ASSOCIATION FOR ENERGY AFFORDABILITY INC.

Multifamily Electrification

Electrical Infrastructure Case Studies

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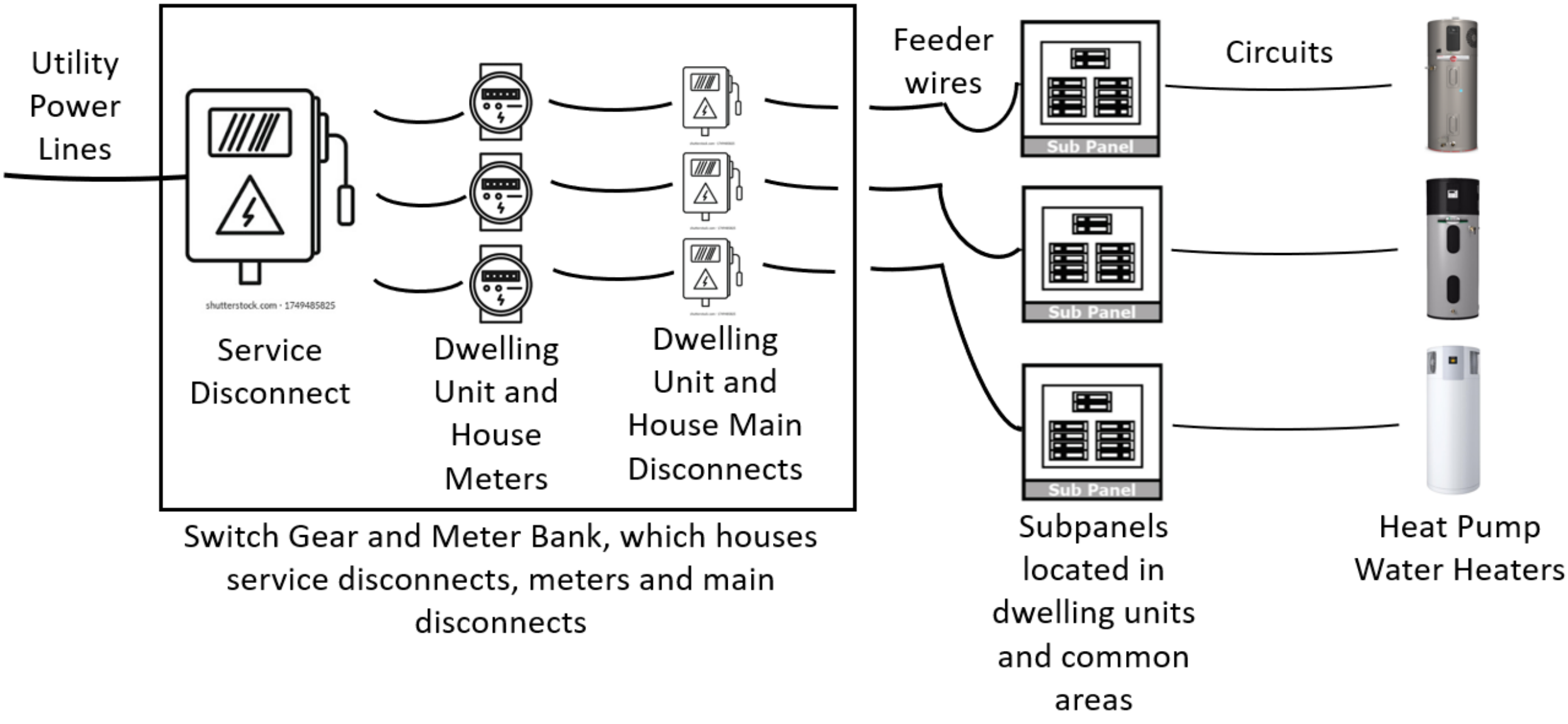
Agenda

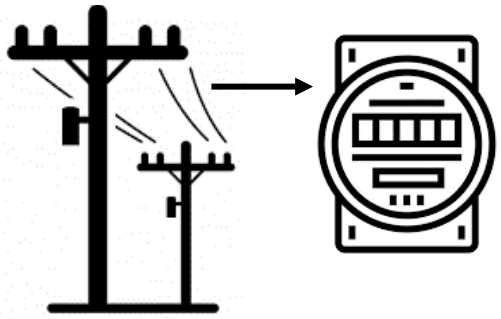
- Multifamily Electrical Infrastructure
- Case Studies:
  - **High Rise Example**
    - Avoiding a Service Upgrade
  - **Low Rise Example**
    - Avoiding Subpanel Upgrades


