



**Asia-Pacific
Economic Cooperation**

Rooftop Solar PV System Designers and Installers

Training Curriculum

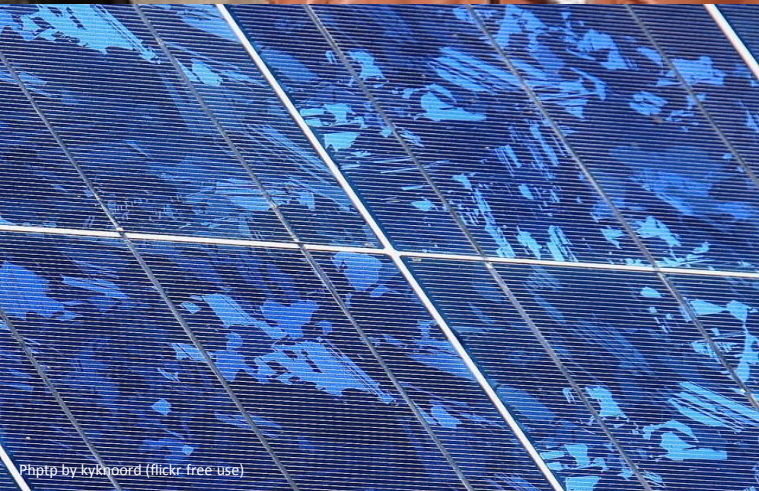
APEC Secretariat

March 2015



CONSTRUCTION DRAWINGS

Training of PV Designer and Installer



**Asia-Pacific
Economic Cooperation**



**International Copper
Association**
Copper Alliance



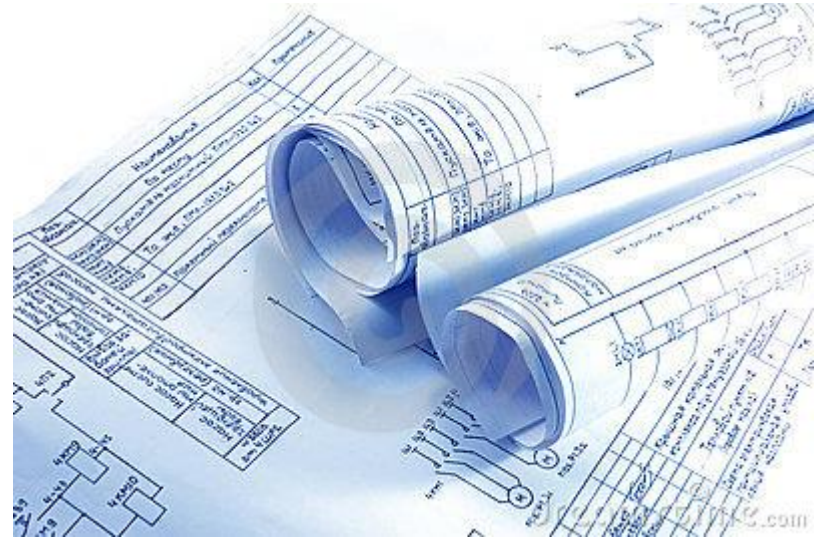
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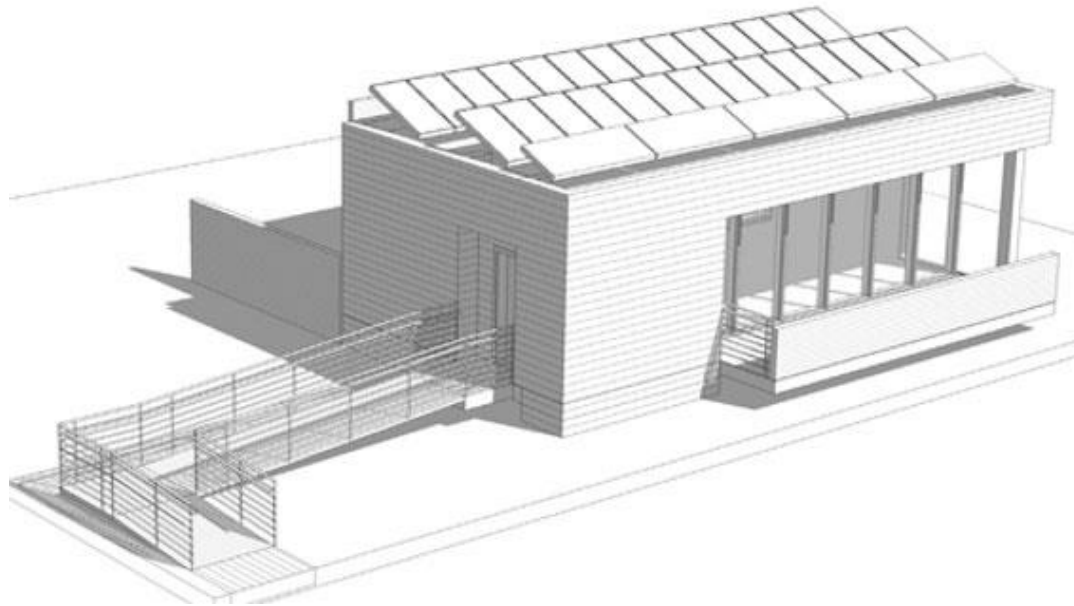
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Construction Drawings

