PHILIPPINE NATIONAL STANDARD FOR RETAIL STATION – DESIGN CRITERIA

PIP TRAINING FOR DOE
OCTOBER 17-18, 2017

DESIGN CRITERIA OF SS

- PHILIPPINE NATIONAL STANDARD FOR RETAIL STATION – LIQUID PETROLEUM PRODUCTS

- HEALTH SAFETY & ENVIRONMENT
- UNDERGROUND STORAGE TANKS
- PIPING SYSTEM
- DISPENSING PUMPS

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DESIGN CRITERIA OF SS

- **HEALTH, SAFETY AND ENVIRONMENT**

Structure		Dimensions [m(ft)]			Distance/Clearance	
		Length	Width	Height	Relative to Object	Measurements [m(ft)]
Canopy			2.5m from edge of DP on both sides	min 4.5m from floor to ceiling	Edge to property line	Follows Table 1-Yard for Commercial Building
Dispensing Pump (DP)	a. Construction				Potential ignition source	min 6m(20ft) radius
	b. Maintenance				All are prohibited	min 6m(20ft) radius
Hose		max 5.5m(18ft)				
Pump Island		min 3.5m	min 1.2m		Pump Island (center to center)	min 6m(20ft)
					Edge to any fixed object	min 0.2m
UGT		Defined by Capacity			B/w edge and adjoining object	min 1m(3ft)
					B/w edge of UGT's	min 0.45 m
					Opening to Pump Island Center	min 6m(20ft)
Setbacks			min 2m	max 1m for iron bars w/ solid masonry		
Ingress and Egress	a. Structure		min 7m; based on turning radii			
	b. Turning Radius	See Table 1 - Turning Dimensions				

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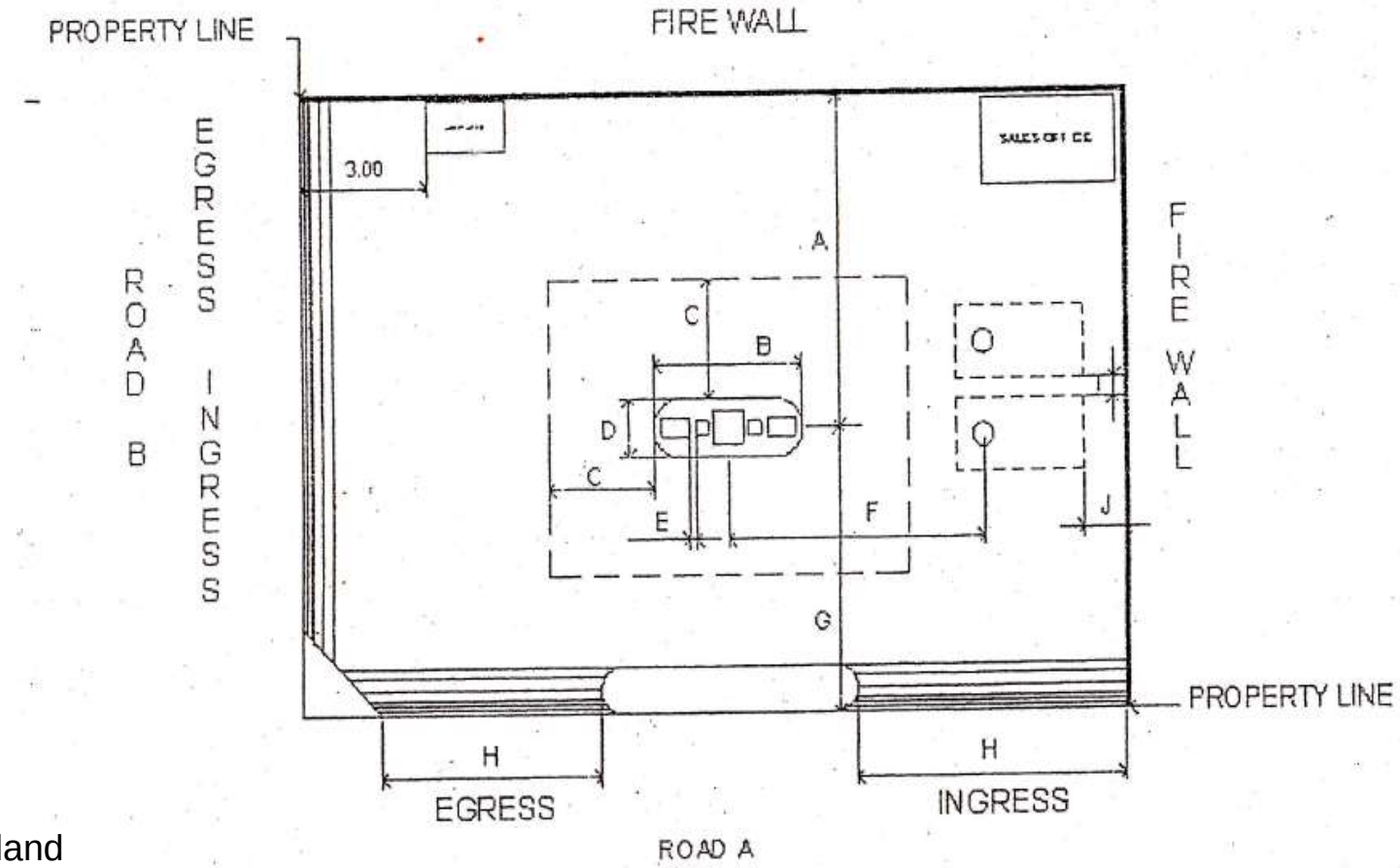
- **HEALTH. SAFETY AND ENVIRONMENT**



A. Turning Radius:
B. Length of Pump Island
C. Distance of Canopy Projection beyond Dispensing Pumps
D. Width of the Pump Island
E. Clearance from Dispensing Pump to any Fixed Object
F. Distance from the UGT to center of the pump island
G. Distance from the UGT to property line / other source of ignition
H. Minimum width of ingress and egress
I. Minimum distance between UGTs
J. Distance from UGT to Property Line