Utility Power Lines
shutterstock.com · 1749485825
Service Disconnect
Dwelling Unit and House Meters
Dwelling Unit and House Main Disconnects
Switch Gear and Meter Bank, which houses service disconnects, meters and main disconnects
Feeder wires
Sub Panel
Sub Panel
Sub Panel
Subpanels located in dwelling units and common areas
Circuits
Heat Pump Water Heaters

Metering Configuration

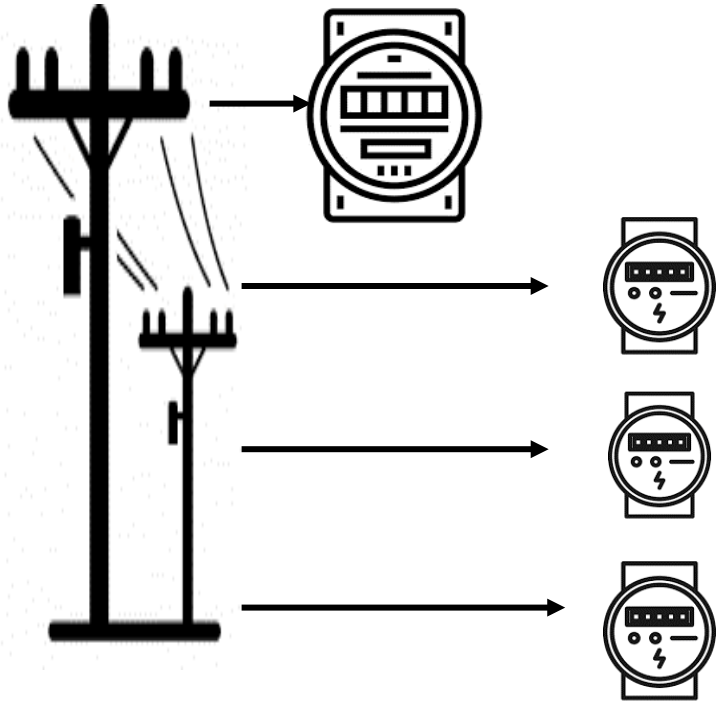
Master Metered

Utility	Building	Apartments



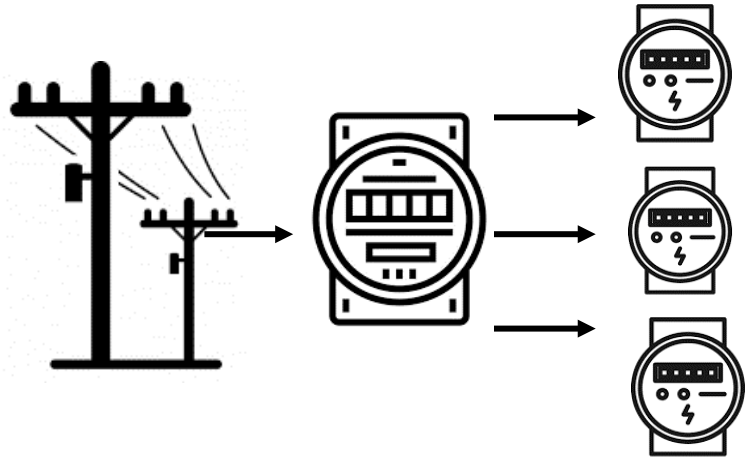
Direct Metered

Utility	Building	Apartments



Sub Metered

Utility	Building	Apartments



High Rise Full Electrification

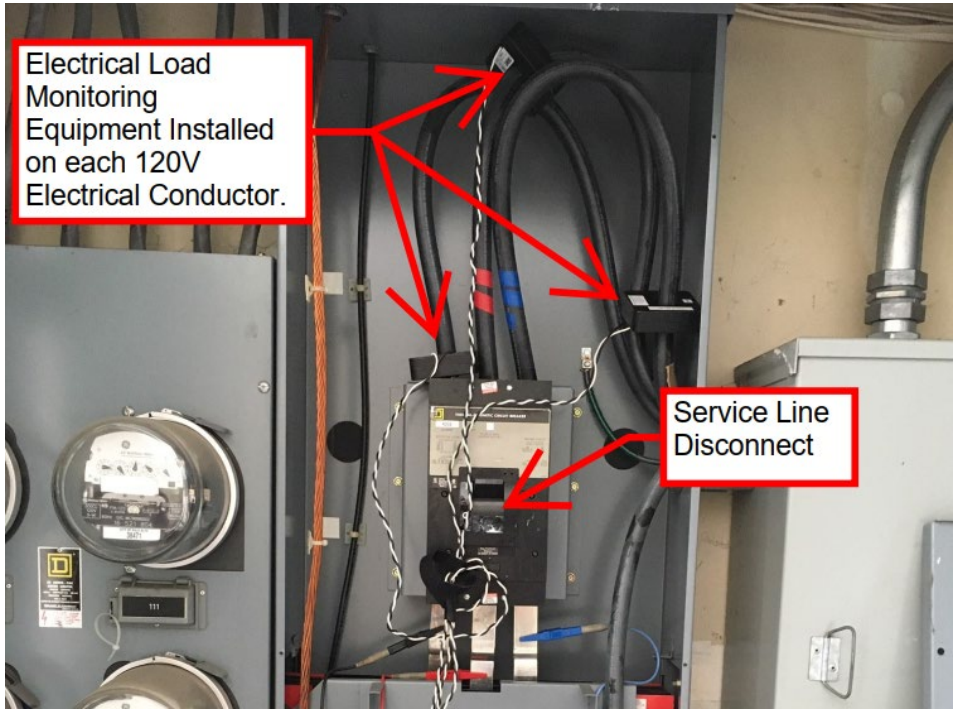
- Santa Ana, CA | Built 1984
- 11 stories, 199 apartments
- Central gas DHW
- 2 pipe heating and cooling
- Chiller and gas boiler
- Limited electrical capacity
- Master Metered

SOW:

- Reversible Chiller to provide hydronic heating and cooling
- Central Heat Pump Water Heater for DHW

NEC Approved Electrical Load Monitoring Study

- Alternative approach to NEC Deemed Calculations
- Utilize actual demand rather than calculated demand to determine existing electrical load and available electrical capacity