1. Civil Drawings
2. Structural Drawings
3. Architectural Drawings
4. Electrical Drawings
5. Mechanical Drawings
6. Plumbing Drawings



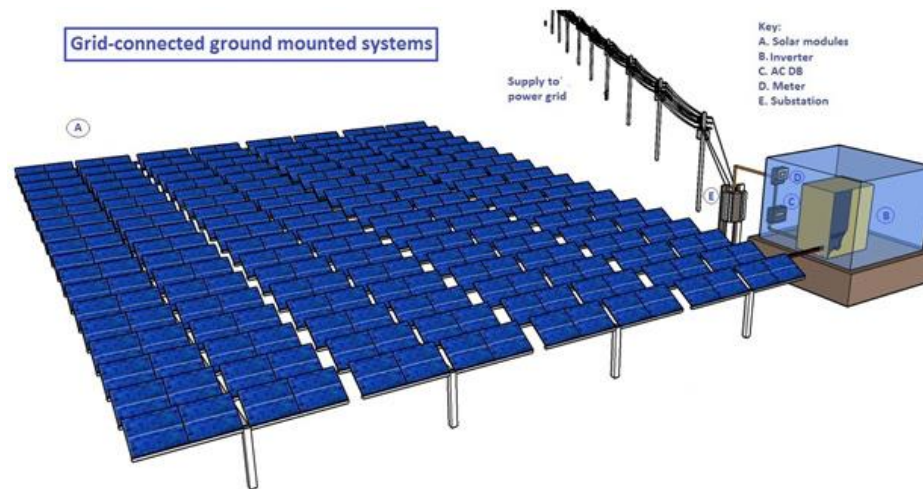
Drawing Contents



1. Civil Drawings: Include site plans, utilities, landscape details, property lines and utility locations
2. Structural Drawings: include foundation, structural steel, building support system, roof framing system along with sections and details



Drawing Contents



3. Architectural drawings: floor plans, elevations, building sections, room finishes, etc. The floor plan is very important as it acts as a reference for the location of other details and sections. It also shows walls, doors, stairs, built in cabinets and mechanical equipment. Sections show walls, stairs and other details not shown in other drawings.