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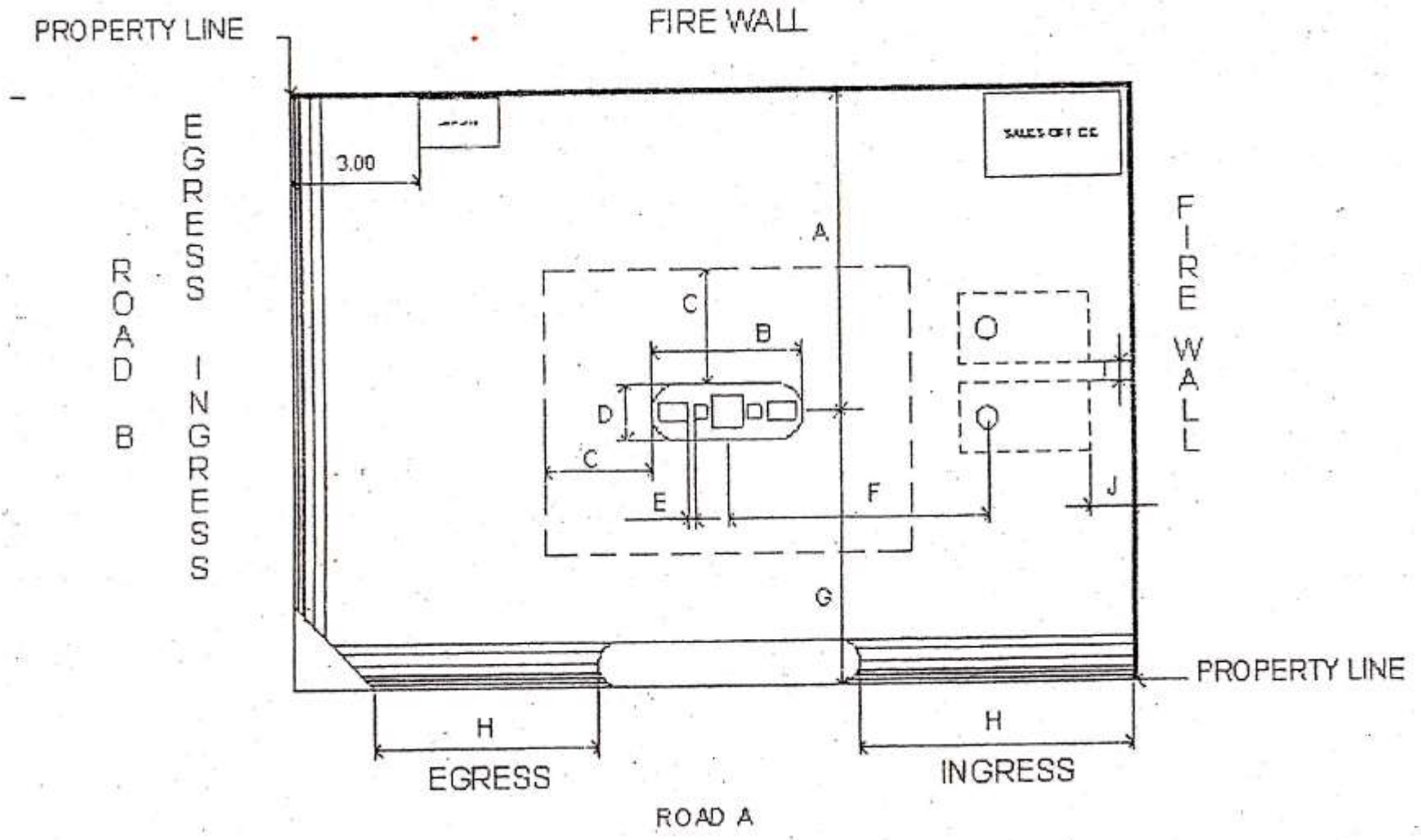
- **HEALTH, SAFETY AND ENVIRONMENT**



A. Turning Radius: 7.0 meters

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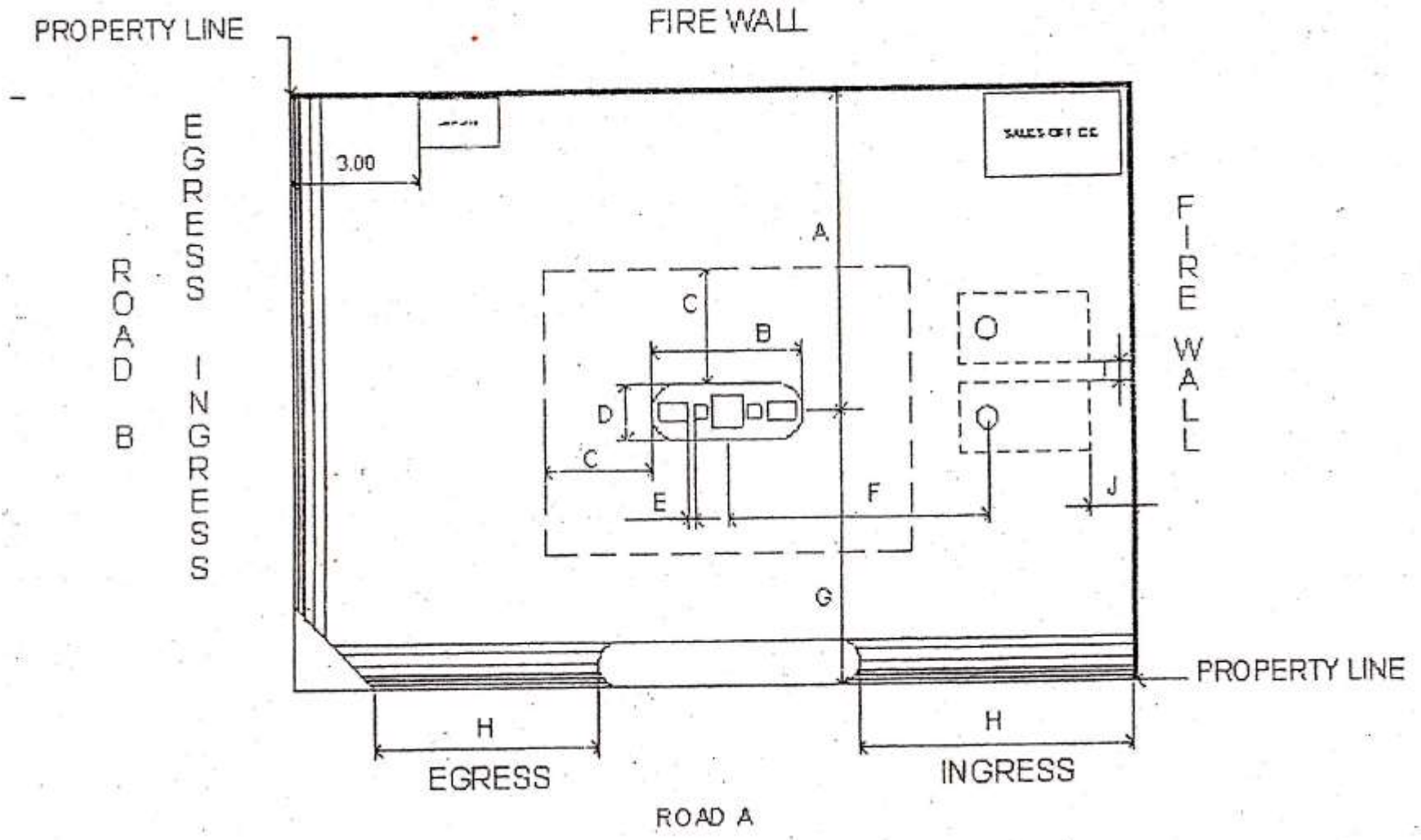

