MEP Coordination Tips

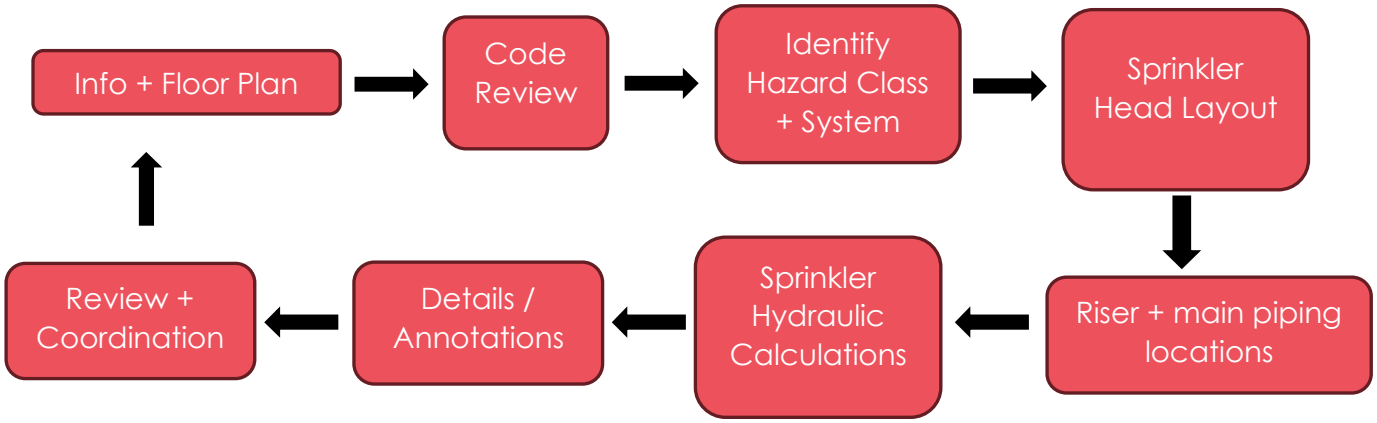
HVAC + Plumbing + Fire Protection Intent + Electrical + Structural

Coordination Tips Overview:

I hope these MEP Coordination Tips help make your design process easier and give you a good starting place for coordinating with MEP. These tips and rules of thumb are taken from design standards and engineering experience. While every project is unique, it should help reduce your MEP coordination iterations. Please reach out to us for any questions or design services we can help on!

Fire Protection Coordination Tips

1. **Sprinkler Intent Design Process:**



2. **Sprinkler Riser Room:**
    a. Start with 4 ft x 4 ft for one riser.
    b. Start with 5 ft x 5 ft for two risers (one dry, one wet).
    c. A dedicated room is not required, but the riser(s) will need to be protected from damage.
    d. Locate on an outside wall so the FDC is visible from the fire truck access.
3. **Fire Pump Room:**
    a. Start with 12 ft x 12 ft for buildings less than 50,000 sqft
    b. Start with 15 ft x 15 ft for buildings larger than 50,000 sqft
    c. Locate on an outside wall.
4. **Fire Risers:**
    a. For typical commercial buildings, 1 riser can cover up to 52,000 sqft per floor.
        i. If each floor area is less than 52,000 sqft, but the building is greater than that then one sprinkler riser is still sufficient.

   b. For typical industrial / warehouse buildings, 1 riser can cover 40,000 sqft per level.

5. **Standpipes:**
   a. Required for buildings where the highest floor is over 30 ft tall or 4+ stories (IFC 905).
   b. Required to have at least a vertical 4" pipe in all exit stairwells.
   c. Each stairwell floor landing is required to have a hose valve connection. This will protrude into the stairs about 1 ft.
   d. A standpipe hose valve is required on the roof where there is occupied access (like a rooftop bar).
6. **Common Sprinkler Pipe Sizes for Chases (4", 6", 8"):**
   a. 4" pipe, use 6" stud / chase
   b. 6" pipe, use 8" stud / chase
   c. 8" pipe, use 10" stud / chase
7. **Common Codes:**
   a. Attics require sprinklers (except most residential occupancies)
   b. Combustible overhangs greater than 4 ft require sprinklers outside (a dry tube sidewall sprinkler is usually the best option)
   c. Elevators may need a sprinkler at the top and bottom of the shaft.
   d. If high-piled storage (over 12 ft) is required, anticipate ESFR sprinklers.
      i. Anticipate a fire pump for ESFR systems due to the increased flow and pressure requirements.
8. **Common Sprinkler Head Spacing:**
   a. Typical commercial + educational buildings: 14 ft x 14 ft (or 225 ft^2)
   b. Commercial kitchens: 10 ft x 12 ft
   c. Industrial Plants + warehouses: 10 ft x 10 ft
9. **Fire Department Connections (FDC):**
   a. Visible location from street or fire access road.
   b. Immediate access to FDCs shall be maintained 24/7.
   c. FDCs require a working space of 36" x 36" (width and front).
   d. Existing buildings: Where the FDC is not visible, requires a sign with "FDC" and an arrow not less than 6" high. (2018 IFC 912)
   e. 2018 IFC 912.5 states the sign requirements: 1 inch raised letters (min), metal sign, mounted on all FDCs + standpipes + pump connections.