Drawing Contents

4. Electrical Drawings: Include electrical wiring, lighting plan and list or materials for the electrical panels. Also show the location of electrical fixtures
5. Mechanical Drawings: Include HVAC and plumbing plans, and list of materials for pipe system, HVAC equipment and plumbing fixtures
6. Plumbing Drawings: Shows the layout for the water systems, sewage disposal system and the location of plumbing fixtures



- Construction drawings – is a set of drawings showing different views of the building
- Plan views – the top view of the building. Taken at different levels throughout the building
- Floor plan – show the layout of the building and shows walls, doors, windows, rooms and stairs
- Foundation plan – similar to the floor plan, except it shows the foundation of the building and includes basement, foundation walls, slabs, piers and footings



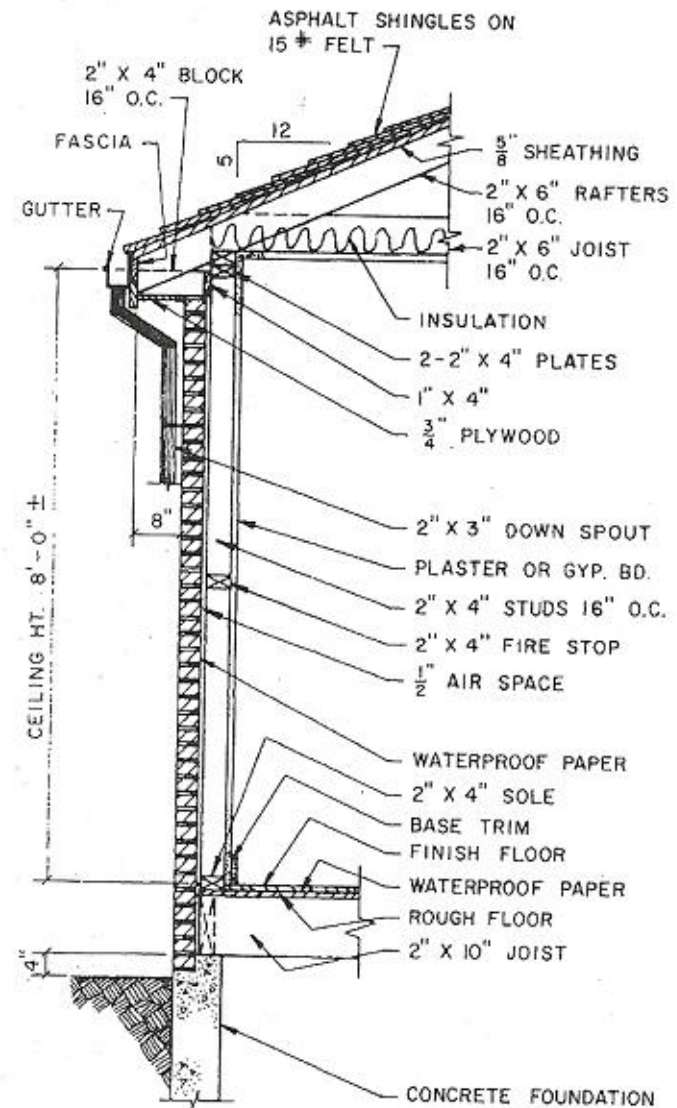
- Framing plan – a drawing showing the layout of the structural members supporting a floor or roof
- Electrical plan – a drawing showing the location of receptacles, switches and fixtures
- Plumbing plan – a drawing showing the HVAC equipment, supply and waste systems, plumbing fixtures
- Mechanical plan – a drawing showing the HVAC ducting, equipment and systems located throughout the building