B. Length of Pump Island: 3.5 meters

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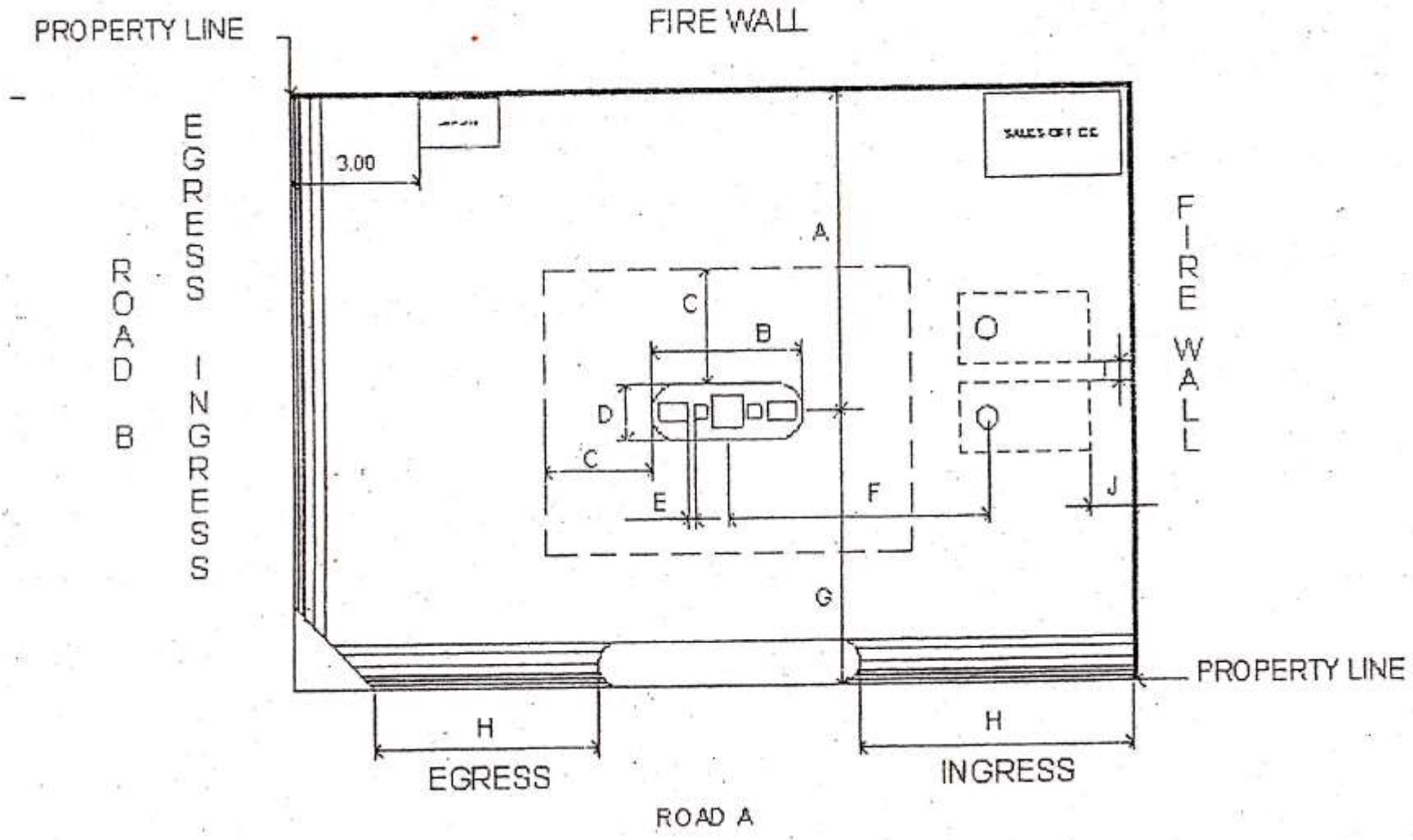

C. Distance of Canopy Projection beyond Dispensing Pumps: 2.5 meters

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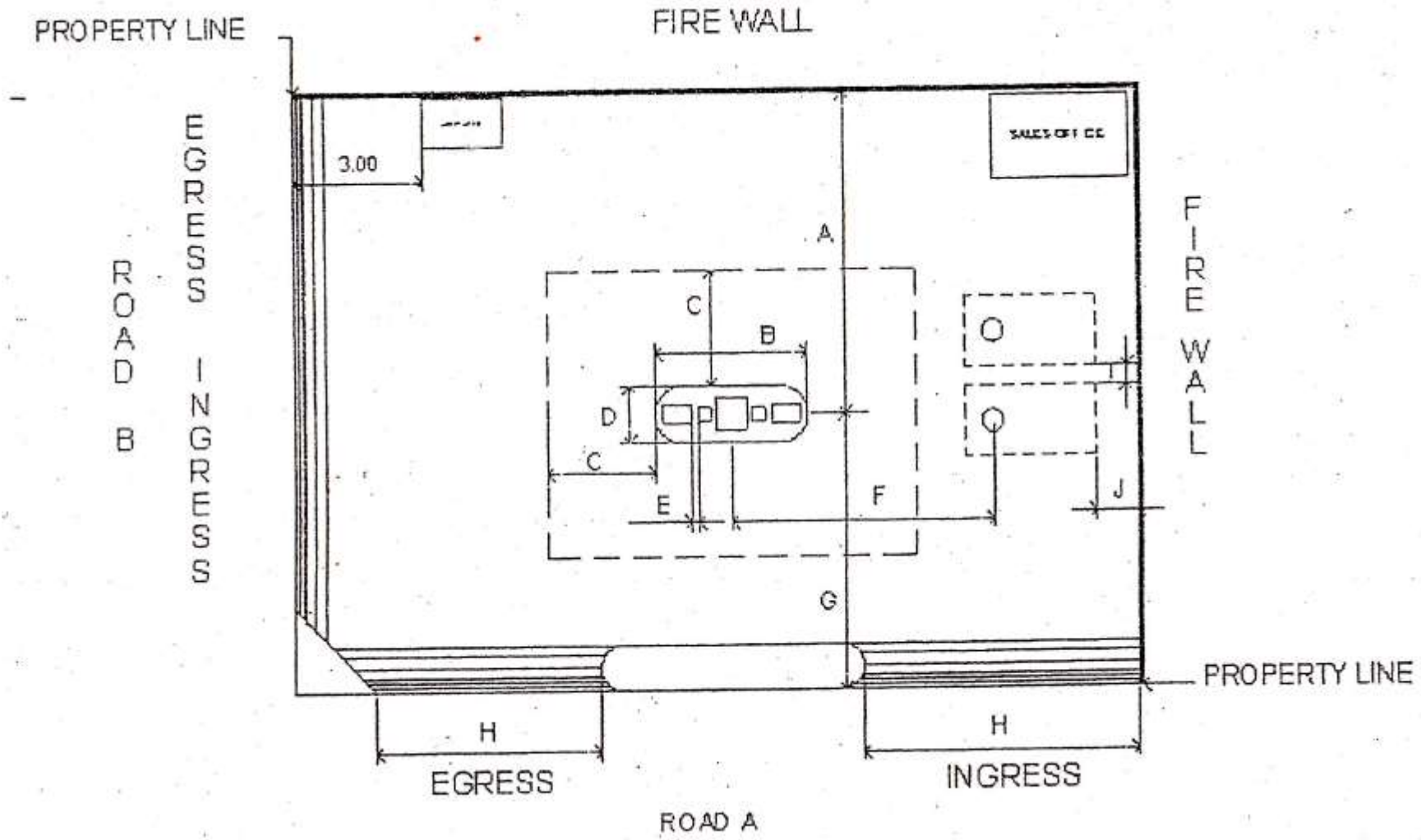