- Often more favorable results compared to the calculated demand/load analysis



High Rise Full Electrification

- Max demand calculation approach
- 12 months of bills reviewed
- 218 KW peak demand (summer)
- =254 amps available capacity

EXISTING LOAD CALCULATION

CKT	LOAD DESCRIPTION	KW	KVA
	EXISTING LOAD MAX DEMAND PER 12 MONTH SCE	218.0	
	218.0 KW / 0.80 PF		272.5
	25% FACTOR (NEC 220.87) ON MAX DEMAND PER 12 MONTH SCE		68.1
		TOTAL KVA	**340.6**

946 AMP@ 208 / 120 V, 3 P / 4 W , 60HZ

EXISTING SERVICE SIZE = **1200A** @ 208/120V, 3PH, 4W

High Rise Full Electrification

- First pass at calculation
- Adds in CHPWH Plant
- Assumes worst case load
- Exceeds 1200 amp service

EXISTING LOAD CALCULATION

CKT	LOAD DESCRIPTION	KW	KVA
	EXISTING LOAD MAX DEMAND PER 12 MONTH SCE	218.0	
	218.0 KW / 0.80 PF		272.5
	25% FACTOR (NEC 220.87) ON MAX DEMAND PER 12 MONTH SCE		68.1
1	New HP Water Heater	77.0	96.3
2	NEW ADDED PLUMBING LOAD		
3	25% OF LARGEST MOTOR		24.1
		TOTAL KVA	460.9

1280 AMP@ 208 / 120 V, 3 P / 4 W , 60HZ

EXISTING SERVICE SIZE = **1200A** @ 208/120V, 3PH, 4W

High Rise Full Electrification

- Second pass at calculation
- Credit for more efficient HP Chiller
  - Existing = 590 amps
  - New = 490 amps (36 kVA)
- Just meets service capacity