Common Terms

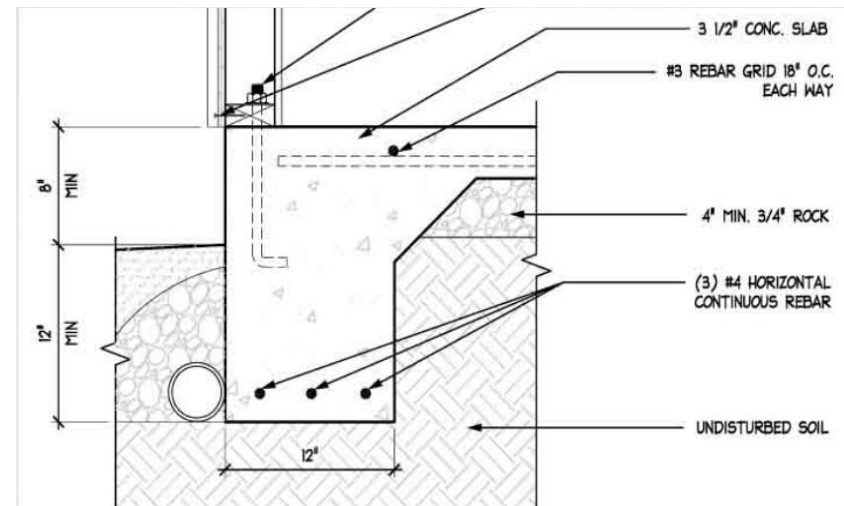


- Sections – besides the plans and elevations, it may be necessary to show the “inside” of a particular structure (such as a wall, cabinet or roof structure) to clarify construction procedures. A section is an imaginary cut through the feature to show construction details or other important information



Common Terms

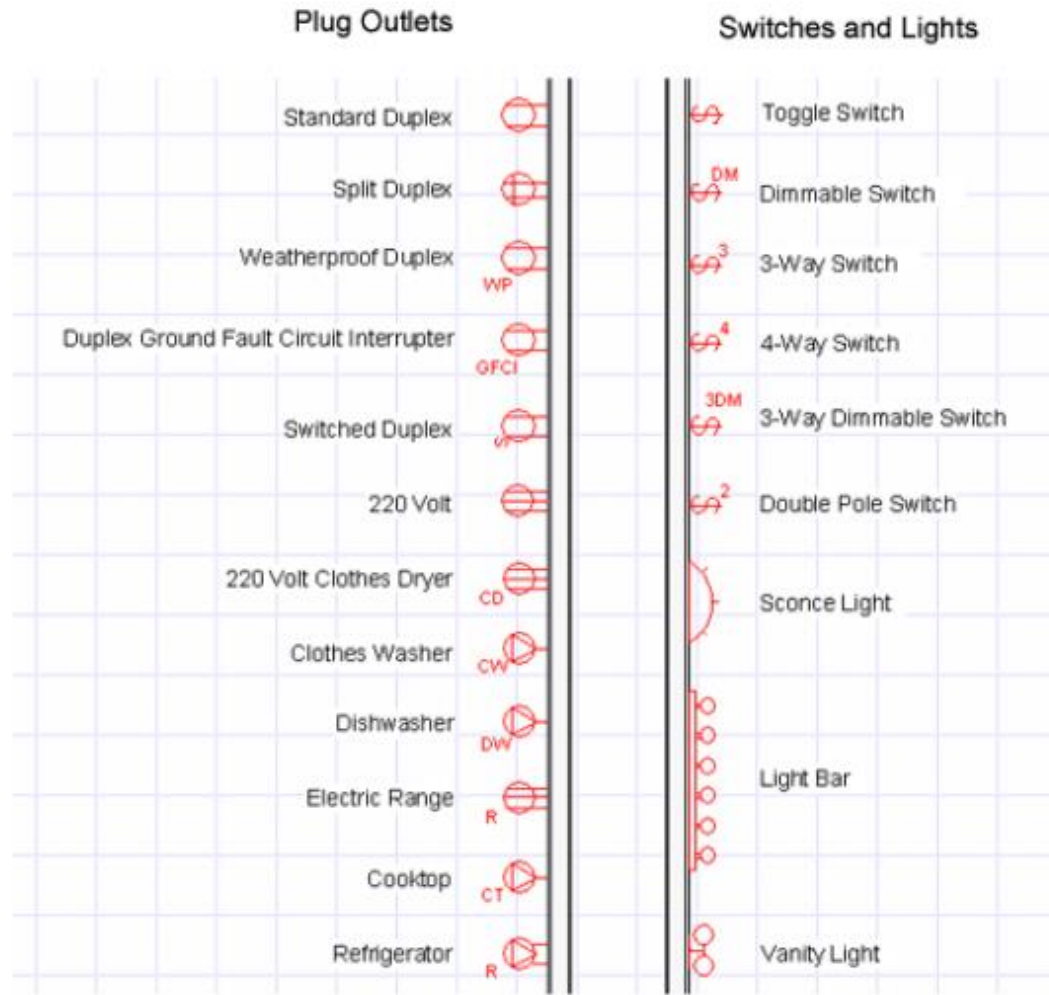
- Details – Because of the scale of the construction drawing, often there will be features that are not clearly shown. These features will need to be “blown up” or require a larger scale drawing to provide the information necessary for construction. This blown up drawings are detail drawings