D. Width of the Pump Island: 1.2 meters

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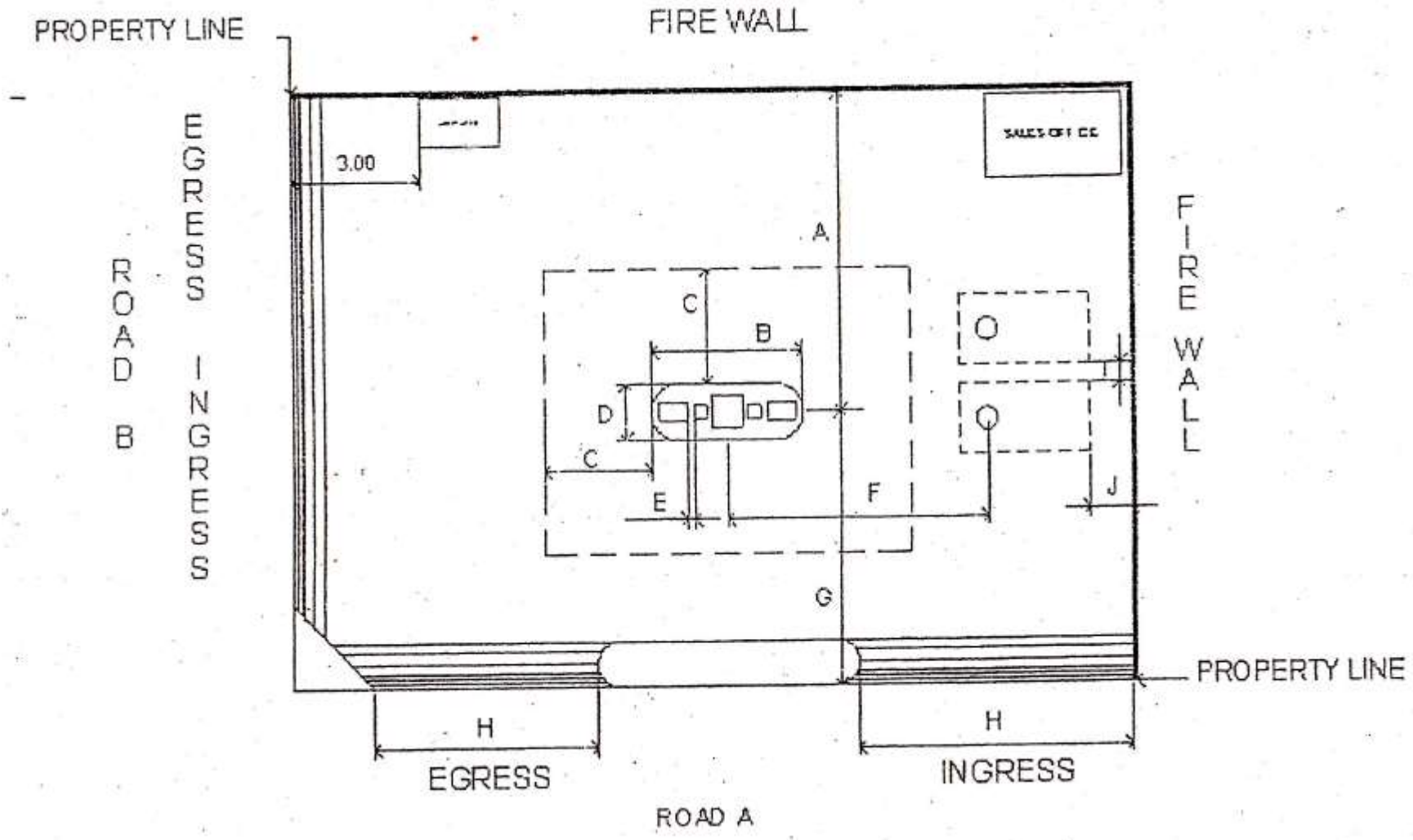

E. Clearance from Dispensing Pump to any Fixed Object: 0.3 meters

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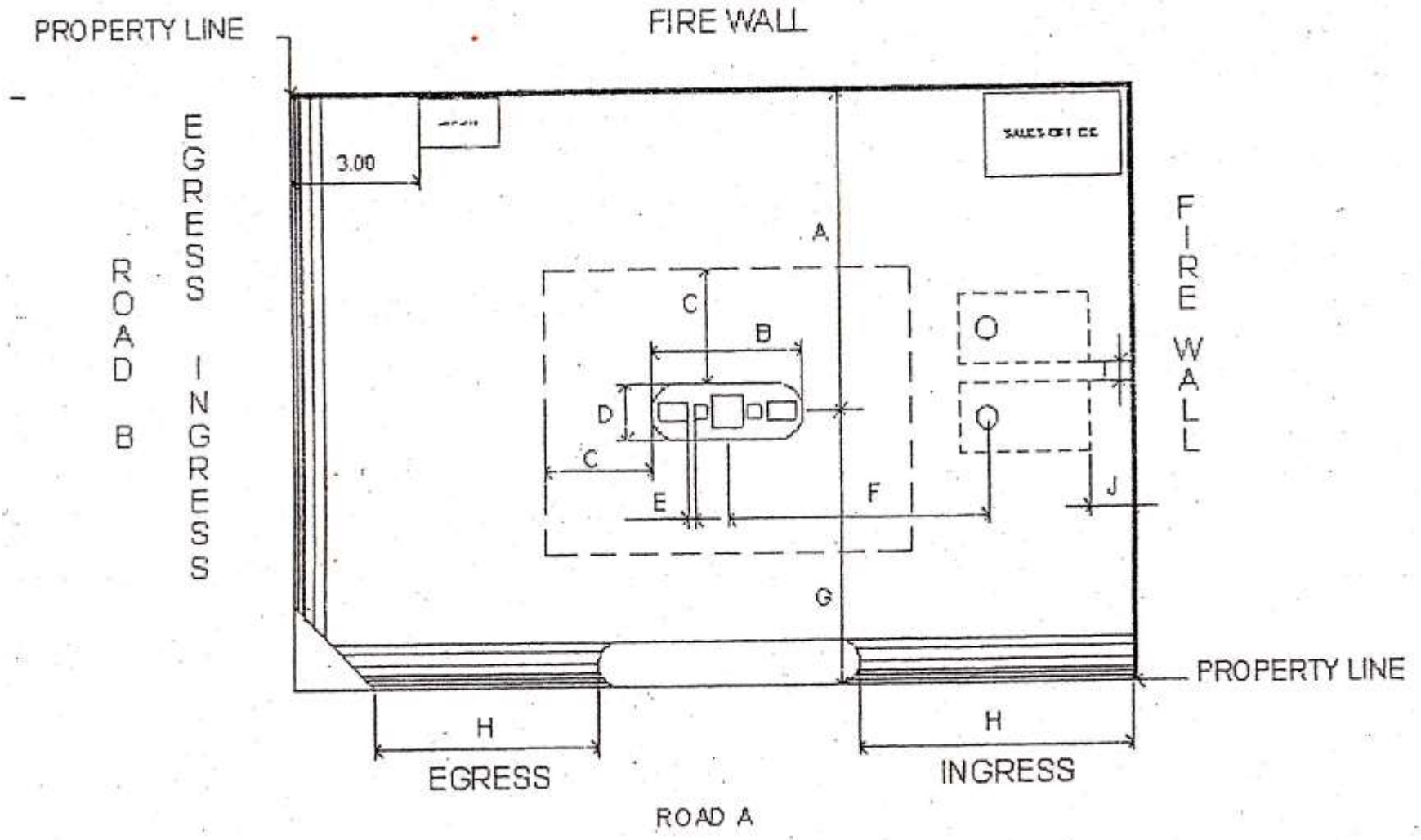

