an officila statement from CMS RPC about the "official gas flow" that we are going to supply to each chamber! and from here we can calculate a **** MAXIMUM FLOW RATE **** for the system in Mexico. → **We can put a conservative limit, to qualify e.g. 5 chambers simultaneously?**
- We plan to visit 904 Lab (Gas room) with Louis Philippe to see the actual working system with some issues they also have now due to 2cm of bad insulating section (for example).
- We need to provide a detailed diagram and pictures of each lab section, concerning the gas system, for Louis Phillippe to fully understand both setups.
 - Give Detail Drawins/scale of each lab section
 - Give orientation of the lab: North/South, etc.
 - What kind of insulation and heating we have → **still need to built the gas room, we need specs**
- We should not reach a temperature of -5 degree Centigrate for the gas system, otherwise the gas will make liquid

Exterior Laboratory Overview

CMS RPC Laboratory 3th floor

Exterior gas distribution lines ($\Delta h = \sim 10$ m)



Gas Room to be built ($\sim 4.5 \times 5$ m):

- Closed room, temperature controlled \rightarrow specs ?
- Mixer installation (+ humidifier ?)
- Shared with ALICE

\rightarrow **NEED SPECS TO BUILD IT**

Exterior Laboratory Overview

CMS RPC Laboratory 3th floor

Exterior gas distribution lines ($\Delta h = \sim 10$ m)

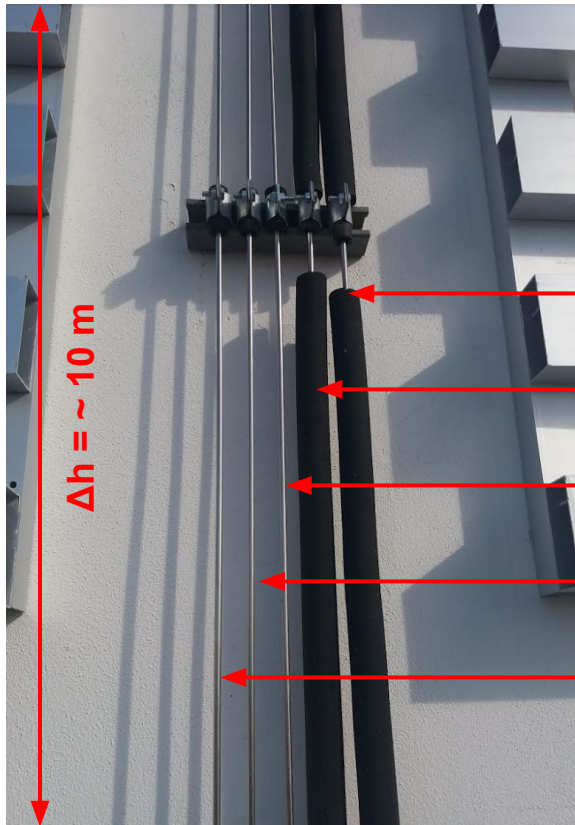
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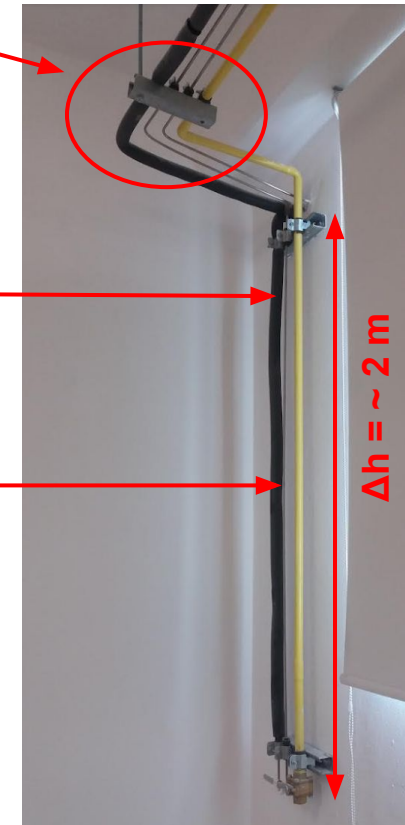
\rightarrow **NEED SPECS TO BUILD IT**

Gas Distribution Lines (1)