10. **Cost Reduction Tips:**
    a. Use less ceiling obstructions (ex: deep exposed beams, decorative hanging clouds, etc), less sprinkler heads may be required.
    b. Insulate the attic roof instead of the attic floor so dry sprinkler heads can be avoided.
    c. If a dry sprinkler system is required, suggest making the whole system dry. One dry riser instead of having two risers (wet + dry). (other requirements may apply)
    d. Request flow test data (taken within 6 months) and preliminary sprinkler calculations early. This determines if a fire pump is required or not. A fire pump will impact all design disciplines and increase construction costs.

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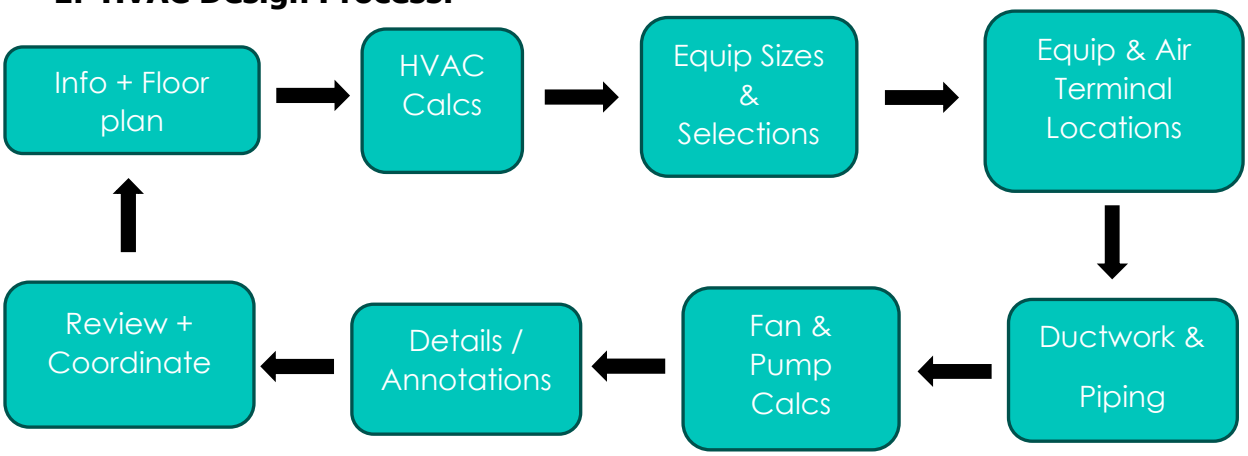
HVAC Coordination Tips

1. **HVAC Design Process:**



2. **Mechanical Space, Equipment Locations, and Clearances:**
    a. In general, 4% to 9% of gross building area. (From ASHRAE)
    b. Ask Engineer early on – it depends on system type
    c. Indoor space not available / desired, use:
        i. Rooftop units or ground packaged units (outside of building)
        ii. Split systems (located above ceiling or attic)
        iii. Ductless mini-splits or VRF (wall or ceiling)
    d. Ground space limited, use:
        i. Rooftop units
        ii. Mount condensers on the roof
        iii. VRF or mini splits (one outdoor unit for many indoor units)
        iv. Use air cooled chiller or water source heat pump tower (One bigger unit, instead of many smaller units. Can be farther from building too)
    e. Rule of Thumbs (Includes clearances):
        i. Assume 3ft of clearance in front of and/or around units.
        ii. Indoor Vertical Air Handlers: 20 sqft for every 2000 sqft of floor plan
        iii. Rooftop Units: 63 sqft for every 2000 sqft of floor plan
    f. Split System Distances: The max distance between an Air Handler and Condensing Unit is typically 140 ft (line set/refrigerant lengths) and

typically 40 ft vertically is the max elevation distance (may vary with manufacturer)