F. Distance from the UGT to center of the pump island: 6.0 meters

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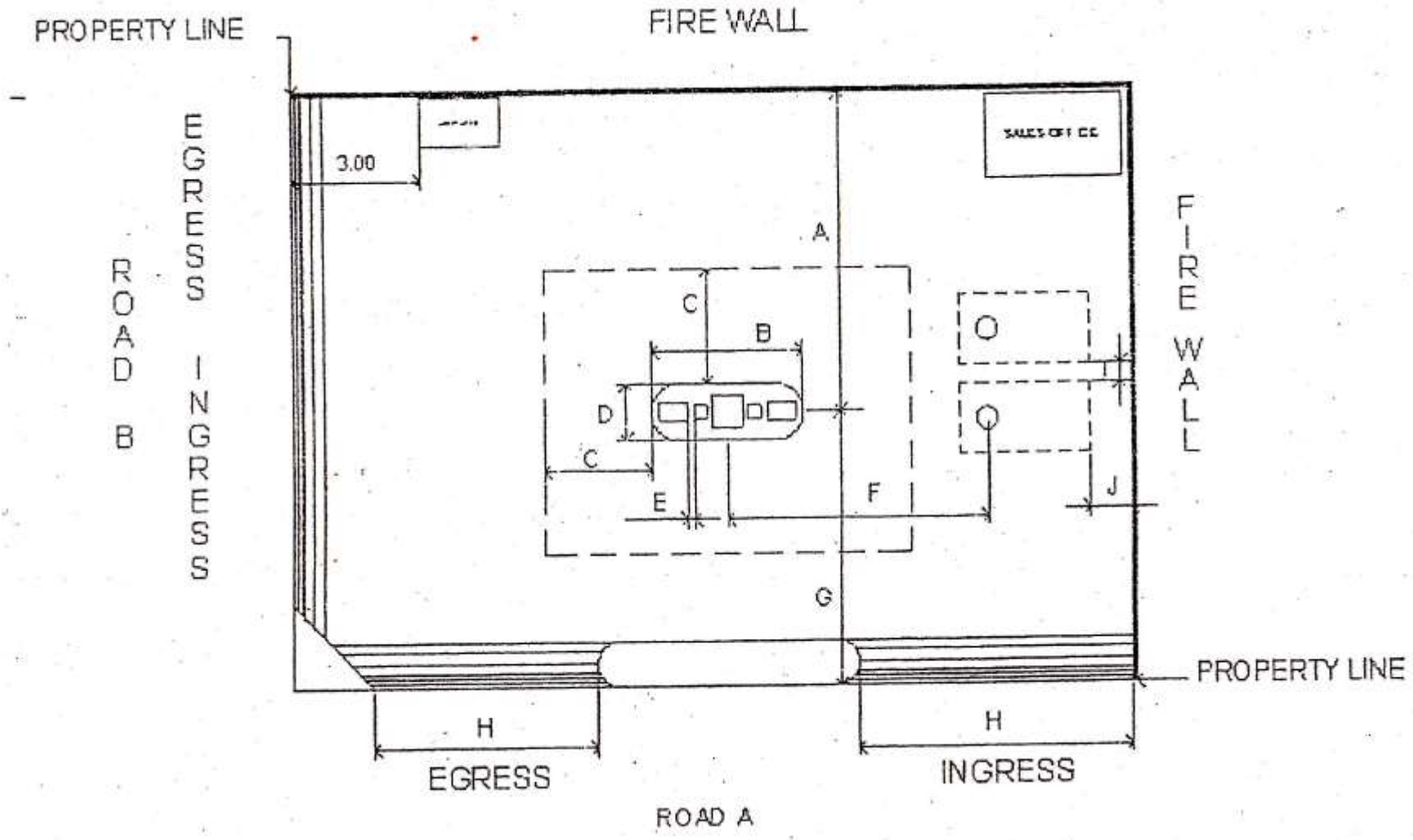

G. Distance from the UGT to property line / other source of ignition: 6.0 meters

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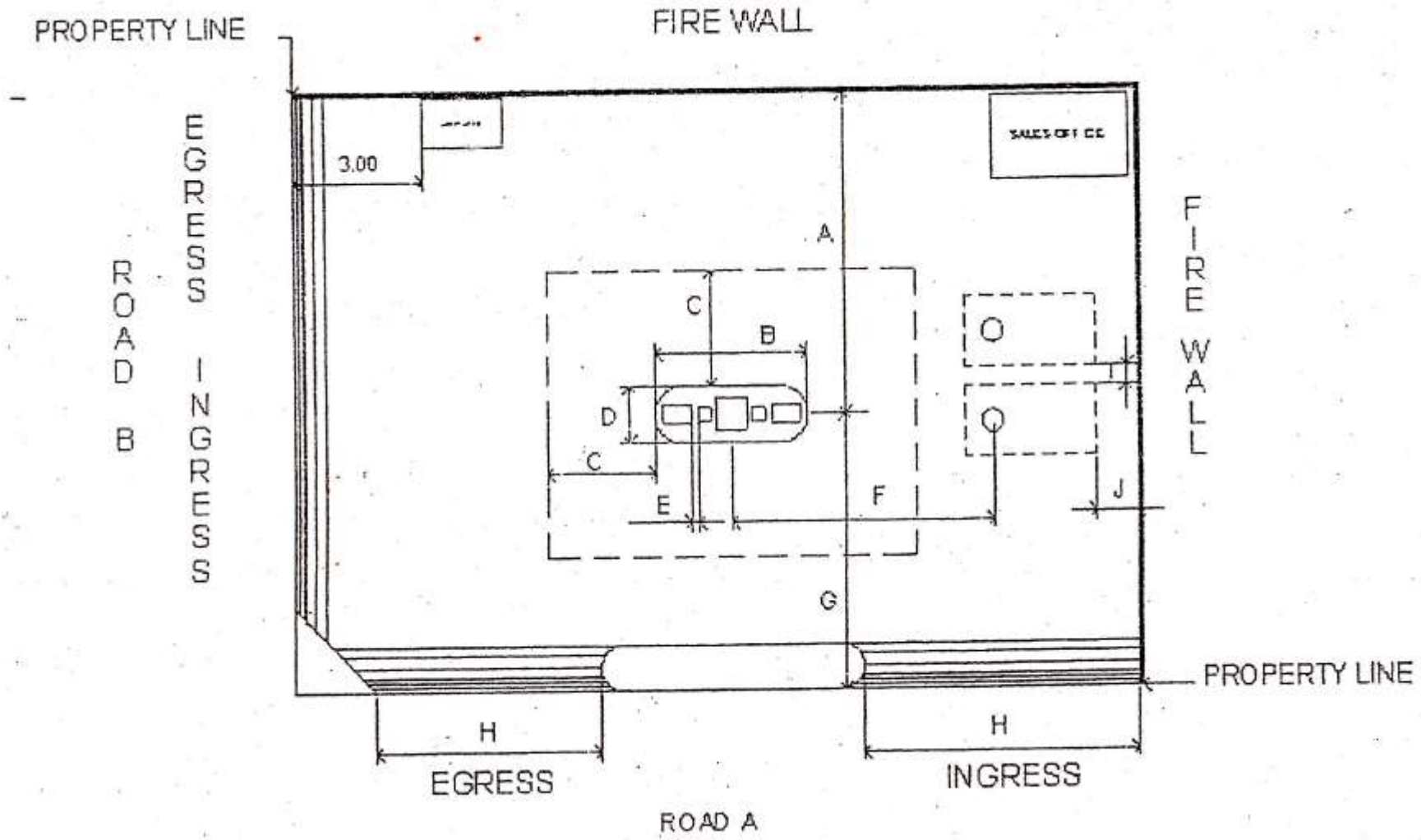