Exterior



Interior



CMS RPC Mixture line

ALICE RPC Mixture line

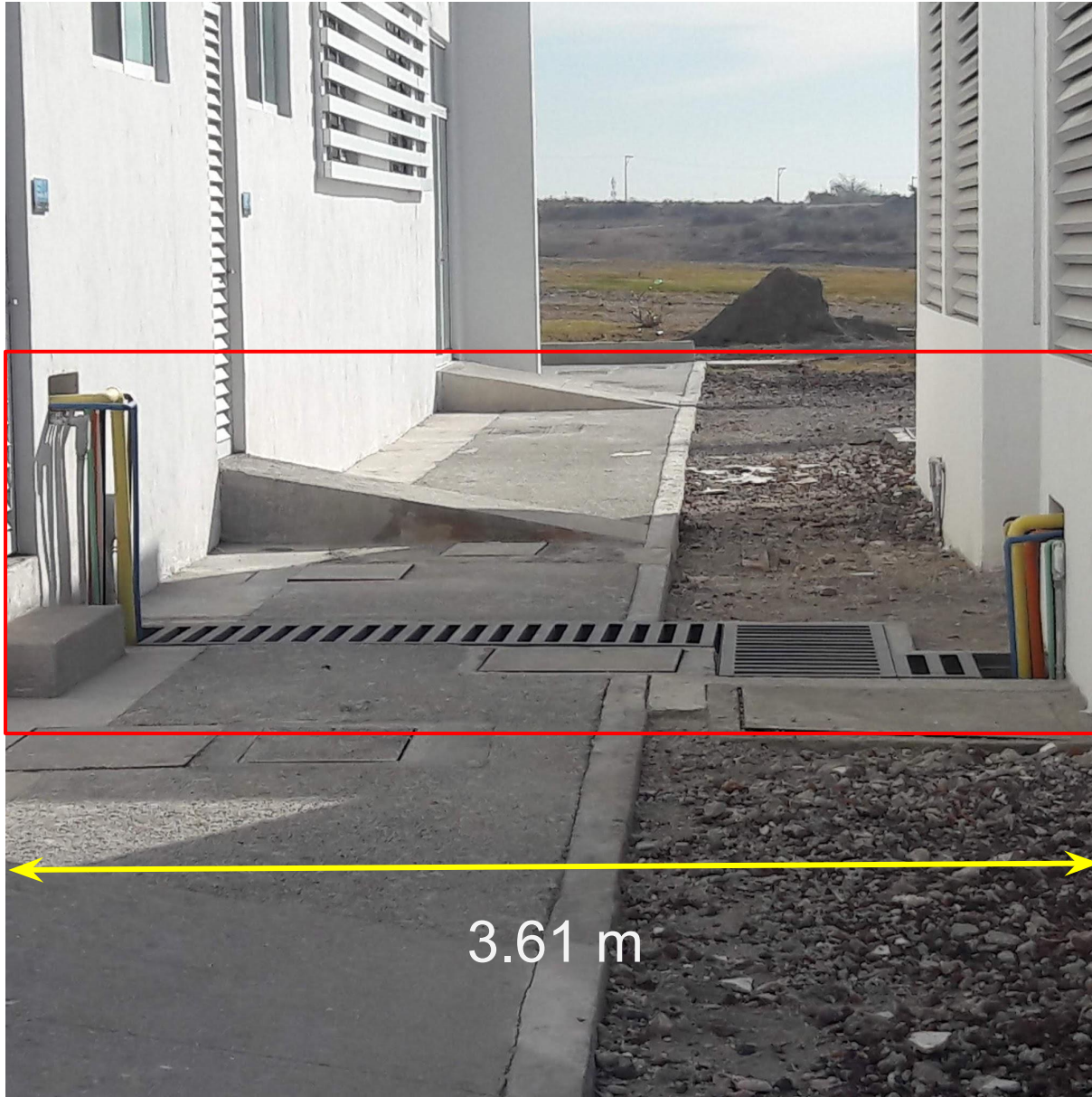
CMS RPC aux. Line

ALICE RPC aux. Line 1

ALICE RPC aux. Line 2

- Pipe internal/external diameter $\varnothing = 4/6$ mm \rightarrow sufficient for gas/Ar mixture?
- Prevent large temperature variations in exterior pipes \rightarrow isolation + heating tape (CERN?)
- Gas thermal equilibrium with constant laboratory temperature \rightarrow

Gas Distribution Lines (2)