Common Symbols



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Common Symbols



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ARCHITECTURAL SYMBOLS (cont.)	
Symbol	Definition
	Column line grid
	Partition type
	Window type
	Door number
	Room number
	Ceiling height
	Revision marker
	Break in a continuous line
	Refer to note #3
	Elevation marker
	Interior elevations 1,2,3 & 4 can be seen on drawing A-5. Direction of triangle indicates elevation.

ARCHITECTURAL SYMBOLS	
Symbol	Definition
	Wall section No. 2 can be seen on drawing No. A-4.
	Detail section No. 3 can be seen on drawing No. A-5.
	Building section A-A can be seen on drawing No. A-6.
	Main object line
	Hidden or invisible line
	Indicates center line
	Dimension lines
	Extension lines
	Symbol indicates center line
	Indicates wall surface
	Indicates north direction



Common Symbols



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PIPING SYMBOLS			
Valves, Fittings and Specialties			
Gate		Concentric reducer	
Globe		Eccentric reducer	
Check		Pipe guide	
Butterfly		Pipe anchor	
Solenoid		Flow direction	
Lock shield		Elbow looking up	
2-Way automatic control		Elbow looking down	
3-Way automatic control		Pipe pitch up or down	
Gas cock		Expansion joint	
Plug cock		Expansion loop	
Flanged joint		Flexible connection	
Union		Thermostat	
Cap		Thermostatic trap	
Strainer			

PIPING SYMBOLS (cont.)			
Float and thermostatic trap		Hose bibb	
Thermometer		Elbow	
Pressure gauge		Tee	
Flow switch		'Y'	
Pressure switch		OS & Y gate	
Pressure reducing valve		Shock absorber	
Temperature and pressure relief valve		House trap	
Humidistat		'P' trap	
Aquastat		Floor drain	
Air vent		Indirect waste	
Meter		Sanitary below grade	
		Sanitary above grade	



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PLUMBING FIXTURE SYMBOLS

Baths

Corner Recessed Angle

Whirlpool Institutional or island

Showers

Stall Corner Stall Wall Gang

Water Closets

Tank Flush Valve Bidet

Urinals

Wall Stall Trough

Lavatories

Vanity Wall Counter Pedestal

PLUMBING FIXTURE SYMBOLS (cont.)

Kitchen Sinks

Single basin Single drainboard

Twin basin Double drainboard

Drinking Fountains or Electric Water Coolers

Floor or wall Recessed Semirecessed

Dishwasher

DW

Laundry Trays

Single Double

Service Sinks

Wall Floor

Wash Fountains

Circular Semicircular

Hot Water

Heater Tank

Separators

Gas Oil



Common Symbols



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LANDSCAPE SYSTEMS AND GRAPHICS	
Property line	
Center line	
Building	
Window	
Door	
Paving pattern	
random	
Wall	
Stone wall	
Hedge	
Fence	
Concrete	
Sand	
Brick	
Gravel	
Rock	
Water	
Swamp	