I. Minimum distance between UGT: 0.45 meters

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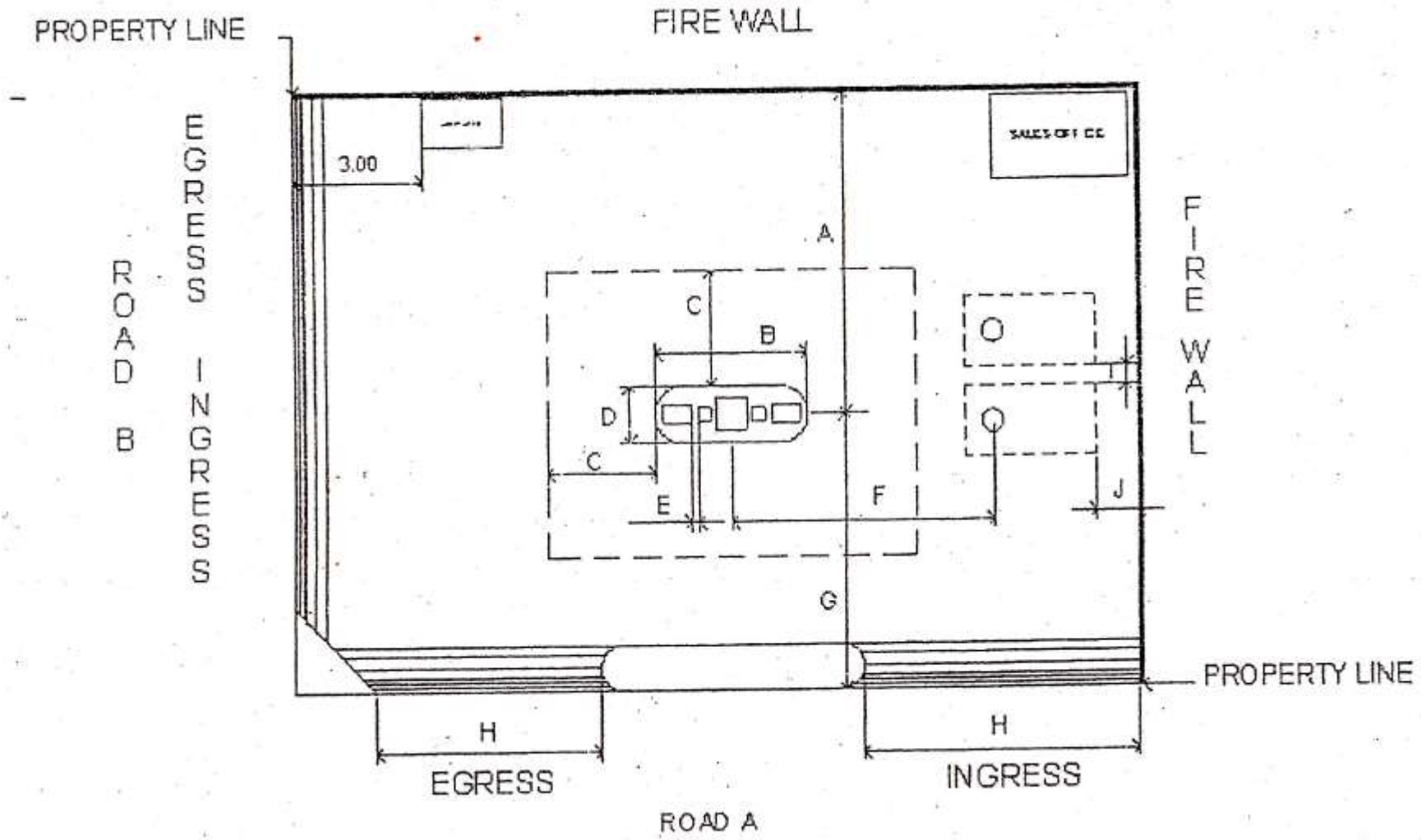