Other Upgrades?
- LED Lighting Retrofit
- Ventilation Upgrades

EXISTING LOAD CALCULATION

CKT	LOAD DESCRIPTION	KW	KVA
	EXISTING LOAD MAX DEMAND PER 12 MONTH SCE	218.0	
	218.0 KW / 0.80 PF		272.5
	25% FACTOR (NEC 220.87) ON MAX DEMAND PER 12 MONTH SCE		68.1
1	REMOVED BOILER HVAC LOADS		-1.2
2	DELTA, REVISED HVAC PUMPS		11.1
3	DELTA, REVISED CHILLER		-36.0
4	DELTA, REV. AHU + SPLITS + EFs		11.1
5	NEW ADDED SWING TANK		36.0
6	NEW ADDED HP WATER HEATER		57.0
7	25% OF LARGEST MOTOR		6.3
	TOTAL KVA		**424.8**

1180 AMP@ 208 / 120 V, 3 P / 4 W , 60HZ

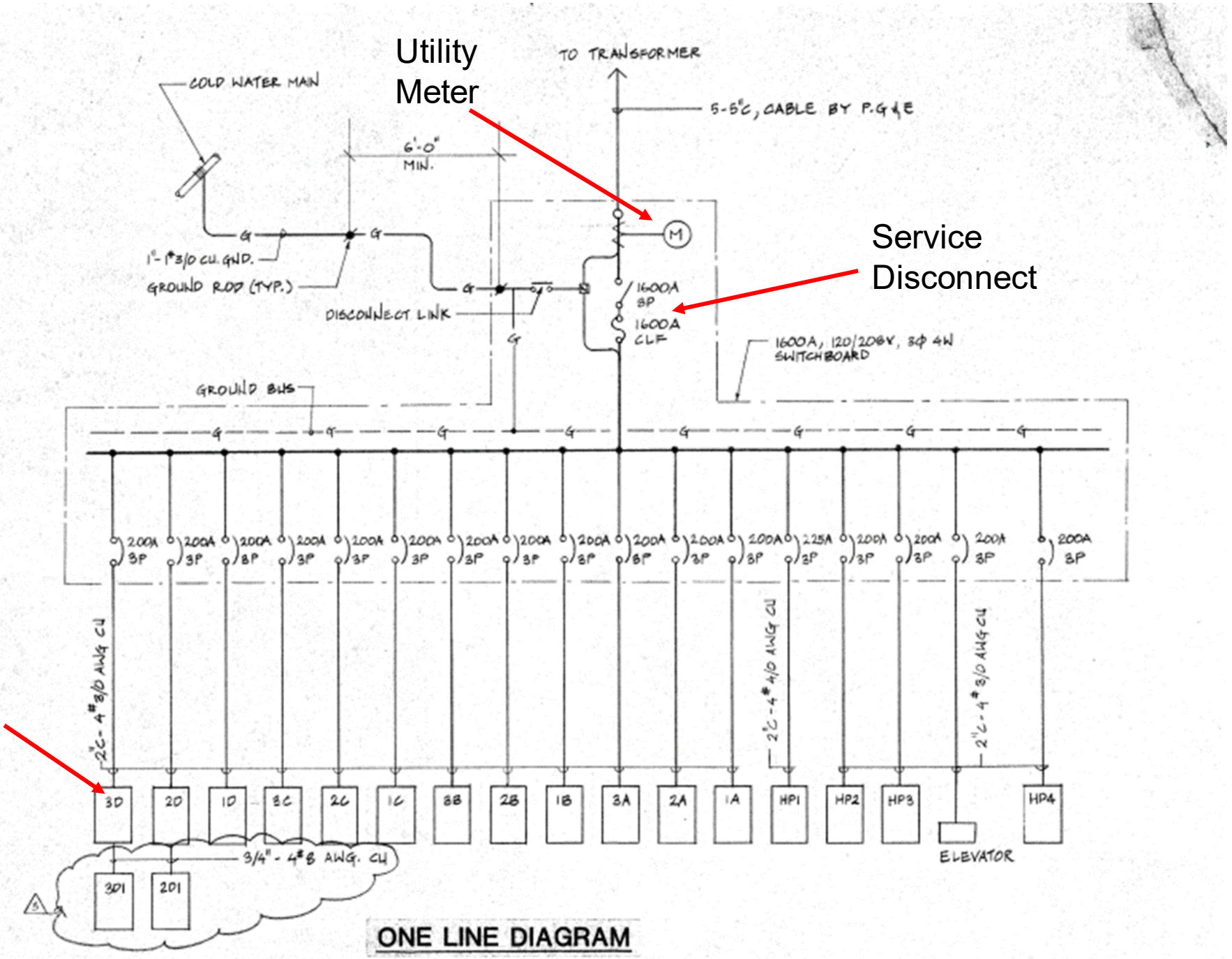
EXISTING SERVICE SIZE = **1200A** @ 208/120V, 3PH, 4W