LANDSCAPE SYSTEMS AND GRAPHICS (cont.)	
Slope	
Steps	
Grass	
Ground cover	
Benchmark	EI.00.0
Trees —	
deciduous	
evergreen	
Shrubs —	
deciduous	
evergreen	
Herbaceous plants (flowers)	
Same variety	
Topographic contours	
Contour lines —	
unaltered	
altered	
proposed	



Common Symbols



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	Electrical switchbox		Single Pole Switch
	Three-Way Switch		SinglePlex Receptacle
	Duplex Receptacle		Duplex Receptacle WP= Waterproof
	GFCI Duplex Receptacle		Isolated Ground Receptacle
	Switched Receptacle		FourPlex Four Gang Receptacle
	240-Volt Receptacle		Ceiling Mounted Light Fixture PC= Pullchain
	Wall-Mounted Light Fixture		Recessed Light Fixture
	Weatherproof Light Fixture		Fluorescent Light Fixture
	Ceiling Fan		Combination Light & Fan
	Power Vent Fan		Electric Motor Number=HP
	Smoke Detector		Circuit Breaker
	Telephone Jack		Doorbell Transformer
	Doorbell Pushbutton		Ground

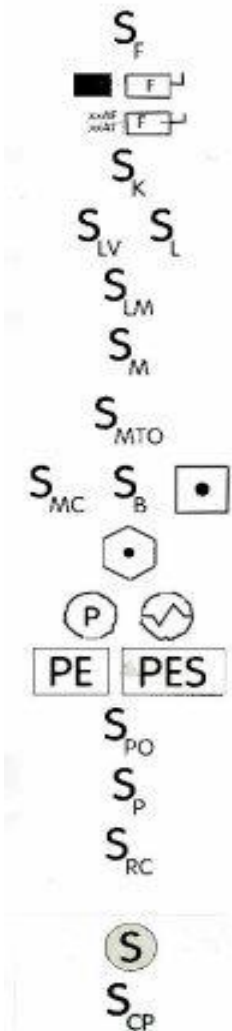
ITEMS	SYMBOL	IN WORDS	OPERATION FUNCTIONS															
RELAY		RELAY COIL	CLOSES INSTANTANEOUSLY WHEN COIL IS ENERGIZED OPENS INSTANTANEOUSLY WHEN COIL IS ENERGIZED															
		NORMALLY OPEN CONTACT																
		NORMALLY CLOSED CONTACT																
TIME DELAY RELAY		RELAY COIL	<table border="0"> <tr> <td></td> <td>ENERGIZED</td> <td>DE-ENERGIZED</td> </tr> <tr> <td></td> <td>NORMALLY OPEN TIMED CLOSED</td> <td></td> </tr> <tr> <td></td> <td>NORMALLY CLOSED TIMED OPEN</td> <td></td> </tr> <tr> <td></td> <td>NORMALLY OPEN TIMED OPEN</td> <td></td> </tr> <tr> <td></td> <td>NORMALLY CLOSED TIMED CLOSED</td> <td></td> </tr> </table>		ENERGIZED	DE-ENERGIZED		NORMALLY OPEN TIMED CLOSED			NORMALLY CLOSED TIMED OPEN			NORMALLY OPEN TIMED OPEN			NORMALLY CLOSED TIMED CLOSED	
		ENERGIZED		DE-ENERGIZED														
		NORMALLY OPEN TIMED CLOSED																
		NORMALLY CLOSED TIMED OPEN																
		NORMALLY OPEN TIMED OPEN																
		NORMALLY CLOSED TIMED CLOSED																
	ON-DELAY																	
	OFF-DELAY																	
		NORMALLY OPEN	CLOSES WHEN ACTUATED BY MECHANICAL FORCE															
FLOW SWITCH		NORMALLY OPEN	CLOSES WHEN WATER STARTS TO FLOW															
		NORMALLY CLOSED	OPENS WHEN WATER STARTS TO FLOW															
PRESSURE SWITCH		NORMALLY OPEN	CLOSES AS THE PRESSURE INCREASES TO A SPECIFIC RANGE (IN PSI)															
		NORMALLY CLOSED	OPENS AS THE PRESSURE INCREASES TO A SPECIFIC RANGE (IN PSI)															
FLOAT SWITCH		PUMP UP OPERATOR	CLOSES AS THE WATER LEVEL FALLS TO A SPECIFIC DEPTH															
		PUMP DOWN OPERATOR	OPENS AS THE WATER LEVEL FALLS TO A SPECIFIC DEPTH															
PUSH BUTTON SWITCH		NORMALLY OPEN	PUSH TO CLOSE, RELEASE TO OPEN															
		NORMALLY CLOSED	PUSH TO OPEN, RELEASE TO CLOSE															
SOLENOID VALVE CONTROL SELECTOR SWITCH TIME METER CONNECTED WIRES NON-CONNECTED WIRES OUT-GOING TERMINAL PROBE STARTER COIL		FOR FLOOR PLANS LIGHTING FIXTURE, CEILING MOUNTED LIGHTING FIXTURE, WALL MOUNTED AT HEIGHT SHOWN FLOODLIGHT FIXTURE, WALL MOUNTED FLOODLIGHT FIXTURE MOUNTED ON POLE TOP FLUORESCENT LIGHTING FIXTURE LIGHTING FIXTURE DESIGNATIONS (LOCATED ADJACENT TO FIXTURES). *A* INDICATES FIXTURE TYPE. (SEE FIXTURE SCHEDULE FOR ALL TYPES). *2/40" = TWO 40 WATTS LAMPS DUPLEX OUTLET, + 16" DUPLEX OUTLET WITH BUILT-IN GROUND FAULT CIRCUIT INTERRUPTER, + 16"																