H. Minimum width of ingress and egress: 7.0 meters

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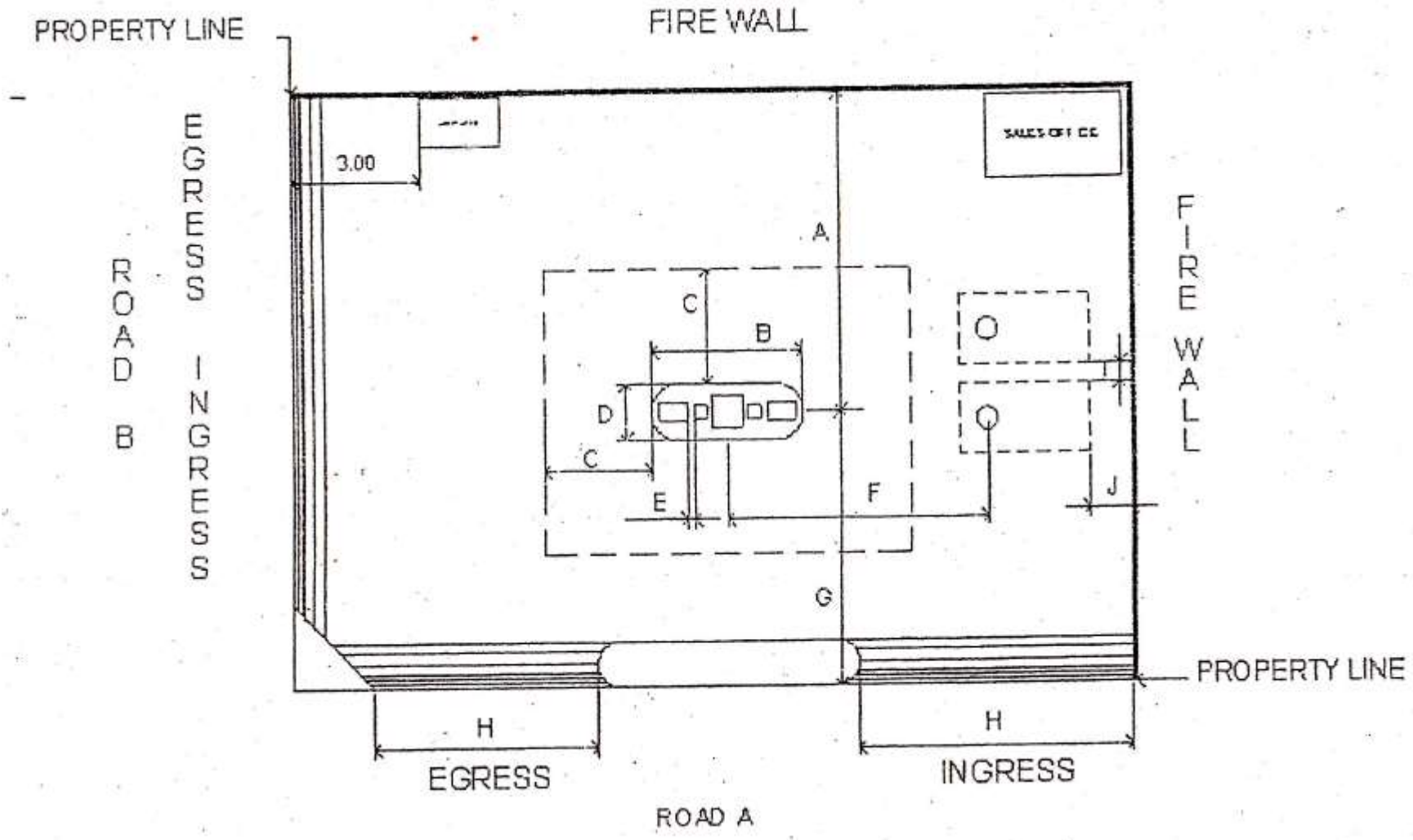

J. Distance from UGT to Property Line: 1.0 meters

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- **UNDERGROUND STORAGE TANK (UGT)**

	Underground Storage Tank		Requirements
*	**Tank Location**		
		Tank	Location shall minimize the maneuvering of tank truck during product delivery. If possible, tank truck shall not travel in reverse. Tank truck shall not block the public right-of-way upon delivery.
		Tank Edge	Shall not be less than 1m (3ft) from property line or building structure.
*	**Bedding and Backfilling**		
		Steel and Jacketed Tanks	Sand shall be used to backfill the tank. It shall be clean, non-plastic, chemically-inert, and free from salt, shells, organic matter, balls of clay, lump of earth and corrosive materials.
		Fiberglass Tanks	Self-compacting pea gravel of nominal size 4.75mm-19mm. If pea gravel is not available, use crushed stoned or gravel of nominal size 4.75mm-13.2mm.
		Filter Fabric	Recommended for the following scenario: (1) where tidal conditions and frequent water table level exist; (2) unstable soil type; and (3) loose gravel soil.
*	**Anchorage**		Tank shall be anchored if high water table exists or if flooding can be expected.

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- **UNDERGROUND STORAGE TANK (UGT)**

	Underground Storage Tank		Requirements
*	**Loading**		
		Cover for areas subjected to traffic.	1. minimum of 0.91m (36 inches) of well-tampered backfill.
			2. minimum of 0.46m (18 inches) of well-tampered backfill plus at least 0.15m of reinforced concrete.
			3. minimum of 0.46m (18 inches) of well-tampered backfill plus at least 0.20m of asphaltic concrete.
		Cover for areas not subjected to traffic.	1. minimum of 0.61m (24 inches) of backfill.
			2. 0.30m (12 inches of backfill plus at least 0.10m (4 inches) reinforced concrete.
*	**Tank Fittings**		
		Tank openings, fill pipes, fill caps and fill tubes.	Normal diameter is 0.13 m (4 inches).
		Submersible pumps	It shall be built with 0.10m (4inches)
		Fill pipes	Fill pipes that enter the tank from the top shall end at most 15 cm (6 inches) from the bottom of the tank.
		Filling and Emptying Products	Filling and emptying products must be located outside the building and at least 3 m (10ft) from any building opening. All connections shall be closed and liquid tight when not in used.
		Driving Manholes	The product being handled and the size of the tank shall be marked on the fill assembly/manhole cover.

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- **UNDERGROUND STORAGE TANK (UGT)**

	Underground Storage Tank		Requirements
*	**Corrosion Protection**		
		Materials	Corrosion-resistant materials or system includes special alloys, fiberglass reinforced plastic, fiberglass reinforced plastic coatings or bituminous-based or asphaltic coatings.
*	**Control/Instrumentations**		
		Dip Stick	Dip stick shall be calibrated, made of T-section aluminum, and of sufficient length to reach the tank bottom. Other measuring device made of non-sparkling material may be used.
		Leak Detection	Monitoring wells detect the presence of petroleum products on the groundwater. Well casings shall be at least 0.10 m (4inches) with 0.5mm (0.020 graduated slots at every 0.33m (12 inches) rise along alternating axis.

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- ## UNDERGROUND STORAGE TANK (UGT)

	Underground Storage Tank	Requirements
*	**Installation**	
	Back Fill	Excavation for steel and FRP tanks shall be deep enough to provide backfill of at least 0.30m (12inches) below the bottom of the tank, with or without holding pad. UGT shall never be installed directly on hold-down pad, compacted earth or any hard surface.
	Security of tank against Flotation	> Placing a concrete slab under the tank, with 0.15m-0.30m, cushion of the backfill between the bottom of the tank and the slab, and anchoring the tank to the slab.
		> Burying concrete deadmen/sinkers on either side of the tank, then anchoring the tank thereto.
		> Burying the tank deeper than normal 2.13m but not exceeding UL limit of 7 feet.
	Secondary Containment	This is required if there is a potable source of water within 100-m radius.
	Vaulting wall	There shall be no enclosure except those necessary for access to inspection, filling, emptying and venting tank.
		The walls and floor of the concrete vault shall be made of reinforced concrete at least 0.15 m (6in) thick while the top floor, made of non combustible material, and tank foundation shall be designed to withstand loading.