3. **Duct Chases:**
    a. Ask Engineer early on
    b. Ducted Systems that may need chases:
        i. Supply Air, Return Air, Restroom Exhaust, Dryer Exhaust, Fireplace Flue, Gas Fueled HVAC Intake / Vent, Kitchen Hood Exhaust, Lab Exhaust, Outside Air Intakes.
    c. A Starting Place:
        i. One supply and return duct routing to another floor – 2ft x 4ft
        ii. Kitchen Exhaust & Makeup air – 4ft x 4ft
4. **Interstitial Space:**
    a. 2 ft above ceiling will work most of the time.
    b. Kitchens and Labs; start with 3 ft above ceiling.
5. **Air Distribution Options:**
    a. In Ceiling
        i. Square / Rectangular / Round Diffusers
        ii. Slot Diffusers
    b. Exposed to Structure
        i. Spiral Ductwork
        ii. Fabric Duct
        iii. Concentric Diffuser
    c. Open Ceiling / Skylight Roof
        i. Sidewall Diffusers
        ii. Floor Register
6. **HVAC Systems Selection Matrix (Next Page)**

HVAC System Considerations

System Type	Window / Through Wall Units	Residential / Light Commercial Split Systems	Packaged Ground or Roof Top Unit	VAV Systems	Water-Source Heat Pump	VRF	Central Chiller Water / Boiler Water
Application	Hotel room, classroom, office, apartments	Residential, office, apartments, retail, low-rise buildings, etc	All low-rise buildings or top floor	Individual zone control - Connect to RTU, SS, WSHP	Small or large buildings - All types	Small or large buildings - All types	Large buildings, high rises, campus energy plant, industrial process cooling, Steam
Temperature Control	May experience temperature swings	All zones must be in cooling or heating	All zones must be in cooling or heating	Zones can be cooling/heating at same time	Zones can be Cooling/heating at same time	Zones can be Cooling/heating at same time	Great control, size for diversity
Dehumidification	Limited	Good	Good	Good	Direct -Good, Indirect (DOAS) - Great	Direct -Good, Indirect -Great	Based on secondary equipment
Outdoor Air Capacity	Low	Good to Low	Good - Easily available	Good	Good - Direct or great-Indirect (DOAS)	Direct - Low, DOAS - Great	Based on secondary equipment
First Cost	Lowest	Low	Low	Moderate	Moderate to Highest	High	Highest
Efficiency	Standard	Standard	Standard	Good	High Geothermal - Highest	High	High
Maintenance	Simple, but possibly many units in occupied space	Standard - May be in occupied space	Standard - Roof Access	Depends on central system, may have many VAV boxes, units above occupied space	Moderate to High - Cooling tower, pumps, indoor locations may be in/above occupied space	Moderate -May have many indoor units, units above or on wall in occupied space	High - Cooling tower, boilers, pumps, piping indoor units
Life Span	10 to 15 years	10 to 15 years	About 15 years	About 15 years	~15 yrs for AHUs, ~20 yrs for CT	15 to 20 yrs	~20+ yrs
Installation	Simple	Simple	Moderate (Roof access)	Moderate to High	High - (Outdoor space, pump/boiler room, AHU space)	High - May have many indoor units, critical refrigerant piping	High - (Outdoor space, pump/boiler room, AHU space)
Air Distribution	Ductless	Ducted or Ductless	Ducted	Ducted	Ducted	Ducted or Ductless	Based on secondary equipment
Additional Equipment	None	Outdoor unit	None	VAV boxes, possibly a Boiler	Closed Circuit Cooling Tower or geothermal source, Pumps, boiler, Water Piping, DOAS	One outdoor unit serves many indoor units, Branch controller boxes, DOAS	Cooling Towers, Chillers, Boilers, Pumps, Tanks, Piping, complex controls

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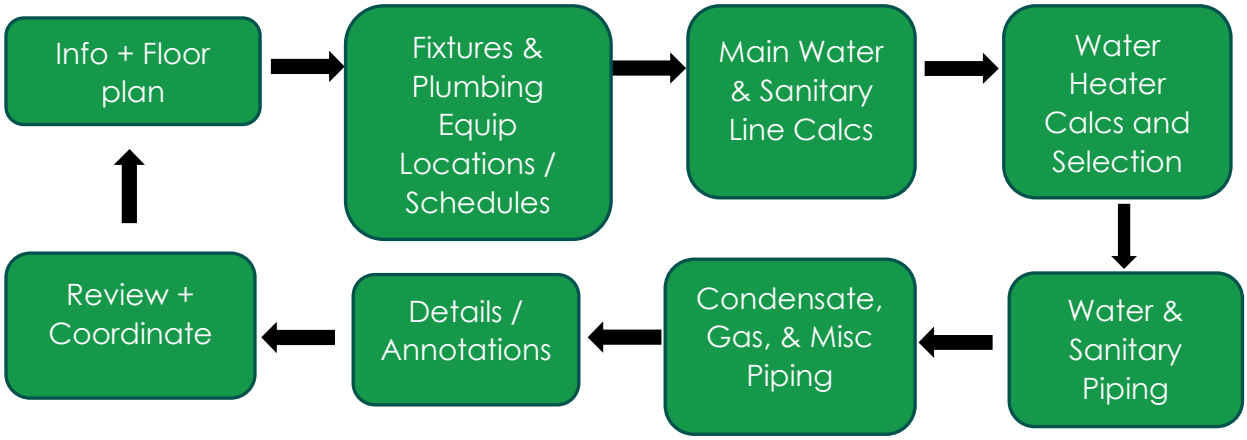
Plumbing Coordination Tips

