

## LNG/LCNG Fuel Station Design/Build September 2000 - July 2001

General Physics Corporation completed the design and construction of a new natural gas fueling facility for the City of Tulare. City vehicles, local school buses, and local trucking firms benefit from this public / private partnership. An existing CNG island and canopy have now been complemented by an LNG island and canopy. The LNG island features a new two-hose LNG dispenser, integrated with a card reader system. A new LCNG fueling system replaced a small natural gas compressor to supply CNG to the existing CNG island. The design and operation of the dispenser and metering system are targeted toward California Weights & Measures approval. The existing facility power distribution panel was modified, and a new transfer switch was added to enable the City to install a back-up power generator.



The LNG transport offload panel (see above photo, right) is mounted flush with the front of the containment wall. All valves and controls that the transport operator needs to reach can be accessed from outside the containment area. Transports are normally unloaded in 60 minutes (gate-to-gate).



OMNITRANS  
San Bernardino, California

# GP CASE STUDY

## LCNG Fuel Station Design/Build June 2001 - March 2002

General Physics Corporation has completed the design and construction of an LCNG fuel station for Omnitrans located at their bus maintenance facility in San Bernardino.

The facility consists of two 30,000-gallon horizontal LNG storage tanks, three 25-hp LNG boost/offload pumps, and three 100-hp high-pressure LNG-CNG pumps. Each LCNG fuel pump has a capacity of 20 gpm. Two LCNG pumps operate in parallel, and the third serves as a back-up. Two 10-hp horizontal fan-assisted vaporizers convert the high-pressure LNG (5,000 psig) to CNG to feed two transit-style CNG dispensers. The existing facility electrical service was modified to provide back-up power to the LCNG fuel station from an existing diesel generator.



To reduce required property line setbacks, the LNG storage tanks and pumping equipment are installed in a hybrid vault. GP designed and built this first-of-its-kind vault system. The hybrid vault system consists of a 50:50 below grade 50:50 above grade structure designed to withstand 1.0 psi internal pressure; 20 each roof-mounted explosive relief vents; a high-expansion foam system capable of filling the vault with foam in less than 2 minutes; a ventilation system; blast-proof doors; and an emergency shutdown system. This is the first time in the USA that an LNG storage and pump system has been installed inside a vault.

We worked closely with the local California Title 8 Department and the County Fire Department for approval of this unique configuration and of the reduced property line setbacks.



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OMNITRANS  
Montclair, California

# GP CASE STUDY

## LCNG Fuel Station Design/Build June 2001 - March 2002

General Physics Corporation completed the design and construction of an LCNG fuel station for Omnitrans located at their bus maintenance facility in Montclair.



The facility consists of one 20,000-gallon horizontal LNG storage tank; three 25-hp LNG boost pumps; and two 60-hp, high-pressure LNG-CNG pumps. Each LCNG fuel pump has a capacity of 16 gpm. One LCNG pump operates as the primary and the second as a back-up. A 7.5-hp vertical fan-assisted vaporizer converts the high-pressure LNG to CNG to feed two new transit-style CNG dispensers installed by GP. A 150-KW, diesel-powered back-up generator was also installed to provide back-up power to the LCNG fuel station.

GP removed the concrete foundations for the previous CNG compressors, relocated the existing CNG storage bottles to improve bus traffic flow, provided landscaping to meet planning commission requirements, obtained waivers for City of Montclair ordinance limiting the amount of LNG storage allowed on-site, and obtained permission to encroach on an Army Corps of Engineers flood control channel property adjacent to the site.

GP worked closely with the City of Montclair Fire Department, the Montclair Planning Commission, the Army Corps. of Engineers, and the local California DOSH (Title 8) Department to obtain approval of this project.



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## LNG Fuel Station Design/Build December 2001 - June 2002

General Physics Corporation completed design and construction of an LNG fuel station for Riverside County Waste Management's Agua Mansa fueling facility. The facility consists of a single 15,000-gallon vertical LNG vessel, a single LNG pump that serves as the offload pump and the dispensing pump, and a two-hose LNG dispenser mounted on a fuel island.

In addition to the design and installation of the LNG fueling system, GP provided Civil and Electrical design and Professional Engineering signoff for site improvements. Improvements, such as site electrical, foundations, roads, and canopy were provided by others under a separate contract with Riverside County due to government funding requirements. Site improvement design provided by GP included new electrical service; facility lighting; an integral foundation and containment structure for up to two LNG fuel tanks and dispensers, and an all-underground conduit for the installation of a second LNG storage tank and LNG dispenser and future LCNG equipment.