Low Rise Full Electrification

- Sunnyvale, CA | Built 1994
- 3 stories, 121 SRO apartments, 1 on-site Manager Apartment
- Central combi gas boiler providing DHW & Space Heating
- Limited electrical capacity
- Master Metered
- Units do not have their own Kitchen

SOW:

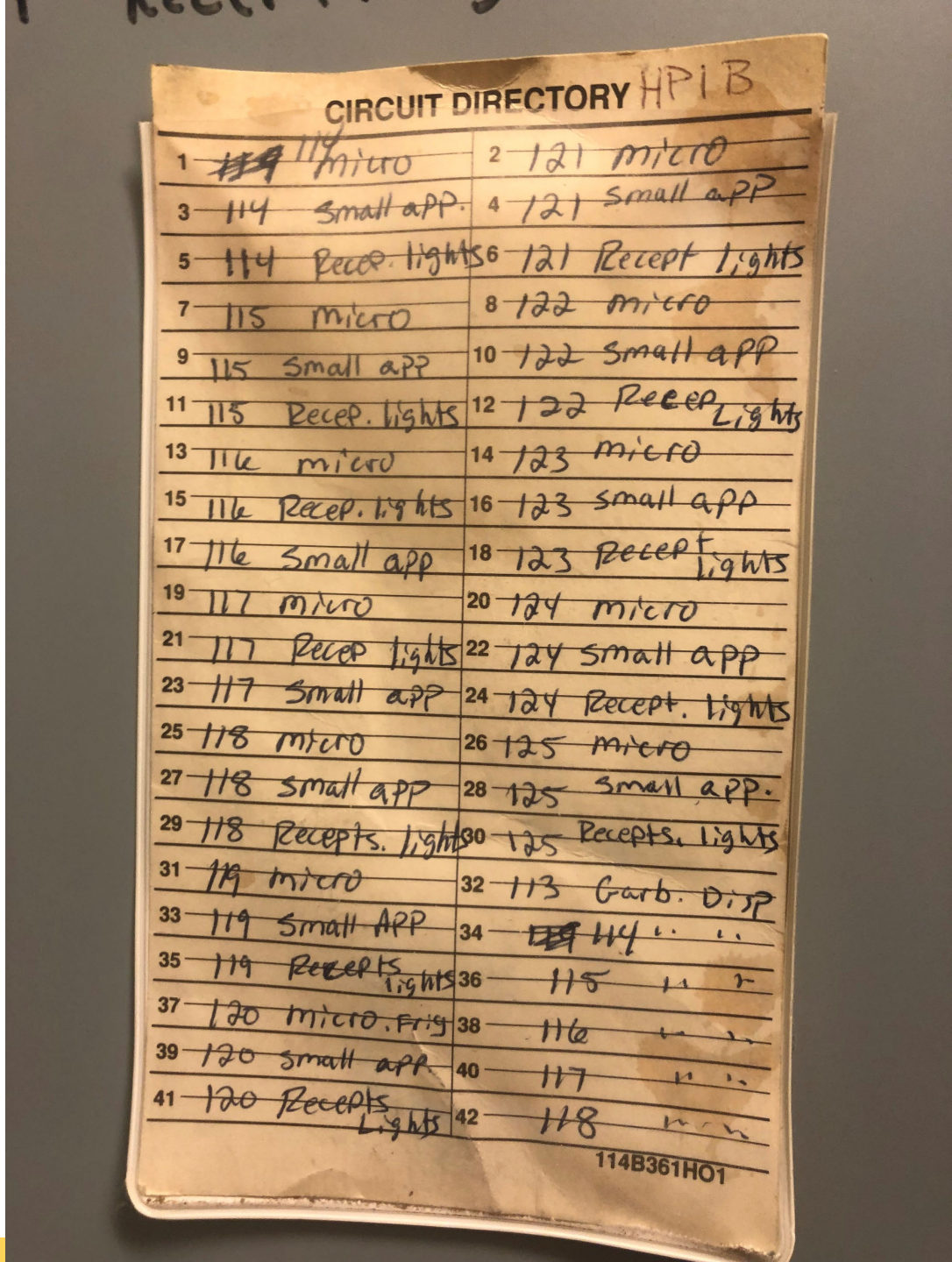
- In-unit HVAC Electrification with Packaged Terminal Heat Pump (PTHP)
- Central Heat Pump Water Heater for DHW