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- **UNDERGROUND STORAGE TANK (UGT)**

	Underground Storage Tank		Requirements
*	**Installation**		
		Ballasting	Product can be used in ballasting the tank provided the height of the ballast shall not exceed the level of the backfill and in no time shall the height of the ballast exceed 0.30m above the level of the backfill.
			Water shall be used as ballast but submersible pump shall not be installed until the water is removed.
		Observation Well	There shall have at least one observation well, well's bottom shall be at least 0.33m below the tank's bottom, at the low side of the tank.
			Slotted portion of the well casing and the gravel pack around the well must prevent the migration of natural fine soil into the well. Soil between the tank and the well must be permeable such as gravels, coarse to medium sands, and coarse silts.
			Observation well shall be sealed from the top of the filter pack at about 0.15m (6inches) below the finished grade.
*	**Testing of Single walls**		
		Testing	Pressure inside the tank is increase from 3-5 psi for at least 30 minutes holding time.
			A pressure gauge with maximum range of 10-15 psi with no more than 1/4 psi increment shall be used.

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- **PIPING SYSTEM**

	Piping System		Requirements
*	**Materials**		
		Fiberglass reinforced plastic (FRP)	These are made of layers of fiberglass and resins. Manufacturer's installation instruction must be followed.
		Coated Steel Piping	There are Schedule 40 minimum, steel pipes, which are protected against corrosion. Its couplings and fittings shall be made of malleable iron and rated to handle at least 150 psi. Use NPT threads.
		Flexible Piping	There are pipes made of non-corrosive materials, and are flexible with no inaccessible joints.
		Vent line	Above-ground portion of the vent line, uncoated steel pipes can be used. Uncoated pipe can't be used underground.
*	**Corrosion Protection**		
		Underground Pipe	All underground pipe shall be protected from corrosion induced by the earth surrounding the pipe.

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- **PIPING SYSTEM**

	Piping System		Requirements
*	**Location and Climatic condition**		
		Near Community	In locating the height of the vent lines, existing structures must be considered to minimize inconvenience.
		Ground water table	If the location has high ground water table, material and installation methodology must be reviewed. Liquid and vapor tightness of the pipeline system must be ensured.
		Site analysis	Site analysis shall be done to check on the soil stability, and soil composition with respect to the type of piping system to be installed. Factors affecting the site include soil stability, underground rock soil resistivity, acidity, moisture, sulfide content, and contamination.

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- **PIPING SYSTEM**

	Piping System	Requirements
*	**Design Performance**	
	Pipe Sealant	Only certified pipe sealant for petroleum service shall be used.
	Suction Type Pumping System	In suction type pumping system, underground product lines shall have a uniform slope of not less than 1% down towards the tank.
	Product Lines	Both FRP and Steel lines, shall be buried with a minimum of 450mm (18in) from top of the pipe to unpaved finish grade, 300mm (12in) from steel and 360mm (14in) for FRP from top of pipe to concrete paved finish.
	Siphon	For two tanks of same products need to be interconnected, siphoning method can be used. Remote pump and system and suction type pumping system may be used as illustrated by Figure 1 and 2 respectively. For tanks of different diameter connected together, both the top of the tank and the end of the suction stub in the piping must be of the same elevation. Siphon piping shall be of the same diameter or smaller than the lines of dispenser.

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- **PIPING SYSTEM**

	Piping System		Requirements
*	**Design Performance**		
		Remote Pump System	Piping shall be in a single trench between the tank and island area. Piping across the tanks shall be minimized, and trenches shall run in straight lines with 45 or 90 degrees bend.
		Vent Pipes	It must be appropriately sizes to avoid build up in tank. Vent pipes of 50mm (2in) in diameter, with maximum length of 45m, shall be appropriate for flow rate incurred using 100mm (4in) delivery equipment.
		Vertical Vents Lines	It shall be installed with support or be attached in a building. Vents may be provided with pressure-vacuum valve and its discharge points must be at least 3.65 m (12ft) from the adjacent nearby ground, or at least 0.9m (3ft) if the vent is attached to the building, and 1.5m (5ft) from any building opening.

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- **PIPING SYSTEM**

	Piping System		Requirements
*	**Construction and Installation**		
		Pipe	Pipe must be handled with care to prevent damage to coatings. Inspection must be done before installation.
		Back fill	Piping within the same trench shall be separated as follows (1) two pipe diameters between steel pipes; (2) two pipe diameters between FRP lines; and (3) two or more levels of pipe by at least 150mm(6in) of backfill.
			Pipe trenched shall be bedded by at least 150mm (6in) of backfill or as recommended by manufacturer.
			River washed sand is recommended as backfill material.

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- **PIPING SYSTEM**

	Piping System		Requirements
*	**Commissioning**		
		Bubble Test	The pipeline, including fittings, valve and all accessories wetted with soap, shall be isolated and pressurized to 150% of the maximum operating pressure of the system or a minimum 50 psig which is maximum a recommended by the manufacturer for 0.5-1 hour.
		Test for Double wall Pipes	For double wall pipes, the inner wall shall be tested of tightness before closing of the outer pipe, while the outer pipe must be tested to maximum of 5 psi before backfilling.
		Other Tests	Conduct bubble test once the pipe is connected to the tank and dispenser. Addressed leaks accordingly.
			Once backfilling is done, repeat pressure test to know if installations have been damage during backfilling.
			Compressed air shall not be used for pressure and leak test of pipes that are used to transport products.

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- **DISPENSING PUMP**

EQUIPMENT	CONDITION	RELATIVE OBJECTIVE	MINIMUM CLEARANCE	MAXIMUM CLEARANCE
Dispensing Device	Installation	Property Lines	6 meters	
		Buildings w/ combustibles on exterior wall except for Canopy	6 meters	
		Building w/o combustible on exterior wall but not part of 1 hour fire resistive assembly	6 meters	
		Building w/o combustible on exterior wall but part of 1 hour fire resistive assembly	1 meter	
	Dispensing Kerosene to Portable devices	Any dispensing device for motor fuels	6 meters	
			6 meters	
	Maintenance	All vehicles and unauthorized person	6 meters	
	Emergency shut-off	Electrical Disconnect	6 meters	
Nozzle		Any building w/ the hose fully extended	1.5 meters	
Hose Length	Together w/ breakaway coupling	Dispensing Device to end (hose)		5.5 meters

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- **DISPENSING PUMP**

LOCATION	EXTENT OF CLASSIFIED AREA
Dispensing Device Pits	Any pit or box below grade level, any part of which is within a classified area.
Dispenser	Within 46 cm (18 inches) horizontally in all directions extending to grade from the dispenser enclosure containing liquid handling components.
Outdoor	Up to 46 cm (18 inches) above grade level within 6 meters (20 ft) horizontally of any edge of enclosure.
Remote pump	Any pit or box below grade level if any part is within a horizontal distance of 3 meters (10 ft) from any edge of pump within 0.9 meters (3 ft) of any fill or dispensing point, extending in all directions.
Vent	Within 1.5 meters (5 ft) of open end of vent extending in all directions.
Underground Tank Fill Opening	Any pit or box below grade level, any part of which is within a classified area.
Vent Discharging Upward	Within 0.9 meters (3 ft) of open end of vent extending in all directions.

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Thank you!

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