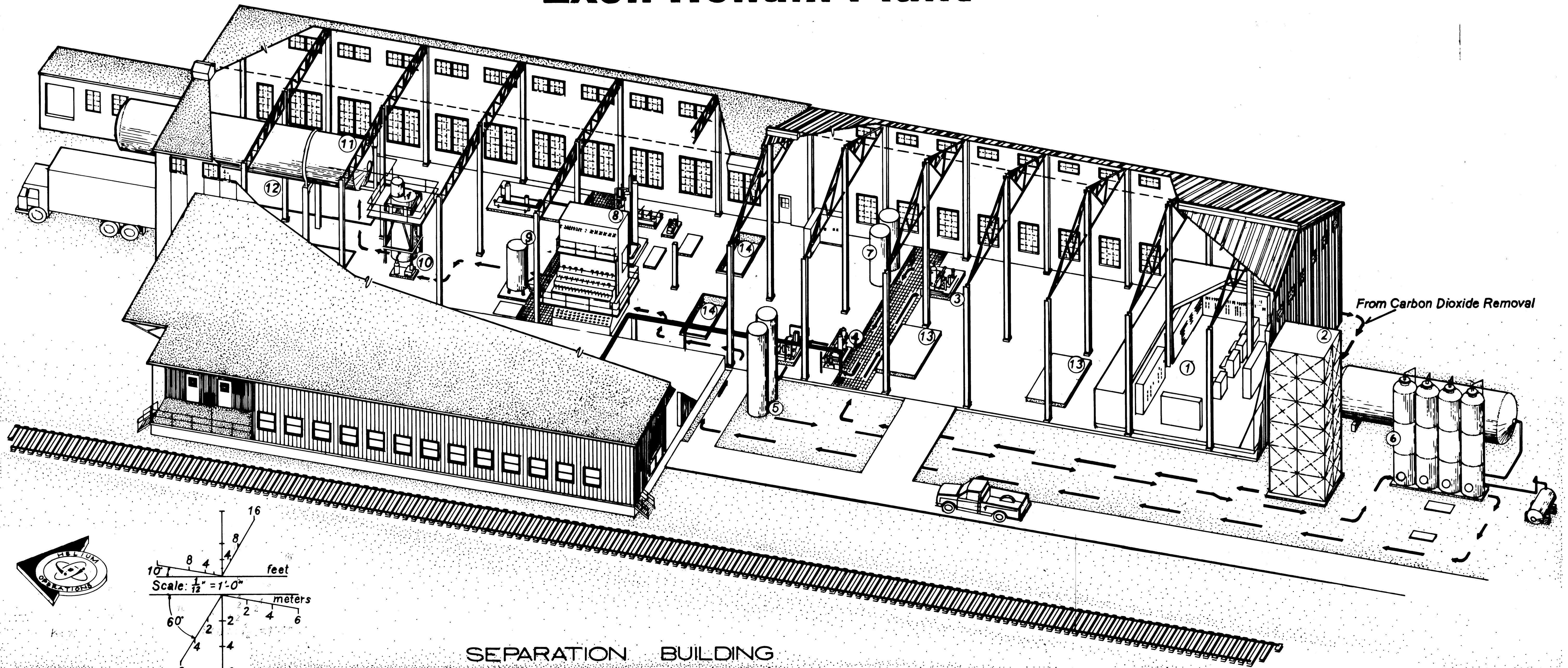


# CRUDE HELIUM SEPARATION PROCESS

## Exell Helium Plant



SEPARATION BUILDING

① Control Room- Monitored and directed plant operations of the separation and purification processes.

② Unit II- (Cryogenic Separator) Main extractor unit brings crude helium levels to about 80% purity.

③ Deoxo Unit- Removes hydrogen from 80% crude helium mixture.

④ Crude Helium Drier- Removes water to prevent freezing later in the process.

⑤ CPL Carbon Dioxide Unit- Removes carbon dioxide.

⑥ PSA Purifier- The Hudson Engineering Corporation Pressure Swing Adsorption Unit came on line in 1979. This non-cryogenic unit produced the highest grade helium at 99.9999% after neon removal. (See sheet 7)

⑦ Neon Removal Units- Used to maintain less than 23 ppm in pure helium product

⑧ Helix Purifier- Dual purpose Unit Used to upgrade crude helium to the PSA purifier or as a cryogenic purifier

⑨ Liquid Nitrogen Tank- Liquid nitrogen was used in the Helix purifier to reduce the temperature to -280° F.

⑩ Liquifier- Liquefied the pure helium gas for storage and for shipping later.

⑪ Helium Storage Tanks- Liquid helium was produced and kept cool here with recycled liquid nitrogen.

⑫ Truck Scales- used when filling to achieve accurate liquid helium levels.

⑬ Retired Equipment Pad.

⑭ Location of retired Bureau of Mines Purifier.

After the carbon dioxide was removed, the gas, containing roughly 20% helium, was sent to the separation unit. The cryogenic separator utilized a cryogenic process to remove heavy gases such as methane from the raw gas. The cryogenic process employed a series of heat exchangers to cool the incoming gas to about -280 degrees F. At this temperature most of the contaminant gasses liquefied and were drained away. The resulting gas, which contained 75-80% helium, as well as nitrogen, hydrogen and neon, was known as crude helium.

The Cryogenic Separator was used in two capacities in the history of Exell. Before the advent of the Pressure Swing Adsorption (PSA) unit in 1980, the Cryogenic Separator produced 99.995 percent pure helium. After the PSA came on line, the Cryogenic Separator was mostly used to upgrade the gas percent purity before sending it to the PSA, which operated more efficiently using gas with a higher purity content that came into it.

The heat exchangers employed the cold liquefied contaminant gasses to cool the incoming raw gas. This process in turn vaporized the liquefied contaminants, which were then either sent back into the natural gas pipeline or were burned as fuel at the plant.

The original separation unit was replaced in the 1960s by Unit II, (INDEX) a new computer controlled separation unit with a significantly higher capacity. Unit II was monitored from the plant control room (INDEX) on the south end of the separation building.

From the separator the crude helium was either sent to compressors and pumped into the conservation field at Cliffside, or sent on to the purification process.