Utility Meter
Service Disconnect
Subpanel
TO TRANSFORMER
5-5"C, CABLE BY P.G&E
COLD WATER MAIN
6'-0" MIN.
1"-#3/0 CU. GND.
GROUND ROD (TYP.)
DISCONNECT LINK
1600A 3P
1600A CLF
1600A, 120/208V, 3Φ 4W SWITCHBOARD
GROUND BUS
2"C-4#3/0 AWG CU
2"C-4#4/0 AWG CU
2½"C-4#3/0 AWG CU
3D
2D
1D
3C
2C
1C
3B
2B
1B
3A
2A
1A
HP1
HP2
HP3
HP4
ELEVATOR
3/4"-4#8 AWG. CU
3D1
2D1
ONE LINE DIAGRAM

PANEL : 1B
MTG. :
TYPE : MLO

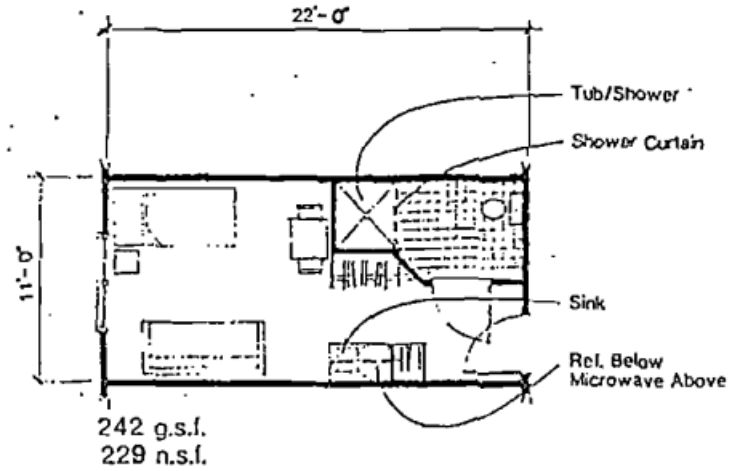
VOLTS : 3φ 4W 120/208V
MAIN BRK :
BUS : 225A

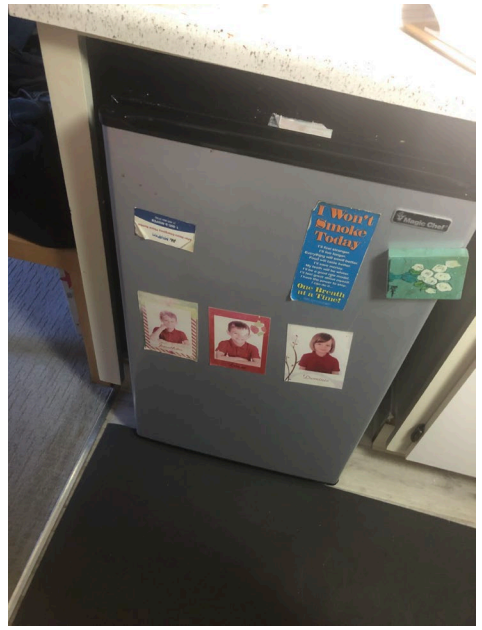
LOAD	DESCRIPTION	BRK	ℓ		ℓ	BRK	DESCRIPTION	LOAD
1200	#114 MICROWAVE & FRIG	20/1	1		2	20/1	#121 MICROWAVE & FRIG	1200
1500	#114 SMALL APPLIANCE		3		4		#121 SMALL APPLIANCE	1500
1355	#114 RECEPT & LTS		5		6		#121 RECEPT & LTS	1355
1200	#115 MICROWAVE & FRIG		7		8		#122 MICROWAVE & FRIG	1200
1500	#115 SMALL APPLIANCE		9		10		#122 SMALL APPLIANCE	1500
1355	#115 RECEPT & LTS		11		12		#122 RECEPT & LTS	1355
1200	#116 MICROWAVE & FRIG		13		14		#123 MICROWAVE & FRIG	1200
1500	#116 SMALL APPLIANCE		15		16		#123 SMALL APPLIANCE	1500
1355	#116 RECEPT & LTS		17		18		#123 RECEPT & LTS	1355
1200	#117 MICROWAVE & FRIG		19		20		#124 MICROWAVE & FRIG	1200
1500	#117 SMALL APPLIANCE		21		22		#124 SMALL APPLIANCE	1500
1355	#117 RECEPT & LTS		23		24		#124 RECEPT & LTS	1355
1200	#118 MICROWAVE & FRIG		25		26		#125 MICROWAVE & FRIG	1200
1500	#118 SMALL APPLIANCE		27		28		#125 SMALL APPLIANCE	1500
1355	#118 RECEPT & LTS		29		30		#125 RECEPT & LTS	1355
1200	#119 MICROWAVE & FRIG		31		32		#113 GARBAGE DISPOSER	1200
1500	#119 SMALL APPLIANCE		33		34		#114 " "	1200
1355	#119 RECEPT & LTS		35		36		#115 " "	1200
1200	#120 MICROWAVE & FRIG		37		38		#116 " "	1200
1500	#120 SMALL APPLIANCE		39		40		#117 " "	1200
1355	#120 RECEPT & LTS		41		42		#118 " "	1200