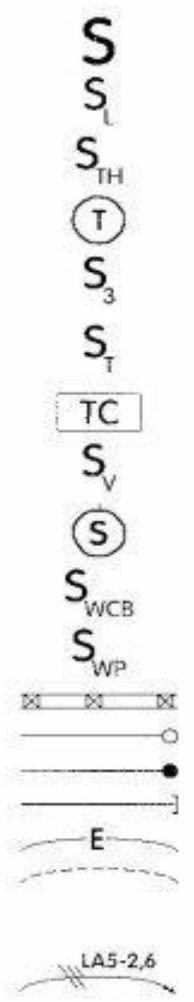
Common Symbols



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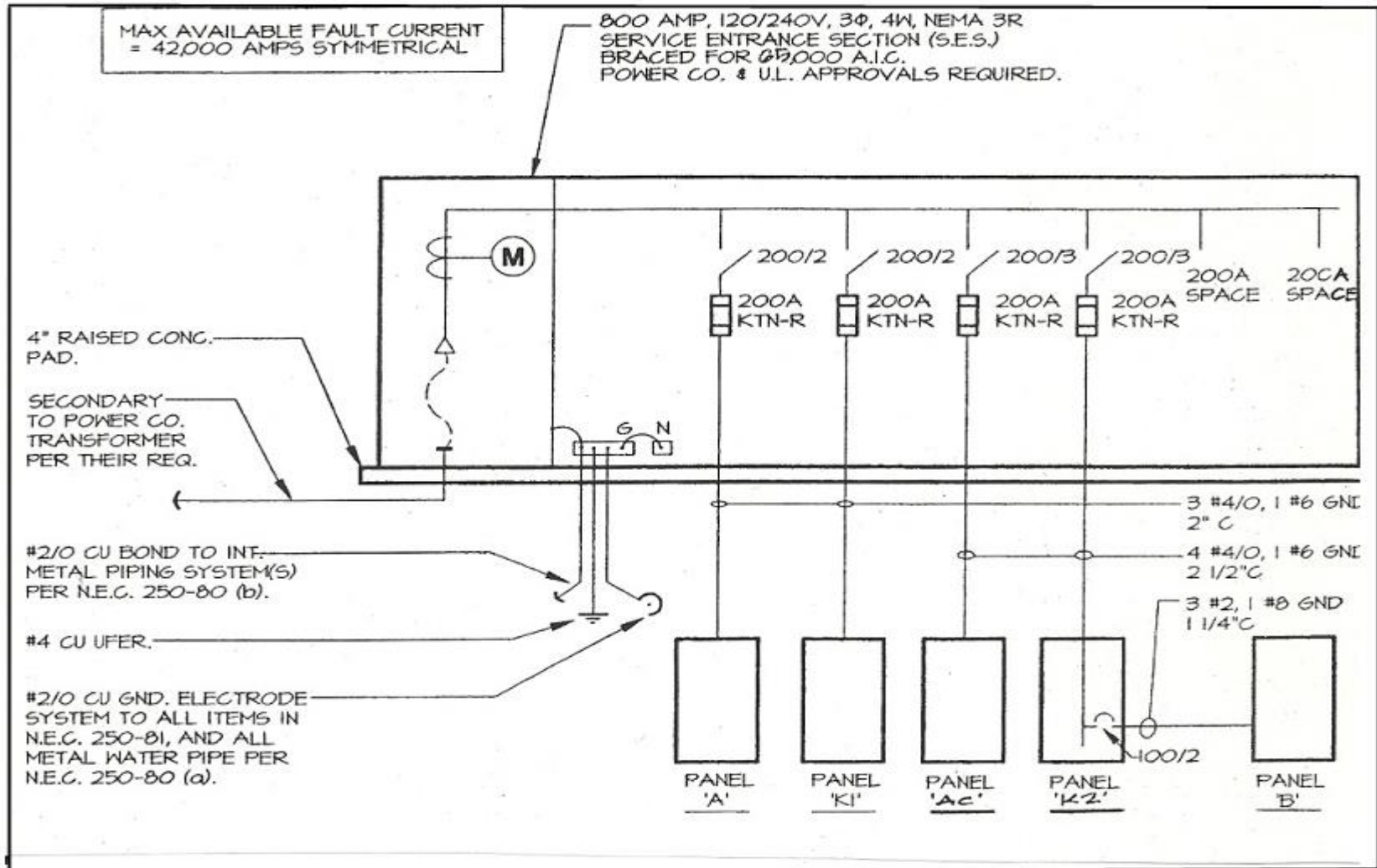
Fused switch, wall mounted
Fused safety switch
xxAF= frame size
xxAT= trip size
Key controlled switch,
wall mounted
Low voltage switch,
wall mounted
Low voltage master switch,
wall mounted
Manual motor switch,
wall mounted
Manual motor switch,
with thermal overloads
wall mounted
Momentary contact Intermittent
switch, wall mounted
Motion detector sensor
Photoelectric switch
Pilot/remote light switch
load off, wall mounted
Pilot/remote light switch
load on, wall mounted
Remote control switch
receiver, wall mounted
Ceiling pull switch
ceiling mounted
Chain pull switch



Single pole switch, wall mounted
Switch with locator lamp
glow, wall mounted
Thermal rated motor switch
Thermostat
Three-way switch, wall mounted
Timer or motor switch
with thermal overload
wall mounted
Time clock switch
Variable speed or volume
control switch, wall mounted
Wall bracket pull switch
Weather proof circuit
breaker, wall mounted
Weather proof switch,
wall mounted
Cable tray
Conduit turning up
Conduit turning down
Conduit with capped end
Emergency circuit
Exposed circuit
Homerun to panel
letters indicate panel
numbers indicate circuits



One Line Diagram





Asia-Pacific Economic Cooperation

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