1. **Plumbing Design Process:**



2. **Water Heater Types:**
    a. Electric Tank:
        i. Most common and simple.
        ii. Recommended for low to medium hw demands.
    b. Electric Tankless:
        i. Best for point of use or remote sinks / eye washes
        ii. Not recommended for central hw because of high electric load
    c. Gas Tank:
        i. Can use a smaller tank then electric and provide much more hw
        ii. Recommended for medium to high hw demands
        iii. Above 199,000 btu it becomes a "boiler"
    d. Gas Tankless:
        i. Creates instant hw and saves floor space
        ii. Recommended for low-medium hw demand and close to fixtures
        iii. Can be over-rated because the flow rates are limited and usually require more than one WH or separate storage tank. Also, hw recirculation is typically required which makes the WH heat the water continuously anyway.
3. **Plumbing Fixture Location Recommendations:**
    a. Place restrooms back-to-back to save piping.
    b. Avoid fixtures on outside walls or over footers if possible.
    c. Stack restrooms and fixtures on multi-story buildings.

4. **Piping Space Requirements:**

Schedule 40 PVC Pipe (Sanitary Piping)	
Nominal Pipe Size	Outside Diameter (Inches)
1/8"	0.405
1/4"	0.54
3/8"	0.675
1/2"	0.84
3/4"	1.05
1"	1.315
1-1/4"	1.66
1-1/2"	1.9
2"	2.375
2-1/2"	2.875
3"	3.5
3-1/2"	4
4"	4.5
5"	5.563
6"	6.625
8"	8.625
10"	10.75

Copper L Pipe (Water Piping)	
Nominal Pipe Size	Outside Diameter (Inches)
3/8"	0.5
1/2"	0.625
3/4"	0.875
1"	1.125
1-1/4"	1.375
1-1/2"	1.625
2"	2.125
2-1/2"	2.625
3"	3.125
3-1/2"	3.625
4"	4.125
5"	5.125
6"	6.125

5. **Common Codes:**
   a. Backflow Protection: All buildings require a BFP on the incoming water line prior to any fixtures. Usually requires about 3 ft along a wall and a floor drain or mop sink.
   b. Hot Water Recirculation: HWR is required for fixtures that are 50ft or farther from the WH. We recommend about 15 ft.
   c. Grease / Oil / Lint:
      i. Point of use Grease Traps/Interceptors are required for triple sinks. Large 1500 gallon + traps are required for kitchens. Size/requirement is usually controlled by the local utility company.
      ii. Oil separators are required prior to draining any oil into the sanitary sewer. These may go in the floor or ground. Common for (auto garages, industrial applications, and elevator sump pumps)
      iii. Lint traps are required for commercial washing machine drains prior to draining into the sanitary sewer. Typically located in the floor or outside right after a washer.

d. Cleanouts: These are required every 100 ft on sanitary piping and when sanitary piping turns more than 45 degrees. These can be in the wall or in the floor.
e. Roof Drain (Primary / Secondary):
    i. Each roof drain requires two pipes. The Primary will route underground to the storm water. The Secondary or overflow will spill out above grade. If the secondary drain is flowing, this means the primary drain is plugged up.
    ii. The Secondary drain can be omitted if there are roof scuppers.

6. **Cost Reduction Tips:**
    a. Use tank toilets instead of flush valves if practical (not recommended for high traffic facilities). Cheaper fixture and smaller water piping.
    b. Place restrooms back-to-back or along the same wall to save piping/trenching.
    c. Locate the main kitchens, restrooms, laundry rooms, etc near the sanitary building exit if known. Also, near mechanical / water rooms. This will save piping.