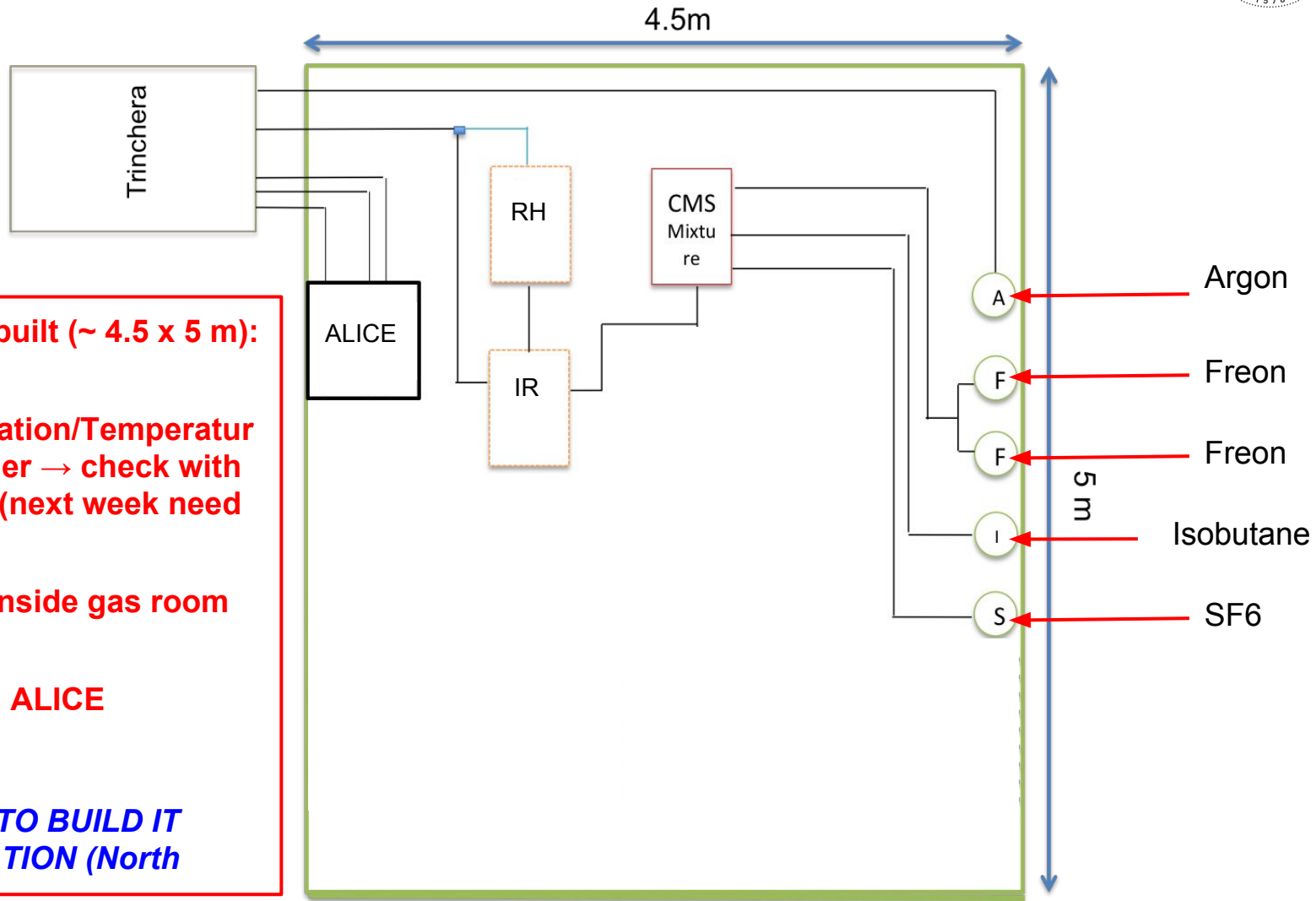
Trinchera

Gas Extraction System



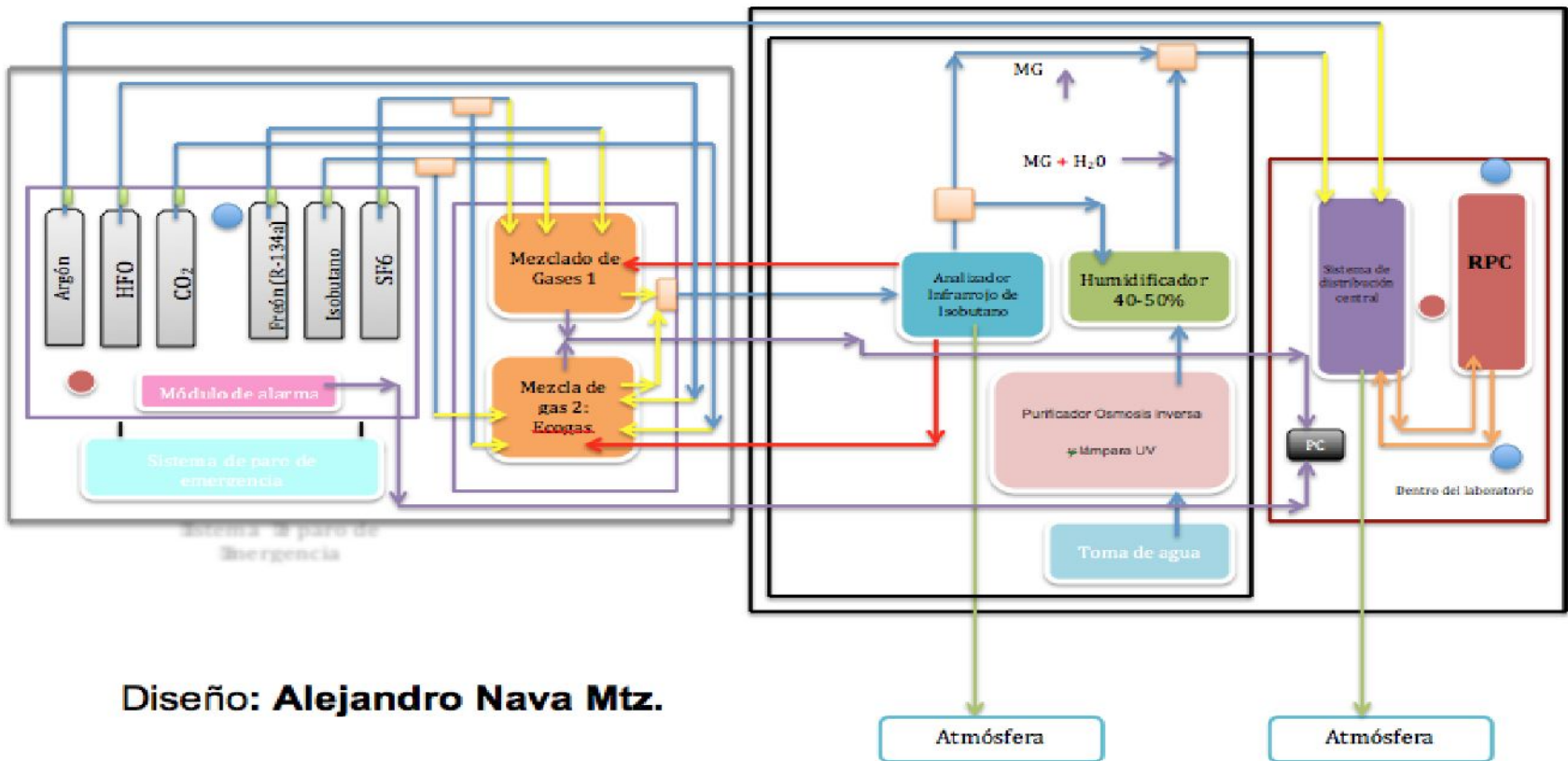
- Safety gas extraction system installed → need to move it to the floor
- Feedback system with gas supply: gas kill if the extraction of OFF/not working

Gas Room: Overview



Gas System: Overall Overview

Diagrama de flujo del gas completo



Diseño: Alejandro Nava Mtz.



List of gas components

- IR analyzer gas module (Isobutane): Emerson

<https://www.emerson.com/documents/automation/brochure-x-stream-enhanced-process-gas-analyzer-spanish-rosemount-es-71078.pdf>

- Mass flow controller: Matheson

<https://store.mathesongas.com/829-series-flow-controller/>

- Gas supply, two companies (see next slides):

- INFRA

- PRAXAIR

- Hose connector, polyamide pipe. The company ROCAME is in Puebla and sells PARKER material). <https://www.parker.com/>

- Components for gas humidifier.