The photos above show the final stages of the installation of the LNG fueling system with the LNG dispenser located under the fuel island canopy.

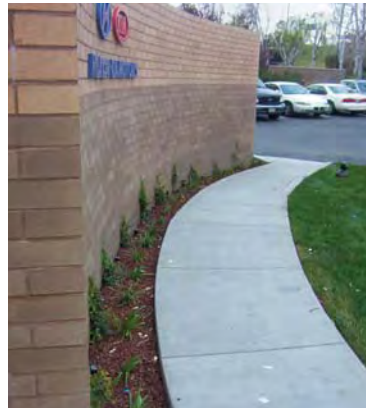


## Hydrogen Fuel Station Construction October 2004 - September 2005

General Physics Corporation won a competitive bid to construct Chevron's first hydrogen refueling station. This station is located at Hyundai's test facility in Chino, CA. The facility consists of a natural gas reformer, hydrogen compressor, hydrogen storage, and a dual hose hydrogen dispenser mounted on a fuel island with a custom canopy. The hydrogen equipment is housed inside a custom designed building structure.



GP's scope of work included design and permitting assistance, all site improvements and the installation of Chevron supplied hydrogen equipment. Site improvements include a 2400 SF enclosure structure with removable roof, new gas service, landscaping, and parking lot improvements. The structure included an electrical room, control room, and hydrogen process/storage area. Despite heavy rains through-out the project, GP completed the project in time for the grand opening. The station will serve Hyundai's private fleet of fuel cell cars.



## Hydrogen Fuel Station Construction July 2005 - November 2005



General Physics Corporation (GP) completed the design and construction of a hydrogen fuel station for Chevron. This station was constructed at the AC Transit Bus Fueling and Maintenance Facility in Oakland, California. This project is part of the U.S. Department of Energy (DOE) Controlled Hydrogen Fleet and Infrastructure Demonstration and Validation Program. AC Transit will fuel a small fleet of fuel cell demonstration buses and passenger cars powered by UTC Fuel Cells from this facility.

GP completed the engineering and design for all site improvements required for the hydrogen refueling station which included foundations, buildings, new high pressure gas service, electrical, process equipment interconnections, fire wall and permitting. GP was awarded the construction contract through a competitive bid, fixed price process. GP constructed all site improvements including a hydrogen production and storage building, two fuel islands with canopies, and an electrical/control room building. GP installed hydrogen generation, storage, and dispensing equipment provided by Chevron.



## Hydrogen Fuel Station Construction September 2006 – February 2007



General Physics Corporation won a competitive bid to construct a hydrogen fueling station for Chevron in cooperation with the Florida Department of Environmental Protection. This station is located on donated land from Progress Energy's newest facility in Orlando, FL. The facility consists of a natural gas reformer, hydrogen compressor, hydrogen storage and a single hose dispenser mounted on a fuel island with a custom canopy. The hydrogen equipment is housed inside a custom designed building structure.

GP's scope of work included site improvements and the installation of Chevron supplied hydrogen equipment. Site improvements include a 1792 SF enclosure structure with removable roof, new gas service, landscaping, and parking lot construction. The structure included an electrical room, control room, and hydrogen process/storage area. Despite permitting delays, GP is on track to complete construction efforts and meet fueling needs scheduled for February 15, 2007. The station will serve Orlando International Airport shuttle services to local hotels with Ford Motor Company supplied hydrogen limousine service.



## Hydrogen Fuel Station Design/Build



**Construction Services:** General Physics Corporation (GP) has completed the construction of four compressed-hydrogen fuel stations in three different states and is currently completing the construction of one hydrogen fuel station. GP team members completed detailed construction drawings and all site improvements for these stations. Site improvements included the following:

- Equipment foundations
- Buildings and structures to house the hydrogen equipment
- Custom canopies
- Removable roof systems
- Natural gas supply systems
- Electrical systems
- Fire alarm control panels and fire hydrants
- Paving and parking improvements
- Bollards and landscaping

GP staff also installed hydrogen generation (reformer or electrolyzer), compression, storage and dispensing systems as well as safety systems that included gas and flame detection and emergency shutdown devices. All process connections were installed in accordance with ASME B31.3 and then precision-cleaned.

**Engineering Services:** GP provided complete Professional Engineer design and permitting for two hydrogen fuel stations. In-house engineers and designers performed all design and analyses, which enables the GP team to respond quickly to requested design changes and meet the clients' demanding schedules.