Existing Circuits in Each Dwelling Unit:

- Microwave/Mini Fridge
- Lighting and Receptacles
- Small Appliance
- Garbage Disposal
- No Available PTHP





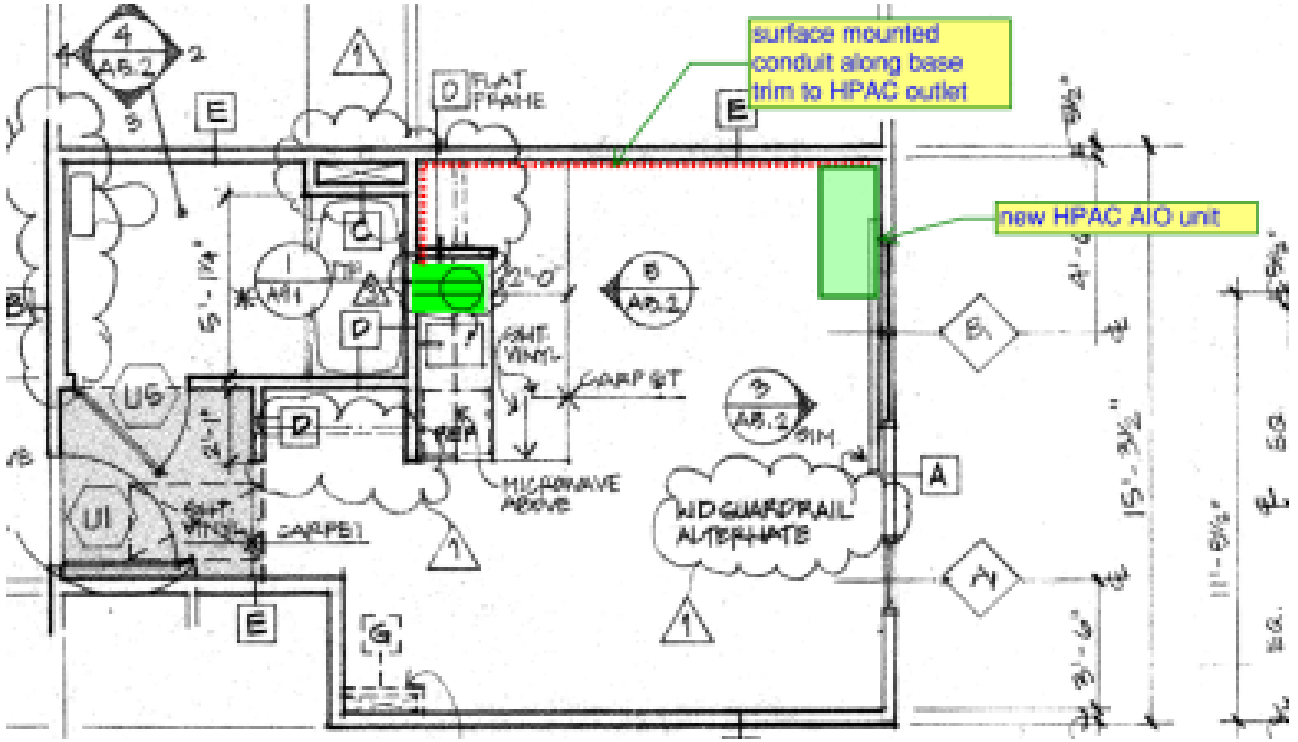


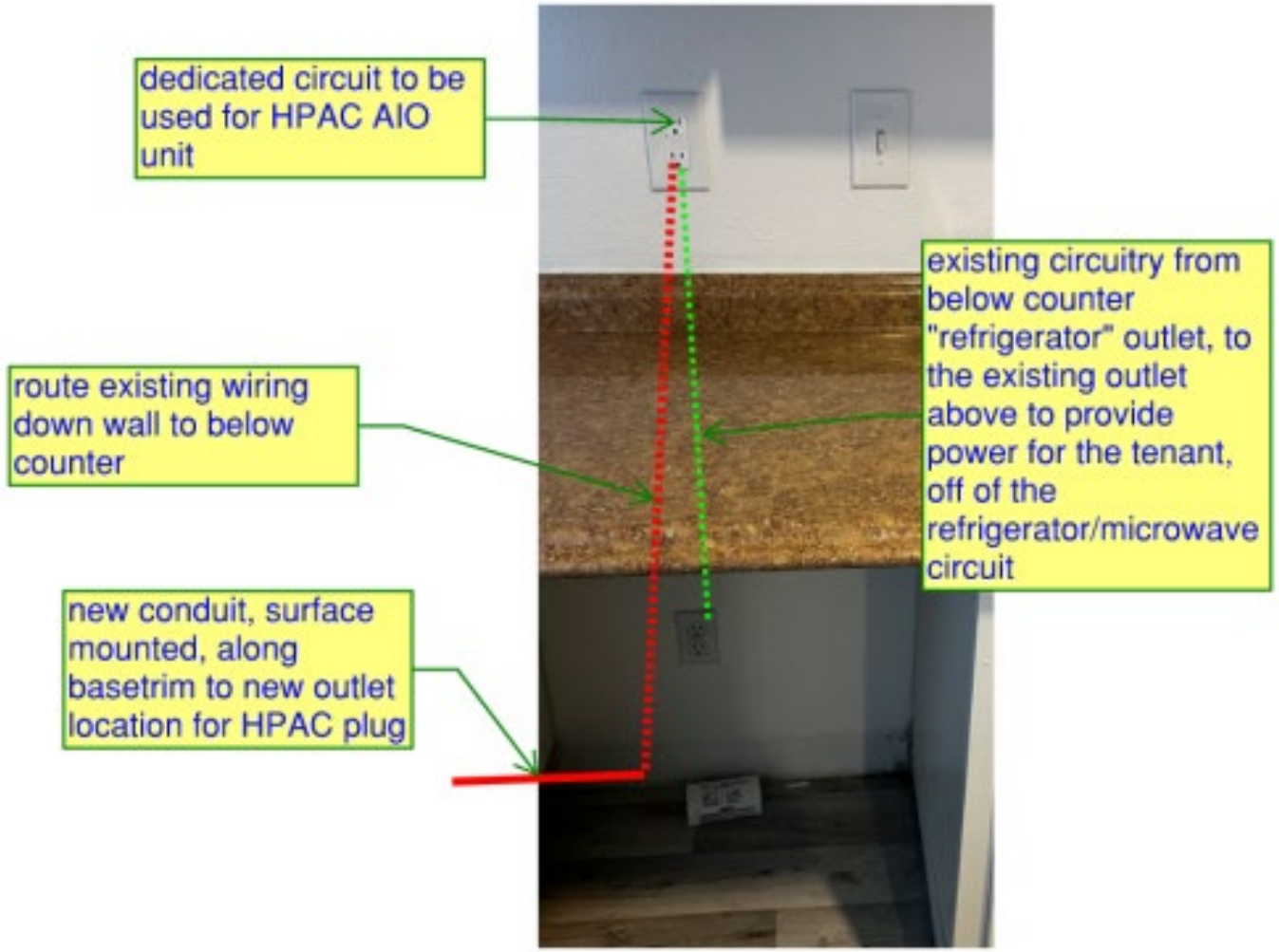
Figure 4: Dwelling unit electrical

Proposed Circuits in Each Dwelling Unit:

- Microwave/Mini Fridge/Small Appliances
- Lighting and Receptacles
- PTHP
- Garbage Disposal

Other Options?

- Smart Splitter/Circuit Sharer
- Garbage Disposal/Small Appliance Circuit



Thank You!