<http://www.fideris.com/product/reactant-gas-humidifier>

Gas supplier INFRA

Carbon steel and
chromium-molybdenum



A



B



BT 80



BT 40



BT 20

Aluminium



30 AL



15 AL



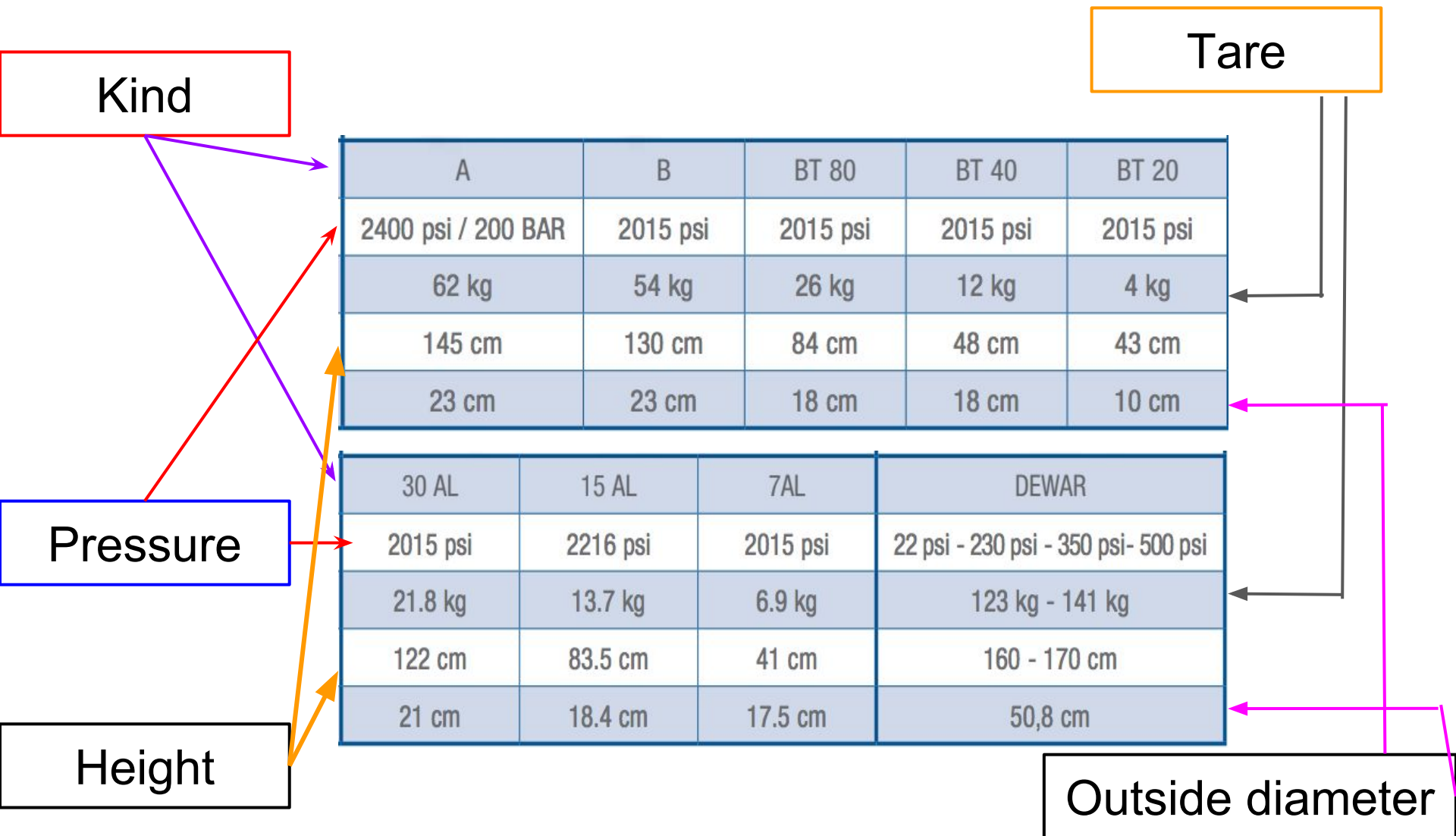
7 AL



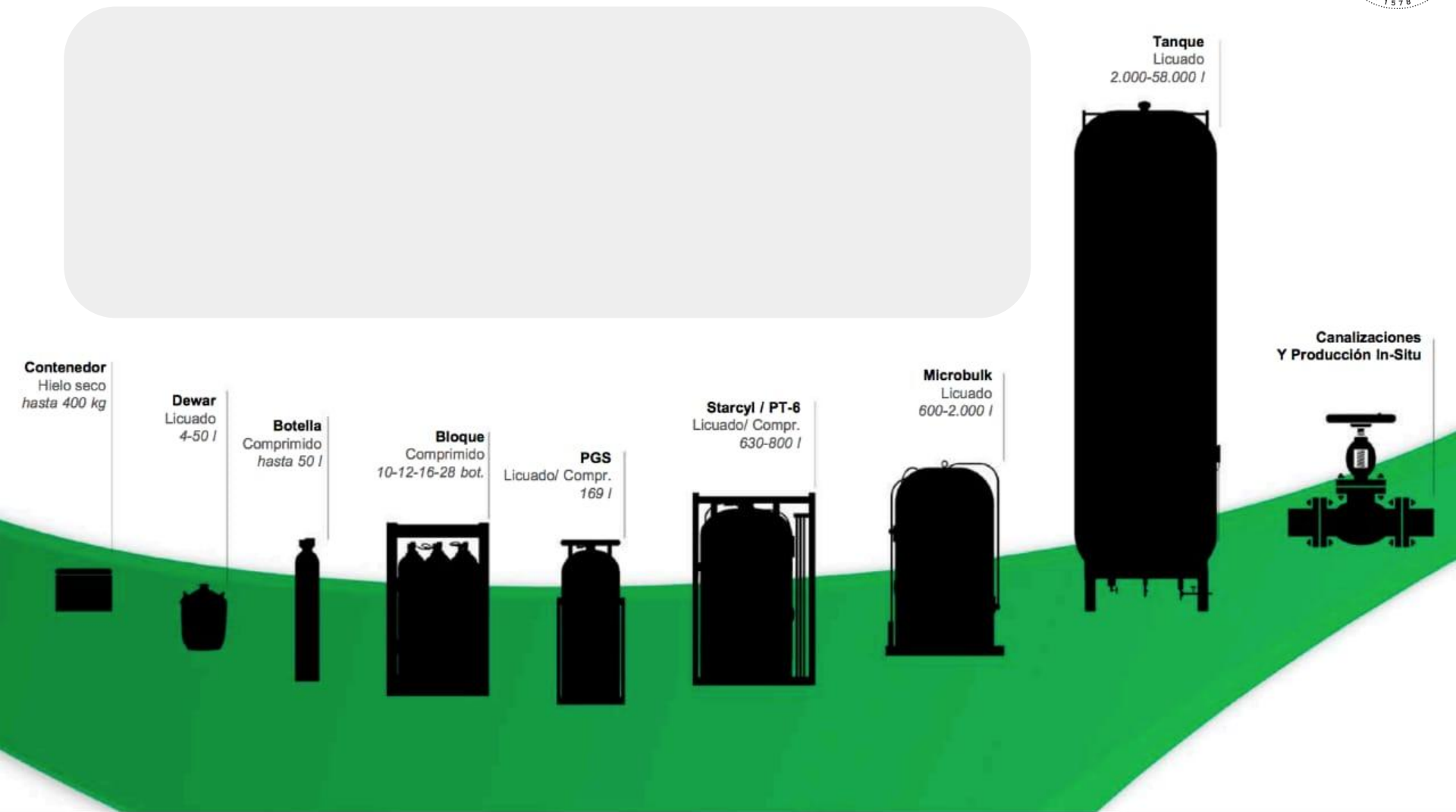
DEWART



Gas supplier INFRA



Gas supplier PRAXAIR



The size of bottles of the company PRAXAIR.

Gas supplier PRAXAIR



Botellas



Bloque



PGS



STARCYL/PT-6



Microbulk



Tanques

Consumo (m³/mes)

Technical data sheets



- <http://www.infra.com.mx/wp-content/uploads/2013/09/isobutano>
- http://www.infra.com.mx/wp-content/uploads/2016/03/hexafloruro_azufre_hds.pdf
- http://www.infra.com.mx/wp-content/uploads/2013/09/argon_comprimido.pdf
- <https://www.praxair.com/-/media/corporate/praxairus/documents/sds/halocarbon-134a-c2f4h2-safety-data-sheet-sds-p6213.pdf?la=en&rev=e5c4b877a1d741f4ba3dc0fb2c3c0cb3>
- <http://www.praxair.com.mx/-/media/corporate/praxair-mexico/documents/safety-data-sheets/argon-hds-p4563-2014.pdf?la=es-mx&rev=23ac6db1d190474d853b767511ada2bb>
- <http://www.praxair.com.mx/-/media/corporate/praxair-mexico/documents/safety-data-sheets/isobutano-hds-p4613c-2004.pdf>
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- <http://www.praxair.com.mx/gases>