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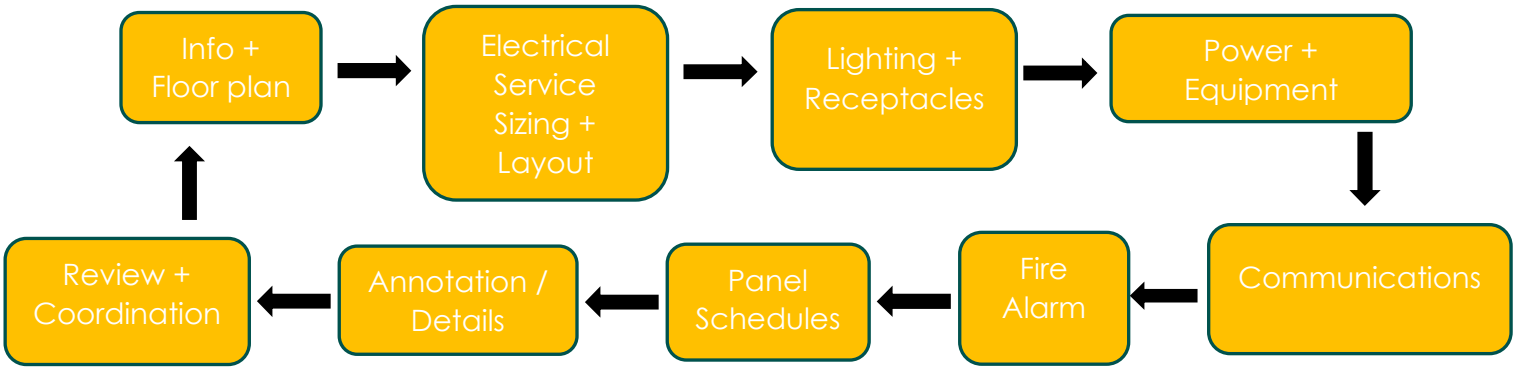
Electrical Coordination Tips

1. **Electrical Design Process:**



2. **Electrical Space and Clearances:**
    a. Provide engineers with preferred electrical panel locations in addition to the main electrical room.
    b. Spaces Around Electrical Equipment (NEC 110.26):
        i. Nothing can be in the electrical working clearance. Not even other electrical equipment. Work clearances can be overlapped / shared among 1 or more pieces of equipment.
        ii. Front Working Clearance:
            1. In general, account for 3’ 6” in front of electrical equipment (i.e. transformers, panelboards).
        iii. Width of Electrical Equipment:
            1. 30” minimum or the width of the electrical equipment; whichever is greater.
        iv. Height of Working Space:
            1. 6’6” minimum from floor or the top of the equipment, whichever is greater.
            2. No mechanical equipment, ducts, or piping can be in the vertical space of electrical equipment. The only thing allowed is electrical conduit.
        v. Entrance Into and Out of Electrical Rooms:
            1. Equipment 800-amps and larger require 2 means of egress. A ladder cannot be used as the primary means of egress for equipment 800 amps and larger. Personnel

doors cannot be more than 25' away and all doors must swing out from the room where the electrical equipment is located.

3. **Common Codes:**
    a. Arc-Flash Hazard Warning (NEC 110.16):
        i. Equipment 1200 amps and over require an arc flash performed by a licensed individual (Hodge can do this!).
        ii. Arc flash labels must include:
            1. Nominal system voltage
            2. Available fault current
            3. Clearing time of service overcurrent protective device based on the available fault current.
            4. The date the label was applied.
    b. Electrical Disconnect Rule (NEC 230.71 and .72 – 6)
        i. A building can only be supplied with 6 service disconnecting means.
        ii. All disconnects must be grouped in a single location so the fire department can shut off power to the building without fear of hosing down energized equipment. This can be done with disconnect switches or shunt trips.
    c. NEC 450.13.B Transformer installations
        i. Dry-type transformers (most common) 50 kVA and below can be placed above drop ceilings.
    d. NEC 695.3 – Fire Pumps
        i. Electrically driven fire pumps must be fed directly from the utility, either supplied on the line side of the incoming service or its own service, and a standby generator.
    e. Occupancy Sensors - IECC C405.2.1 & ASHRAE
        i. Occupancy sensors are required in classrooms, lecture rooms, training rooms, meeting rooms, multipurpose rooms, conference rooms, break rooms, storage rooms, copy rooms, printing rooms, private offices, restrooms, locker rooms, and dressing rooms.

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4. **Cost Reduction Tips:**
    a. Use aluminum transformers instead of copper.
    b. Avoid generators and UPS when possible (except for small ones located in server racks)
    c. Avoid an electrically driven fire pump.
    d. Avoid explosive (liquids/gases, dusts, fibers) materials inside building when possible. This will multiply all the electrical equipment costs by 1.5-2 times.