Calculate the size service (120/208 V, Three-phase) for a welding shop that measures 35m x 25m. The service will be underground with parallel runs (2 conductors per phase) of direct buried aluminum cable configured for diagram B4-1 (Detail 2). Service equipment is rated for continuous use at 80% of maximum load. Cable is installed in a vehicular area. The following loads are to be installed:

100 kW Electric Heat
10 kW Fixed Tools (Grinders, Drill press, etc.)
4.5 kW Water Heater
50 kW Welding machines
20 kW Yard lighting

Calculate the Service demand wattage, minimum conductor ampacity, main service size, size of service conductors, minimum trench depth without protection,

Basic Demand = 35m x 25m x 25W/m² = 21,875 W

Elec Heat 75,000 W
Fixed Tools 10,000 W
Water Heater 4,500 W
Welders 50,000 W
Lighting 20,000 W
Total 181,375 W

504 A is the Minimum Ampacity of Conductor. We have to determine how many conductors per phase and divide the amperage by the number. In this case it is 2 per phase so 504/2 = 257 A

504/.8 = 630 A  Next we must select an overcurrent device that is larger than 630 A which would be 800 A. Now we need to select conductors that are rated at more than 400 A for parallel runs with 2 conductors per phase. If we look in Table D9B for direct buried aluminum cable and continuous load we will get No. 600 kcmil

Service Demand wattage = 181,375 W
Minimum Conductor Amperage = 504 A
Main Service Size = 800 A
Size of Service Conductors = No. 600 kcmil

Minimum Trench Depth (Table 53) = 900 mm